

**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 2023-24 onwards)****Eligibility:**

Students who have B.Sc. Foods and Nutrition, Food Science and Nutrition, Clinical Nutrition and Dietetics, Food Science and Quality Control, Applied Nutrition, Food Technology, Nutrition and Dietetics, Public Health and Nutrition, B.Voc. Food Processing, Food Processing and Safety, Food Technology with minimum 50% marks or B grade are eligible to apply.

Students having pure Science Degree in Life Science, Biotechnology, Bio Chemistry, Physiology and Microbiology are eligible provided they have secured a minimum of 60% or 'A' grade in their Undergraduate degree.

**Updated on 21.04.2025**

Sem.	Courses	Title	Ins. Hrs.	Credit	Exam. Hrs	Marks		Total
						Int.	Ext.	
I	Core Course I (CC)	Advanced Food Science	6	5	3	25	75	100
	Core Course II (CC)	Applied Human Physiology	6	5	3	25	75	100
	Core Choice Course I (CCC)	1. Food Processing 2. Functional Foods and Nutraceuticals	6	5	3	25	75	100
	Core Practical I (CP)	Food Analysis Practicals	6	3	3	40	60	100
	Elective Course I (EC)	1. Nutritional Biochemistry 2. Nutrition Through Life Cycle	6	4	3	25	75	100
	Value Added Course I (VAC)	Computer Application in Research	-	2*	3	25	75	100*
	<b>Total</b>		<b>30</b>	<b>22</b>	-	-	-	<b>500</b>
II	Core Course III (CC)	Advanced Nutrition	6	5	3	25	75	100
	Core Course IV (CC)	Clinical Biochemistry	5	5	3	25	75	100
	Core Choice Course II (CCC)	1. Sports and Fitness Nutrition 2. Public Health Nutrition	5	5	3	25	75	100
	Core Practical II (CP)	Clinical Biochemistry Practicals	6	3	3	40	60	100
	Elective Course II (EC)	1. Food Analytical Techniques 2. Nutrigenomics	5	4	3	25	75	100
	Non-Major Elective Course I	Fundamentals of Nutrition	3	2	3	25	75	100
	<b>Total</b>		<b>30</b>	<b>24</b>	-	-	-	<b>600</b>

III	Core Course V (CC)	Therapeutic Nutrition	6	5	3	25	75	100
	Core Course VI (CC)	Food Microbiology and Safety	5	5	3	25	75	100
	Core Choice Course III (CCC)	1. Nutrition in Critical Care 2. Food Biotechnology	5	5	3	25	75	100
	Core Practical III (CP)	Therapeutic Nutrition Practical	6	3	3	40	60	100
	Elective Course III (EC)	1. Food Service Management 2. Food Product Development	5	4	3	25	75	100
	Non-Major Elective Course II	Basic Food Preservation	3	2	3	25	75	100
		<b>Total</b>	<b>30</b>	<b>24</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>600</b>
IV	Core Course VII (CC)	Techniques of Food Preservation	6	5	3	25	75	100
	Core Course VIII (CC)	Research Methodology and Statistics	6	5	3	25	75	100
	Entrepreneurship / Industry Based Course	Food Industry / Hospital / Research Lab Internship	6	5	3	40	60	100
	Project	Dissertation	12	5	-	20	80	100
	Value Added Course II (VAC)	Basics of Interior Design	-	2*	3	25	75	100*
		<b>Total</b>	<b>30</b>	<b>20</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>400</b>
		<b>Grand Total</b>	<b>120</b>	<b>90</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2100</b>

### SUMMARY OF CURRICULUM STRUCTURE OF PG PROGRAMMES

Sl. No.	Types of the Courses	No. of Courses	No. of Credits	Marks
1.	Core Courses	8	40	800
2.	Core Choice Courses	3	15	300
3.	Core Practicals	3	9	300
4.	Elective Courses	3	12	300
5.	Entrepreneurship/ Industry Based Course	1	5	100
6.	Project	1	5	100
7.	Non-Major Elective Courses	2	4	200
	<b>Total</b>	<b>21</b>	<b>90</b>	<b>2100</b>
	Value Added Courses *	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.**

## **PROGRAMME OUTCOMES:**

- Disciplinary knowledge and skills: Possess sound knowledge in the principles of food science and nutrition and the relationship between diet and health; acquires skill in applying knowledge gained to prevent and manage disease conditions, promote health and be a productive member in the food industry.
- Skilled communicator: Acquires the ability to translate evidence-based scientific information into practical applications for health promotion; develops skills necessary to be an effective diet counsellor and food educator.
- Critical thinker and problem solver: Demonstrates ability to employ critical thinking in identifying nutritional problems and problems in food industry. Develop analytical skills and capabilities to resolve the problems efficiently to cater to the needs of a client, customer, family and society either independently or with institutional support.
- Sense of inquiry: Develops capability to probe the factors affecting the diet disease relationship and arrive at diet modifications and recommendations to enhance public health and eliminate disease.
- Team player/worker: Displays ability to be a good team player either as a food analyst, food safety officer, food business operator in a food industry or a nutritionist, dietician in the health care team. Acquires the ability to work independently or as part of a group.
- Skilled project manager: Demonstrates managerial skills required to be an entrepreneur or serve in various capacities in research centers, food industry, hospitals and fitness centres.

## **PROGRAMME SPECIFIC OUTCOMES:**

- Understand the applications of advanced food science, food chemistry, functional foods & nutraceuticals, nutritional sciences, food safety and assurance and public health strategies in combating current spectrum of malnutrition.
- Implement strategies for quality enhancement and innovation in food industry following the concepts and components of food microbiology, food preservation, food processing and food biotechnology through the application of enhanced theoretical and practical knowledge.
- Exhibit professional competency in planning diet and offer counselling for normal, therapeutic conditions, recommend nutritional modifications during space and sea travel, plan and implement diet regimes for sports person, critically ill and during conditions of disaster.
- Provide a platform to undertake innovative research for new food product development, analyse the food products using appropriate food bioanalytical techniques, ensure food safety management and quality assurance with an insight of alleviating the current nutritional problems.
- Exhibit collaborative competency, professional ethics, communication capabilities and computer skills while performing scientific experiments, documenting data and dissemination of the same to the stakeholders.
- Explore the therapeutic effects of food, develop nutraceutical food products that could be used as a supplement for specific diseases and examine the effects of nutrigenomics in nutritional diseases of public health significance.
- Develop integrated problem-solving competency and become scientists, research associates, food assurance officers, nutritionists, independent entrepreneurs and dietitians.
- Competent to pursue career in the fields of R&D, food industry and health care sector.

**COURSE OBJECTIVES:** 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 WATER CHEMISTRY AND DISPERSION SYSTEMS:**

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 CARBOHYDRATES AND LIPIDS:**

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 PROTEINS AND 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. Thermodynamics of protein- flavors interaction

Amino acids: Physiochemical properties of aminoacids. Structure and classification stereochemistry of amino acids. Isoelectric point. Hydrophobic properties of aminoacids. Chemical reactivity of amino acids – Reaction with ninhydrin & reactions. Synthesis of amino acids 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. Betalains-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, chlophyllase, texture-pectic enzymes; flavour and aroma changes, nutritional quality in food.

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

1. Visit to NIFTEM, Thanjavur.
2. Food Processing centers- Industrial visits.
3. Visits to Food Research Centers.

#### **TEXT BOOKS:**

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, 2<sup>nd</sup> 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.

#### **REFERENCE BOOKS:**

1. Vaciavik, V.A., (2021), Essentials of Food Science, 5<sup>th</sup> edition, Springer Publications, New York.
2. Eskein, (2012), Biochemistry of Food, Elsievier Publications, UK.
3. O' brien Nabors, L., (2001), Alternative Sweetners, Taylor and Francis Publications, UK.
4. Ward, J.D., and Ward, L., (2006), Principles of Food Science, 4<sup>th</sup> 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, 3<sup>rd</sup> Edition, CBS Publishers and Distributers 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:**

- Discuss the chemistry of water and the dispersion systems that influence food quality.
- Review the physicochemical properties, chemical and biochemical reactions of carbohydrates and lipids that are vital in the applications of food industry.
- Recognize and realize the role of proteins and amino acids their interactions among components that modulate the specific quality attributes of food systems.
- Demonstrate the effects of processing on the pigments and develop methods to preserve the colours.
- Appraise the functions of enzymes and enumerate its applications in food industries.

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**First Year**

**CORE COURSE II  
APPLIED HUMAN PHYSIOLOGY  
(Theory)**

**Semester I**

**Code:**

**Credit: 5**

**OBJECTIVES:** To enable the students to

- Acquire enhanced knowledge and appreciation of human physiology
- Understand the anatomy of various organ systems of the body
- Appreciate the functions of important physiological systems of the human body

**UNIT – I     BODY FLUIDS AND CARDIOVASCULAR 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, Colour index. 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 ECG 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, synbiotics. Gut-brain interaction; Gut-liver-brain axis, neuronal & endocrine regulations, role of microbiomes, role of phytochemicals including phytoestrogen, phytoinsulin & phytopolyphenols.

**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 MUSCULO SKELETAL AND NERVOUS SYSTEM PHYSIOLOGY:**

**Muscle:** Protein components and contraction mechanism, excitation – contraction coupling, role of fast and slow channels, Ca<sup>++</sup> 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 degree 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



**TEXT BOOKS:**

1. Sembulingam, Kirma, and Prema Sembulingam. Essentials of medical physiology. JP Medical Ltd, 2012.
2. Ashalatha, P. R., and G. Deepa. Textbook of Anatomy & Physiology for Nurses. JP Medical Ltd, 2012.
3. Chatterjee CC, 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.

**REFERENCE BOOKS:**

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 EN, Human Anatomy and Physiology, VI edition, Pearson edition, 2004
4. Tortora. G & Grabowski, S.R. Principles of Anatomy & Physiology, 10<sup>th</sup> 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., Textbook 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:**

- Illustrate the structure and functional organization of the human body.
- Develop insight of normal functioning of all the organ systems of the body and their interactions.
- Summarise the interrelationship between various physiological and metabolic processes.
- Identify the movement and coordination of human body its structure and physiology of various muscle systems.
- Cite relate the activity of the organs and muscle through biopotential measurements.

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**First Year**

**CORE CHOICE COURSE I**

**Semester I**

**1. FOOD PROCESSING**

**Code:**

**(Theory)**

**Credit: 5**

**OBJECTIVES:** To enable the students to

Explain major food processing techniques and underlying principles.

Understand the technology available currently for food processing.

Determine suitable methods of processing techniques for a chosen food.

Know the novel food processing methods that increase the shelf life of the foods.

**UNIT – I INTRODUCTION AND CEREAL PROCESSING:**

Indian food processing industry - outline of food supply chain, principles, need, advantages and disadvantages of processing.

Cereal processing - Milling process: complete milling process, break rolls, reduction rolls, milled products. Rice- milling methods, high-pressure processing, by products of rice milling and their utilization; wheat- milling, by- products of milling, nutritional losses during processing; nutritive value and applications.

Flour and millets- types and grades of flour; processing - maize, sorghum, barley, oats

Extrusion- process - macaroni products, breakfast cereals - RTC, RTS, RTE

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

**UNIT – II PULSES AND OILSEEDS PROCESSING:**

Pulse processing - Pre- processing, milling of pulses, types of milling, decortication, methods to remove toxic factors, dhals, flours, puffed dhal and peas, quick cooking dhal, instant legume powders, protein concentrates, isolates and hydrolysates.

By-products utilization; Effect of processing on nutritive value and physiochemical properties of pulses.

Soya bean processing - processed soy products - soymilk, soynut butter, soy flour, dehydrated soy and textured vegetable protein.

Nuts and Oilseed 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 SHELL FISH 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. Visit to FCI, TNAU, Milk processing unit
2. Visit to oil processing unit
3. Visit to related research institutes

#### **TEXT BOOKS:**

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, 2<sup>nd</sup> edition, New Age Publisher, New Delhi.
6. Roday, S., (2011), Food Science, 1<sup>st</sup> edition, Oxford Publication, UK.
7. Srilakshmi, B., (2015), Food science, 6<sup>th</sup> edition, New Age Publishers, New Delhi.
8. Fellows, P., (2000), Food Processing Technology, 2nd Edition, Woodhead Publishing Limited, India.
9. Sharma, A., (2017), Text book of food science and Technology, 3<sup>rd</sup> 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, 4<sup>th</sup> edition, Stem Publishers, USA.
6. Srivastava, R. P. and Kumar, S., (2006), Fruits and Vegetables Preservation- Principles and Practices, 3<sup>rd</sup> edition, International Book Distributing Co., Lucknow.
7. Crusess, W.B., (2004), Commercial Unit and Vegetable Products, W.V. Special Indian Edition, 2<sup>nd</sup> 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:**

- Define the characteristics of raw food material and examine the science behind processing of foods
- Identify the changes in physicochemical properties of foods during processing and appraise their effect on the quality of the products.
- Demonstrate the production of processed foods by adopting different processing methods
- Evaluate the impact of processing on nutritive value of foods
- Explain the technologies in food processing and select the equipments used in food processing

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**First Year**

**CORE CHOICE COURSE I  
2. FUNCTIONAL FOODS AND  
NUTRACEUTICALS**

**Semester I**

**Code:**

**(Theory)**

**Credit: 5**

**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
- Develop diet supplements incorporating functional foods
- Appreciate the effects of nutraceuticals in health and therapeutic conditions

**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.

### **TEXT BOOKS:**

1. Mary, K. Schmidl and Theodore, P. Labuza, Essentials of Functional Foods, Culinary and hospitality industry publication services, 2000.
2. Israel Goldberg, Functional foods, pharma foods, 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.

### **REFERENCE BOOKS:**

1. Wildman, Robert. Nutraceuticals and Functional Foods, second edition. Taylor and Francis Group, 2007.
2. Gibson GR & William CM. Functional Foods - Concept to Product, 2000.
3. Goldberg I. Functional Foods: Designer Foods, Pharma Foods, 2010.
4. Brigelius-Flohé, J & Joost HG. 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.
8. Satinder Kaur Brar, Surinder Kaur and Gurpreet Singh Dhillon, Nutraceuticals Functional Foods, 2014.

### **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://gavispanel.gelisim.edu.tr/Document/bgcol/20190220115348732\\_dcfb1798-bc12-4788-a50f-ec72d7f69ef4.pdf](https://gavispanel.gelisim.edu.tr/Document/bgcol/20190220115348732_dcfb1798-bc12-4788-a50f-ec72d7f69ef4.pdf)
5. <https://www.youtube.com/watch?v=QxORI49hcI4>
6. [https://onlinecourses.swayam2.ac.in/cec23\\_ag02/preview](https://onlinecourses.swayam2.ac.in/cec23_ag02/preview)
7. <https://youtu.be/9G1wWUjkyz8?si=0XDM9lh7T6f1IGEY>

### **COURSE OUTCOMES:**

- Explain the growing importance of nutraceuticals and functional food.
- Assess the role of nutraceuticals and functional foods in disease prevention.
- Identify, analyze and isolate the different types of functional foods and their nutraceutical components.
- Outline the beneficiary role of probiotics, prebiotics and synbiotics
- Infer the safety and regulatory aspects pertaining to functional foods and nutraceuticals.

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**First Year**

**CORE PRACTICAL I  
FOOD ANALYSIS  
(Practical)**

**Semester I**

**Code:**

**Credit: 3**

**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

**REFERENCE BOOKS:**

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.

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**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 insight into interrelationships between various metabolic pathways.

### **UNIT I CARBOHYDRATES:**

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, denovo synthesis of fatty acids, synthesis and breakdown 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 monosubstrate and bisubstrate catalysed 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 Signalling: Overview of extracellular cell signalling, G protein couple receptors and their effectors, enzyme linked receptors and their effectors, ras and rho family signalling; 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

#### **TEXT BOOKS:**

1. Ambika Shanmugam, Fundamentals of biochemistry for medical students, 8<sup>th</sup> edition, Wolters Kluwer Health, India, 2016.
2. Vasudevan DM, Sreekumari S, Textbook of Biochemistry, 5th edition, Jaypee Publishers, New Delhi, 2007.
3. VeeraKumari L, Biochemistry, 1st edition, MJP Publishers, 2005.
4. Sulochana H, 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, McGraw hill Education, 2015
2. Murray RK, Granner DK, Mayes PA, Rodwell VW, Harper's Illustrated Biochemistry, 26<sup>th</sup> edition, Mcgraw hill publishing house, 2003.
3. Cox MM and Nelson DL, Leininger Principles of biochemistry, 5th edition, EH Freman & Company, New York, 2008

## **E RESOURCES:**

1. [https://www.youtube.com/watch?v=YQV\\_ODVCzQQ](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](https://www.youtube.com/watch?v=ePZc-71PT_4)
4. [https://www.youtube.com/watch?v=ruPRVAQ\\_wrl](https://www.youtube.com/watch?v=ruPRVAQ_wrl)
5. [https://www.youtube.com/watch?v=HD7ErUVccJ4&list=PLyvXYqABoA5UxMmEimkcS8qOY\\_o1zpJWG&index=4](https://www.youtube.com/watch?v=HD7ErUVccJ4&list=PLyvXYqABoA5UxMmEimkcS8qOY_o1zpJWG&index=4)
6. <https://www.youtube.com/watch?v=2UfjwZAGTl0&list=PLRpz4J5dUMCcJ6t2g8bfzDjkbQC0nSEP9>

## **COURSE OUTCOMES:**

- Illustrate systematic knowledge on carbohydrate metabolic regulation
- Examine the lipid metabolism and its regulation
- Appraise the enzymes, their types, enzyme activity
- Summarise the signaling pathways
- Correlate the action of enzymes with metabolic regulation

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**First Year**

**ELECTIVE COURSE I**  
**2. NUTRITION THROUGH LIFE CYCLE**  
**(Theory)**

**Semester I**

**Code:**

**Credit: 4**

**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 lifestyle through proper diet planning
- Identify national nutrition guidelines, 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 guidelines 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

#### **TEXT BOOKS:**

- 1 Srilakshmi B, Dietetics, sixth edition, New age 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 McGraw-Hill Publishing Company Limited, New Delhi.
- 6 Antia, F.P. (2005), Clinical Nutrition and Dietetics, Oxford University Press, Delhi.

#### **REFERENCE BOOKS:**

- 1 Sharma M, Textbook 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 Lifecycle, 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, Lifecycle Nutrition- An evidence-based approach, 2nd edition, Jones & Bartlett learning publications, 2015.
- 6 Mahan LK, Stump SE and Raymond JL, Krause's Food and Nutrition Care Process, 13<sup>th</sup> Edition, Elsevier Saunders, Missouri, 2012
- 7 Stump SE, Nutrition and diagnosis related care, 7th edition, Lippincott, 2012.

- 8 Stacy N, William's Basic Nutrition and Diet Therapy, 12th edition, Elsevier publications, UK, 2005.
- 9 Whitney EN and Rolfes SR, Understanding Nutrition, 9 th edition, West/Wordsworth, 2002.
- 10 Garrow JS, James WPT, Ralph A, Human Nutrition and Dietetics 10th edition, Churchill Livingstone, NY, 2000.
- 11 Groff JL, Gropper SS, Advanced Nutrition and Human Metabolism 3<sup>rd</sup> edition, West / Wadsworth, UK. 2000.

#### **E-RESOURCES:**

- 1 [www.bam.gov/](http://www.bam.gov/)
- 2 [www.health.gov.healthypeople](http://www.health.gov.healthypeople)
- 3 [www.ncemch.org](http://www.ncemch.org)
- 4 [www.e-geriatric.net](http://www.e-geriatric.net)
- 5 [www.cfsan.fda.gov](http://www.cfsan.fda.gov)
- 6 [www.four-h.purdue.edu/foods/Nutrition through the...](http://www.four-h.purdue.edu/foods/Nutrition%20through%20the...)
- 7 <https://main.icmr.nic.in/guidelines>
- 8 [https://www.nutrion.org.uk-](https://www.nutrion.org.uk/) pregnancy
- 9 [https://www.who.int-](https://www.who.int/) infants nutrition
- 10 <https://youtu.be/ZF4aNuttc3g>
- 11 [https://youtu.be/S0\\_ZipHXW1A](https://youtu.be/S0_ZipHXW1A)

#### **COURSE OUTCOMES:**

- Quote the prenatal and neonatal growth and development, evaluate the nutritional needs of infants.
- 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.
- Determine the food and nutrient requirements of adolescent. Analyze the eating disorders and examine the causes of problems during adolescence.
- Recall the food and nutrient requirements and understand the physiological changes during pregnancy and lactation.
- State 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

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**First Year**

**VALUE ADDED COURSE I  
COMPUTER APPLICATION IN  
RESEARCH  
(Theory)**

**Semester I**

**Code:**

**Credit: 2**

**OBJECTIVES:** To enable the students to

- Understand the features of MS Office
- Ascertain the use of computer applications in research work
- Identify Microsoft programmes that aid in enhancing the research 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 bullets and numbering in paragraphs – finding text – replace command – checking spelling and grammar – using auto correct to automatically fix typing 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 headers and footers in the document – print preview – print options – creating tables – formatting a table – using table auto format to format a table – calculations in a table – using mail merge.

**UNIT – III INTRODUCTION TO WORKSHEET AND MS EXCEL:**

Getting started with excel – editing cells and using commands and functions – 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 POWERPOINT:**

Power Point – creating a presentation – power point views – running a slide show – 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 Webtech Solutions, Mastering Microsoft Excel Functions and Formulas 1 Edition, Khanna Publishers, 2010.
- 4 R K Taxali, PC Software for Windows 98 Made Simple, McGraw Hill Education Pvt. Ltd., 2015

### **REFERENCE BOOKS:**

- 1 Jodi Davenport, Critch Greaves, Michael Groh and Eruce Hall Berg, Inside Microsoft Office Professional, New Riders Publications, 1994.
- 2 CloriaMadumere, 3 – IN – 1 Microsoft Word, Powerpoint 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-QI.pdf](https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000827HE/P001415/M011933/ET/1527226202H16RM09-QI.pdf)
- [https://www.researchgate.net/publication/209729264\\_Textbook\\_of\\_Computer\\_applications\\_and\\_biostatistics](https://www.researchgate.net/publication/209729264_Textbook_of_Computer_applications_and_biostatistics)

### **COURSE OUTCOMES:**

- Identify the tools and formats of MS applications
- Apply documentation and presenting skills.
- Demonstrate proficiency in using windows, word processing applications and spreadsheet applications.
- Prepare effective power point presentations.

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**First Year**

**CORE COURSE III  
ADVANCED NUTRITION  
(Theory)**

**Semester II**

**Code:**

**Credit: 5**

**OBJECTIVES:** To enable the students to

- Ascertain the energy requirements and energy components.
- Understand the metabolism of macronutrients 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 emergencies.

**UNIT – I      MACRO NUTRIENTS:**

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: Physiological role, requirements.

**UNIT – II      MICRO NUTRIENTS:**

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 AND AIR TRAVEL:**

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      NUTRITION IN HIGH ALTITUDE AND EMERGENCIES:**

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      NUTRITION TRANSITION:**

Changing trends in life style and dietary patterns in population groups and their 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.

### **TEXT BOOKS:**

- 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.

### **REFERENCE BOOKS:**

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. Wadsworth Thomson, Learning, Australia.
3. Chandra, R.K. and Newberne, 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. 10<sup>th</sup> 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). UNHCR Handbook of emergencies, 2<sup>nd</sup> edition, Geneva. UNHCR

### **E RESOURCES:**

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

### **COURSE OUTCOMES:**

- Estimate the energy requirements for individuals and comprehend the need for macronutrients.
- Realize the importance of micronutrients in growth and development of humans.
- Predict the dietary requirements while scaling high altitudes and in emergencies.
- Plan diets for space, sea and air travel.
- Relate the changing trends in the lifestyle of individuals and nutrition transition.

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**First Year**

**CORE COURSE IV  
CLINICAL BIOCHEMISTRY  
(Theory)**

**Semester II**

**Code:**

**Credit: 5**

**OBJECTIVES:** To enable the students to

- Understand the biochemical mechanisms and pathophysiological processes responsible for common biochemical disorders.
- Have an overview of normal and abnormal metabolic functions, the impact of disorders on metabolic processes.
- Correlate molecular basis of diseases and novel strategies to prevent the diseases.
- Gain insight into the organ function tests.
- Comprehend the role of hormones in health.

**UNIT – I BODY FLUIDS AND BIOMARKERS:**

Intracellular fluid compartment, extra cellular 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. Haematological 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 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, 6<sup>th</sup> 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, Textbook of Medical Biochemistry, Jaypee Brothers, 2015

#### **REFERENCE BOOKS:**

- 1 Rodney F. Boyer, Biochemistry Laboratory: Modern Theory and Techniques, 2<sup>th</sup> edition, Pearson Prentice Hall, 2011.
- 2 Undurti N., Das Molecular Basis of Health and Disease, 1<sup>st</sup> edition, Springer, 2011.

- 3 MN Chatterjea, Ranashinde, Textbook of Medical Biochemistry, 8<sup>th</sup>edition, JAYPEE, 2012.
- 4 William J. Marshall, S. K. Bangert, Clinical Biochemistry: Metabolic and Clinical Aspects, 1<sup>st</sup>edition, Churchillivingstone, 1995.
- 5 Michael Lieberman, Allan D. Marks, Marks' Basic Medical Biochemistry: A Clinical Approach, 3<sup>rd</sup>edition, Lippincott Williams &Wilkins, 2009.

## **E RESOURCES**

1. [https://books.google.co.in/books?id=P3TWDwAAQBAJ&printsec=copyright&redir\\_esc=y#v=onepage&q&f=false](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](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/x0gpa pT-Y2kC?hl=en&gbpv=1&dq=immunology+book+e+link&printsec=frontcover](https://www.google.co.in/books/edition/Fundamental_Immunology/x0gpa pT-Y2kC?hl=en&gbpv=1&dq=immunology+book+e+link&printsec=frontcover)

## **COURSE OUTCOMES:**

- Enumerate the analytical techniques, biomarkers and their significance in health.
- Examine the abnormalities in metabolic functions and analyse the inborn errors of metabolism.
- Appraise the various organ function tests and their significance.
- Discuss the role of different immune bodies and their mechanism of action.
- Speculate the metabolic changes during stress and infer the physiological changes.

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**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, kick boxing, hanging, hand grips, 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.

Kinanthropometry: definition, introduction, body size and proportion; smatotyping; 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.

Macronutrient 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, multi vitamin 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 dietician. Detailed study of nutrition counselling theories and strategies - cognitive behavior therapy, rational emotive 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.

**TEXT BOOKS:**

- 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.

**REFERENCE BOOKS:**

- 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.

**E RESOURCES:**

- <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:**

- Examine the importance and dimensions of sports nutrition.
- Associate the role of nutritional assessment in physical fitness.
- Appraise exercise physiology in terms of training principles and adaptations.
- Review the nutritional care process and counseling strategies for sports person.
- Evaluate current nutritional information dietary supplements & ergogenic aids.

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**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 for age, weight for height, height for age & BMI for age, 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 Breastfeeding 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.

**TEXT BOOKS:**

1. ChanderVir S, Public Health Nutrition in developing countries, Part I, 1st edition, Woodhead 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. ChanderVir S, Public Health Nutrition in developing countries, Part II, 1st edition, Woodhead 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, PeePublishers, New Delhi, 2008
4. Sharma N, Child Nutrition, 1st edition, Murarilal& sons, New Delhi, 2006
5. Gupte S, Textbook of Pediatric Nutrition, Pawaninder P Vij Publishers, New Delhi, 2006.

**JOURNALS/ E RESOURCES:**

- 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\\_In\\_troduction\\_to\\_Public\\_Health](https://www.researchgate.net/publication/344210222_LECTURE_NOTES_In_troduction_to_Public_Health)
- 5 <https://alraziuni.edu.ye/uploads/pdf/An-Introduction-to-Community-Health.pdf>

**COURSE OUTCOMES:**

- Enumerate the ecology of malnutrition and the nutritional problems that have public health significance.
- Choose the appropriate nutrition assessment method to find the nutritional status of the population.
- Examine the role of national, international and voluntary nutritional organizations that combat malnutrition.
- Organize community nutrition education programme with the application of computers.
- Apply immunological intervention programmes to overcome epidemic of communicable diseases.

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**OBJECTIVES:** To enable the students to

- Analyse selected constituent in blood and urine samples.
- Draw inference based on the quantified compounds.

### 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 Hemoglobin.
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.

### TEXT BOOKS:

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

### REFERENCE BOOKS:

1. H. Varley, GowenLock.A.H, willian 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. Ramniksood, Text book 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)

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**OBJECTIVES:** To enable the students to

- Familiarize the experimental techniques used in food analysis.
- Know the advanced instruments/equipments required for food and biochemical analysis.
- Outline the principles in the use of instruments.
- Gain insight in the usage of various techniques and their applications in industry and R & D.

**UNIT – I      SPECTROSCOPIC TECHNIQUES:**

Need for analysis and instrumentation, selecting an appropriate instrumental technique, criteria for selecting a technique, Limit of Detection (LOD) and Limit of Quantification (LOQ), Colorimetry (SS), Spectrophotometry - definition and derivation of Lambert-Beer's Law, UV-VIS Spectrophotometer, Atomic-Absorption Spectroscopy (AAS), Inductively Coupled Plasma — Optical Emission Spectrophotometry (ICP- OES/MS).

**UNIT – II      CHROMATOGRAPHIC TECHNIQUES:**

Basics and Classification of Chromatography- Adsorption, partition, size exclusion, ion-exchange, affinity Gas Chromatography, Liquid Chromatography - Instrumentation, Sampling techniques and Applications, Applications of HPLC, Comparison of HPLC and GC (SS) Thin Layer Chromatography. High Performance Thin Layer Chromatography (HPTLC),

Hyphenated Techniques - Gas Chromatography-Mass Spectrometry (GC-MS), Liquid Chromatography-Mass Spectrometry (LC-MS).

**UNIT – III      FLUORIMETRY, FLAME PHOTOMETRY AND ELECTROPHORESIS TECHNIQUES:**

Theory of fluorescence (SS) and instrumentation, instrumentation in Flame Photometry-oxidant, fuel, filter, detector, amplifier, applications. Principles and procedure of electrophoresis — Paper and Agar Electrophoresis, Moving boundary electrophoresis, PAGE, Applications in food systems (SS).

**UNIT – IV      RADIOACTIVITY AND ADVANCED MICROSCOPIC TECHNIQUES:**

Radioactive isotopes (SS)- Methods and types of radioactive counters- gas and liquid scintillation- uses, applications and safety. Food morphology study-transmission electron microscopy (TEM), scanning electron microscopy (SEM), atomic force microscopy (AFM).

**UNIT – V      TECHNIQUES FOR ANALYSIS OF PHYSICAL PROPERTIES OF FOODS:**

Rheology and viscosity of foods –Rheometer, viscometer, barbender farinography. texture analyser, hunter calorimeter, refractometer. Practical interpretation of texture profile analysis in food systems (SS). Nuclear magnetic resonance spectroscopy (NMR). Fourier transform infrared spectroscopy FTIR. Thermogravimetric analysis and differential scanning calorimeter – principle, instrumentation and application.

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

1. Visit to R&D labs.
2. Demonstration of any one chromatographic or electrophoresis technique.

### **TEXT BOOKS:**

1. Wilson and Walker. A biologist's guide to principles and techniques of practical biochemistry. 5th ed. Cambridge University Press 2000.
2. Boyer, R. Modern Experimental Biochemistry. 3rd ed. Addison Wesley Longman, 2000.
3. Upadhyay, Upadhyay and Nath. Biophysical Chemistry Principles and Techniques. Himalaya Publ. 1997.
4. Simpson CFA &Whittacker, M. Electrophoretic techniques.
5. Sambrook. Molecular Cloning. Cold Spring Harbor Laboratory, 2001.
6. Friefelder and Friefelder. Physical Biochemistry – Applications to Biochemistry and Molecular Biology. WH Freeman &Co. 1994.
7. Pavia et al. Introduction to Spectroscopy. 3rd ed. Brooks/Cole Pub Co., 2000.

### **REFERENCE BOOKS:**

1. Kaur.N. Instrumental Methods of chemical analysis. PragatiPrakashan Educational Publishing. 3rd Edition, 2006.
2. Alan H.Gowenlock, Jannet R Mc Murray and Donald M. McLauchlex, Varley"s Practical Clinical Biochemistry, sixth edition. CBS Publishers and distributors, New Delhi, 2006.
3. Egon Stahl, Thin Layer Chromotography, A Laboratory Handbook, second edition, Springer International Edition, Heidelberg, 2005.
4. Rodney Boyer, Biochemistry Laboratory- Modern Theory and Techniques; Pearson Education Inc. Publications, USA, 2006.
5. Official Methods of Analysis, Association of Official Analytical Chemists – Officially recognized methods of analysis for many food components. 18th ed,2011.
6. Y. Pomeranz and C.E. Meloan. Food Analysis: Theory and Practice. Springer, 2002.

### **E-RESOURCES:**

- <https://www.youtube.com/watch?v=doxGqBOp5MM>
- <https://www.youtube.com/watch?v=62VkLE5inBU>
- <https://egyankosh.ac.in/bitstream/123456789/76467/1/Unit-1.pdf>
- <https://egyankosh.ac.in/bitstream/123456789/13100/1/Unit-6.pdf>
- <https://www.youtube.com/watch?v=ltT8vr5Wmz8>

### **COURSE OUTCOMES:**

- Cite the need for food analysis and instrumentation.
- Identify appropriate techniques for analysing specific substance or nutrients present in food.
- Outline the working principles, tools and techniques of food analysis.
- Summarise the separation and quantification of nutrients by appropriate techniques.
- Analyse the physical properties of food.

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**First Year**

**ELECTIVE COURSE II**  
**2. NUTRIGENOMICS**  
**(Theory)**

**Semester II**

**Code:**

**Credit: 4**

**OBJECTIVES:** To enable the students to

- Understand the basic molecular biology and genetic expression.
- Familiarize with the basic concepts in nutritional genomics.
- Be aware of different technologies in nutrigenomics.
- Develop an understanding 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-DIET INTERACTIONS:**

Nutrigenomics: scope and importance to human health and industry. Transporter gene polymorphisms - interaction with effects of micronutrients in humans. Polymorphisms in genes affecting the uptake and transport of omega-6 and 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 CURRENT CONTOUR (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 databases and submit a mini report on current health status.

### **TEXT BOOKS:**

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

### **REFERENCE BOOKS:**

- 1 Anne Pemberton (2022) Using Nutrigenomics within Personalized Nutrition: A Practitioner's Guide Publisher.
- 2 RaffaeleCaterina, Alfredo Martinez, Martin Kohlmeier (2019) Principles of Nutrigenetics and Nutrigenomics 1<sup>st</sup> edition.
- 3 Lynette R Ferguson Nutrigenomics and Nutrigenetics in Functional Foods and Personalized NutritionPublisher: 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.

### **E RESOURCES:**

- 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](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](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:**

- Examine the functions of nucleic acids and DNA.
- Correlate the role of nutrigenomics in nutrition and health research.
- Explore the different omic technologies in nutrigenomics.
- Appraise nutrient-gene interaction and its role in disease prevention.
- Employ nutritional strategies for prevention of chronic diseases.

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**First Year**

**NON MAJOR ELECTIVE I  
FUNDAMENTALS OF NUTRITION  
(Theory)**

**Semester II**

**Code:**

**Credit: 2**

**OBJECTIVES:** To enable the students to

- Gain knowledge on food groups, physiological fuel value and energy requirements.
- Infer the functions and requirements of macronutrients.
- Understand the types of micronutrients their functions and requirements
- Comprehend the role of water in human health.

**UNIT – I INTRODUCTION AND ENERGY:**

Food groups, balanced diet, my plate, exchange list.

Energy: Energy content of foods, body composition, physiological fuel value; measurement of energy expenditure-BMR, RMR, thermic effect of feeding and physical activity, RDA; estimating energy requirement for individuals and groups.

**UNIT – II CARBOHYDRATES AND PROTEINS:**

Carbohydrate: Types, sources, functions, dietary requirements and physiological significance. Deficiency and maintenance of blood glucose level, glycaemic index of foods.

Protein: Types, sources, functions, dietary requirements; evaluation methods and improvement of protein quality; PEM.

**UNIT – III LIPIDS AND WATER:**

Lipids: Types, sources, functions, dietary requirements, EFA, transport of lipoprotein, prostaglandins.

Water: Functions, intra and extra cellular volume, water balance and its regulation, dehydration, oral dehydration therapy, electrolyte balance.

**UNIT – IV MINERALS:**

Sources, functions, RDI, deficiency and toxicity: Macro minerals- calcium, phosphorus, magnesium, sodium, potassium and chloride; Micro minerals - iron, copper, zinc, iodine, fluoride; Trace minerals- selenium, cobalt, chromium.

**UNIT – V VITAMINS:**

Types, sources, functions, dietary requirements, deficiency and toxicity of fat soluble and water-soluble vitamins.

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

- 1 Prepare flyers of nutrients and their food sources to create awareness.

- 2 Plan and prepare nutrient rich recipe and recipe card.
- 3 Collect information on traditional recipes rich in specific nutrients.

#### **TEXT BOOKS:**

- 1 Sri Lakshmi, B. (2000). Nutrition Science. New Age International (P) Ltd. Pub. New Delhi.
- 2 Swaminathan, M. (2009). Textbook of Food and Nutrition. Bappco publishers, Bangalore.

#### **REFERENCE BOOKS:**

- 1 Bamji, M.S., Rao, N.P & Reddy, V. (1996). Textbook of Human Nutrition. Oxford & IBH Publishing Co. (P). Ltd. Delhi.
- 2 Gopalan, G. RamaShastri B.V & Balasbramnnian, S.C. (2000). Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India.

#### **E RESOURCES:**

- <https://alraziuni.edu.ye/uploads/pdf/fundamentals-of-foodnutrition-and-diet-therapy.pdf>
- <https://alraziuni.edu.ye/uploads/pdf/fundamentals-of-foodnutrition-and-diet-therapy.pdf>
- <https://academic.oup.com/jnhttps://www.informaticsjournals.com/index.php/ijnd/article/view/13405>
- [https://archive.org/details/fundamentalsofcl0000unse\\_a4e6](https://archive.org/details/fundamentalsofcl0000unse_a4e6)
- [https://en.wikibooks.org/wiki/Fundamentals\\_of\\_Human\\_Nutrition/Nutritional\\_Science](https://en.wikibooks.org/wiki/Fundamentals_of_Human_Nutrition/Nutritional_Science)
- [https://kupdf.net/download/fundamental-of-food-nutrition-and-diet-therapy\\_5afd27f1e2b6f559371e1dc2\\_pdf](https://kupdf.net/download/fundamental-of-food-nutrition-and-diet-therapy_5afd27f1e2b6f559371e1dc2_pdf)

#### **COURSE OUTCOMES:**

- Quote the food groups and plan a balanced diet.
- Evaluate the energy value of foods and recognize the energy expenditure.
- Review the importance of nutrients in health.
- Identify the macro nutrients and micro nutrients, their respective food sources and functions.
- Examine the requirements, deficiency and toxicity of the macro and micro nutrients.

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**OBJECTIVES:** To enable the students to

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

### **UNIT – I NUTRITION CARE PROCESS:**

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 GASTROINTESTINAL 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:

**Cardiovascular 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.

**Inborn 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.

#### **TEXT BOOKS:**

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 RJ, Lanham SA, Clinical Nutrition (The Nutrition Society Textbook), 2nd edition, Wiley Blackwell Publishers, 2013.
6. Mahan LK, Stump SE and Raymond JL, Krause's Food and Nutrition Care Process, 13<sup>th</sup> Edition, Elsevier Saunders, Missouri, 2012.
7. Stump SE, 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 M et al., 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, 9 th edition, West/Wordsworth, 2002
7. Guthrie H, Introductory Nutrition, CV Mosby Co. St. Louis, 2002
8. Williams SR, Nutrition & Diet Therapy, CV. Mosby St. Louis, 2001
9. Garrow et al, Human Nutrition & Dietetics, 10th Edition, Churchill Livingston, 2001.

## E- RESOURCES:

1. [www.nutrition.gov](http://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:

- Associate dietary modifications and comprehend the need for modification.
- Enumerate the types, aetiology of the diseases and disorders in public health.
- Infer the risk factors and pathophysiology of the diseases and disorders common in humans.
- Analyse the nutritional modifications and dietary requirements based on the type of diseases and disorders.
- Plan and design diets suitable for individuals suffering from various diseases and disorders.

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**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 waterborne 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-mycotoxins, food parasites, sea food intoxications - 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  $\beta$ -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.

## **TEXT BOOKS:**

- 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 McGraw 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 Anandanarayanan R and Panicker CK, Textbook of Microbiology, Seventh edition, University Press, Hyderabad, 2009.
- 7 Ramesh VK, Food Microbiology, MJP Publishers, 2012.
- 8 Sullia SB 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. 2<sup>nd</sup> 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. 1<sup>st</sup> Edition. Orient Blackswan Private Ltd. India.
- 7 Forsythe, J.S. (2011). The Microbiology of Safe Food. 2nd Edition. Wiley-Blackwell Publishing.
- 8 Ravishashankar, 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.

#### **E RESOURCES:**

- 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/P00043/M00\\_0082/ET/1500370047M-02.pdf](https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000015FT/P00043/M00_0082/ET/1500370047M-02.pdf)
- 4 <https://egyankosh.ac.in/bitstream/123456789/12422/1/Unit-1.pdf>

#### **COURSE OUTCOMES:**

- Cite the microorganisms and their general characteristics and role in food spoilage.
- Enumerate the food and water borne microbial diseases.
- Analyze and describe the characteristics of food additives and food adulterants.
- Examine the toxins and contaminants in various foods operations.
- Apply food safety, standards and sanitation in food service establishments.

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**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.

### **TEXT BOOKS:**

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, 10<sup>th</sup> Edition, Churchill Livingstone.
3. Mahan, L.K. and Escott-Stump, S. (2000): Krause's Food Nutrition and Diet Therapy, 10<sup>th</sup> 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.

### **E 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:**

- Develop skills to screen and assess nutritional status of critically ill patients.
- Review the need for life support nutrition and calculate the exact quantity of feed and nutrients required for individuals on support nutrition.
- Describe the relation between infection and immunity and prescribe altered nutrient requirements during infection.
- Justify the dietary management for surgery, burns, trauma and other high risk conditions.
- Appraise the dietary management and reasons for inclusion of specific foods in sepsis, CKD and MOD.

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**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 skillsets for food production and manufacturing based on industry needs.
- Instil confidence and provide the required environment for practical research in the field of food biotechnology that is socially significant.
- Develop the required skills for efficient communication and teamwork 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 traceability; trade related aspects; bio safety; 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 an album on 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.

#### **TEXT BOOKS:**

- 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.

#### **REFERENCE BOOKS:**

- Owen pward (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 Mcgraw Hill 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. Text Book 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.

#### **E RESOURCES:**

1. <https://journals.sbmu.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\\_biotechnology\\_-\\_g.\\_gutierrez-lopez-signed.pdf](https://k8449r.weebly.com/uploads/3/0/7/3/30731055/37_food_science_and_food_biotechnology_-_g._gutierrez-lopez-signed.pdf).
4. <https://archive.org/details/FoodBiotechnologySecondEdition>
5. <File:///C:/Users/User/Downloads/Food%20Biotechnology.pdf>.
6. <https://www.pdfdrive.com/food-biotechnology-second-edition-d38602120.html>.
7. <library.atu.kz/files/50908.pdf>.

#### **COURSE OUTCOMES:**

- Associate the nature of food and distinctive features of food industry.
- Infer the current applications and foresee future trends in food biotechnology.
- Summarize and distinguish the different types of fermented foods.
- Apply basic knowledge of microbiology, biochemistry and genetic engineering in preparing fermented foods.
- Outline the traditional and modern fermented foods.

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**OBJECTIVES:** To enable the students to

- Analyze the type of disease/disorder and recommend nutritional modifications.
- Plan and prepare diets to individuals based on the disease condition.

**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.

**TEXT BOOKS:**

1. Srilakshmi (2014). Dietetics. 7th edition, New Age International Pvt. Ltd, New Delhi
2. Sue Rodwell Williams (2013) Nutrition, Diet Therapy (9th ed.). WB Saunders Company, Londo
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, Dordecht.
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. 10<sup>th</sup> Edition .Williams and Williams. A. Beverly Co. London.
6. Mahtab, S, Bamji, Kamala Krishnasamy, Brahman, 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.

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**OBJECTIVES:** To enable the students to

- Understand the principles and functions of management.
- Acquire knowledge on the facilities required for different types of food service units.
- Equip individuals in understanding and managing resources in a food service institution.
- Develop entrepreneurship skills.

**UNIT – I CONCEPT OF FOOD SERVICE MANAGEMENT:**

History and development of food service establishment. Factors affecting development, recent trends, types of food service establishment. Approaches to management – theories of management, principles and aspects of management and management tools.

**UNIT – II FOOD MANAGEMENT:**

Menu – planning, purchase and storage, quality food production, planning and control, kitchen production, records and control, delivery and service styles, types of food service systems. Kitchen layout and equipment – steps in planning and layouts. Determining equipment selection and placement, maintenance of equipment.

**UNIT – III MANAGEMENT OF FOOD SERVICE INSTITUTION:**

Personnel management – staff planning and management, employment process, staff recruitment and selection, placement and training, employee laws, trade unions and negotiations, leadership, formal relationships and duties, work design, work measurement in food service operations.

**UNIT – IV FINANCIAL MANAGEMENT:**

Definition, buying and accounting procedures in food service institution; budget, records to be maintained, cost accounting/analysis- cost concepts-types of cost-fixed cost, semi fixed cost, variable cost. Costing of foods–selling price.

Food cost control-methods of controlling food cost, break even analysis. Records to be maintained -system of book keeping, book of account-cash book, purchase book, sales book, purchase returns book, sales returns book, journal and ledger.

**UNIT – V ENTREPRENEURSHIP AND FOOD SERVICE MANAGEMENT:**

Conceptual perspective of entrepreneurship, creativity and innovation, business requirements for food products; Entrepreneurship - development and training.

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

Visit to food service institution- Hotel, Hospital, Industrial canteen and submit a report.

### **TEXT BOOKS:**

1. Sethi. M. (2004), Institutional food management. New Age International Publishers, New Delhi.
2. Terry. G.R. (1972), Principles of Management 6th Ed. Irwin Dorsey International London.
3. Sethi, M. and Malhan, S.(1993) Catering management an integrated approach 2nd ed. New Age, International Publishers, New Delhi.

### **REFERENCE BOOKS:**

- 1 West B Bessie & Wood Levelle (1988) Food Service in Institutions 6th Edition Revised
- 2 By Hargar FV, Shuggart SG, & Palgne Palacio June, Macmillian Publishing Company New York.
- 3 Kazarian E A (1977) Food Service facilities Planning 3rd Edition Von Nostrand Reinhold New York.
- 4 Kotas Richard & Jayawardardene. C (1994) Profitable Food and Beverage Management Hodder & Stoughton Publications
- 5 Kotler Philip. (2001) Marketing management Millennium Edition Prentice Hall of India
- 6 Taneja S and Gupta SL (2001) Entrepreneurship development, Galgotia Publishing
- 7 Dessler Gary (2007) Human Resource Management 11th edition Prentice Hall New Jersey
- 8 Luthans Fred (2004) Organisational Behaviour 10th Edition McGraw Hill International

### **E RESOURCES:**

1. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=NuAs6SreCGryddEfs4kkBA>
2. [https://onlinecourses.swayam2.ac.in/cec22\\_ag07/preview](https://onlinecourses.swayam2.ac.in/cec22_ag07/preview)
3. <https://legaldocs.co.in/blog/food-safety-and-hygiene-norms-in-india>
4. [https://www.brainkart.com/article/Definition-and-Types-of-Equipment\\_35155/](https://www.brainkart.com/article/Definition-and-Types-of-Equipment_35155/)
5. <https://www.mooc-list.com/course/innovation-food-industry-futurelearn>
6. [https://www.tutorialspoint.com/food\\_and\\_beverage\\_services/food\\_and\\_beverage\\_services\\_hygiene\\_and\\_safety.htm](https://www.tutorialspoint.com/food_and_beverage_services/food_and_beverage_services_hygiene_and_safety.htm)
7. <https://www.scribd.com/document/275348426/Modern-Management-Concepts-and-Skills-12th-Edition>

### **COURSE OUTCOMES:**

- Exhibit expertise to function as a food service manager.
- Develop knowledge in managing various food service systems.
- Speculate and manage man power resources in a food service institution.
- Illustrate and manage financial resources in a food service institution.
- Devise strategies to become an entrepreneur

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**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 REGULATORY 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, market research, 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.

#### **TEXT BOOKS:**

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

#### **REFERENCE BOOKS:**

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

#### **E RESOURCES:**

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:**

- Reflect on the role of food trends in the development of new food products.
- Design a food product through the application of systematic knowledge on product life cycle.
- Create and evaluate a novel food product.
- Design and apply packaging for food products and evaluate product quality.
- Exhibit theoretical knowledge and practical skills to reproduce existing food products.

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**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.

**UNIT – I PRINCIPLES OF FOOD PRESERVATION:**

Introduction to food spoilage- Definition, types of spoilage, sources of spoilage and preventive measures. Food preservation – definition, objectives, principles of food preservation and types of food preservation.

**UNIT – II PHYSICAL METHODS OF FOOD PRESERVATION:**

Food preservation by using high temperature – principles of sterilization, pasteurization and blanching. Food preservation by using low temperature – principles of refrigeration and freezing. 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.

**TEXT BOOKS:**

- 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, 4<sup>th</sup> Edition, CBS, New Delhi.
- 3 Fellows P J (2000) Food Processing Technology: Principles and Practice 2<sup>nd</sup> 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.

#### **E RESOURCES:**

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/8iQBAAAQBAJ?hl=en&gbpv=1&dq=techniques+for+food+preservation+book+pdf&print](https://www.google.co.in/books/edition/New_Methods_of_Food_Preservation/8iQBAAAQBAJ?hl=en&gbpv=1&dq=techniques+for+food+preservation+book+pdf&print)
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](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](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:**

- Understand techniques of food preservation.
- Apply methods of dehydration and freezing to extend food shelf life.
- Create novel preserved foods through precise processes.
- Implement food safety practices to prevent spoilage and contamination.
- Evaluate quality and troubleshoot issues in preserved food products.

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**OBJECTIVES:** To enable the students to

- Learn the principles behind the methods of preservations.
- Understand the stages of preservation techniques applied to different food.
- Acquire skills to preserve different types of food items based on their perishability.
- Analyze the characteristics of preservation techniques.
- Formulate preserved food products.

### **UNIT – I PRINCIPLES OF FOOD STORAGE AND POST HARVEST TECHNOLOGY:**

Nature of harvested crop, plant, animal; product storage; effect of storage and quality – storage of grains.

Introduction to post harvest technology of agricultural produce; status of production, losses, need, scope and importance; introduction to various post-harvest operations such as primary processing operation Vs secondary operation, operations like harvesting, handling cleaning, grading, sorting, drying, storage, milling, size reduction, expelling, extraction, blending, heat treatment, separation, material handling- transportation, conveying, elevating, washing; their functions and use in the post-harvest processing.

### **UNIT – II HEAT AND NON THERMAL:**

Blanching, pasteurization, sterilization and UHT processing, canning - Heat resistance of microorganisms and their spores – spoilage of canned foods and types of spoiled cans – aseptic packaging, extrusion cooking, dielectric heating, microwave heating, baking, roasting and frying. Retort processing of Ready to Eat (RTE) products. Newer methods of thermal processing- steam and hot water blanchers; batch and continuous.

High pressure, pulsed electric field, ultrasound technology, cold plasma technology, UV and pulsed light technology, hurdle technology.

### **UNIT – III LOW TEMPERATURE AND IRRADIATION:**

Refrigeration, freezing, Controlled Atmosphere (CA), Modified Atmosphere (MA), and de-hydro freezing. Food irradiation, history and mechanism, the electromagnetic spectrum, forms of radiant energy. Principles of using electromagnetic radiation in food processing, ionizing radiations and non-ionizing radiations, advantages and disadvantages. Controlling undesirable changes in food during irradiation. GRAS and legal aspects for gamma irradiation.

#### **UNIT – IV DRYING, CONCENTRATION AND EVAPORATION:**

Utilities of drying; thermal properties; Equilibrium Moisture Content (EMC); drying theories; methods of drying - contact drying, convective drying, freeze drying, radiation drying, superheated steam; drying rate period; types of dryers- deep bed, flat bed, continuous, recirculating, LSU, fluidised bed, rotary, tray, tunnel and solar. Changes during drying, control of chemical changes, desirable and undesirable changes.

Evaporation- definition, types of evaporator - single effect, double effect and multiple effect evaporator; Freeze concentration- general principles and applications, basic elements, ice crystal nucleation, growth and crystallization, separation techniques - filtration and wash column.

#### **UNIT – V CHEMICALS AND FERMENTATION:**

Preservation of food by the use of sugar, salt, chemicals, antibiotics and by smoking; permissible limits for chemical preservatives - type I and type II.

Use and application of enzymes and microorganism in processing and preservation of foods; Food fermentations, definition, types – homo, hetero and alcohol and functions, pickling.

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

- 1 Make a recipe calendar. Include a food preservation recipe with “in season” fruits and vegetables for each month.
- 2 Plan a special meal weekend menu that incorporates preserved foods for your family.
- 3 Organize a food preservation workshop for your community.

#### **TEXT BOOKS:**

- 1 Subbulakshmi, Shobha A Udipi, Padmini S Ghugre Edition 2022 Food Processing and Preservation (2 Nd Edition) Publisher: New Age International (P) Ltd.
- 2 Avantina Sharma, Text Book of Food Science and Technology, International Book Distributing Co, Lucknow, UP, 2006.
- 3 Sivasankar, Food Processing and Preservation, Prentice hall of India Pvt Ltd, New Delhi. III rd Printing, 2005.
- 4 M. Shafiur Rahman. 2007. Handbook of Food Preservation, 2nd Ed. CRC Press, Boca Raton, FL, USA.

#### **REFERENCE BOOKS:**

- 1 Fellows P J (2002), Food Processing Technology- Principles and Practices, 2nd Edition. Woodhead Publishing Ltd
- 2 Earle RL. 1985. Unit Operations in Food Processing. Pergamon Press.
- 3 Fellows P. 1988. Food Processing Technology. VCH Ellis Horwood.
- 4 Heldman DR & Singh RP.1995. Food Process Engineering. AVI Publ.

- 5 McCabe WL & and Smith JC. 1971. Fundamental of Food Engineering. AVI Publ.
- 6 Sahay KM & Singh KK. 1994. Unit Operation of Agricultural Processing Vikas Publ. House.
- 7 Singh RP &Heldman DR. 1993. Introduction to Food Engineering. Academic Press.

## **E RESOURCES:**

1. <https://nchfp.uga.edu/>
2. <https://ifst.onlinelibrary.wiley.com/journal/17454549>
3. <https://www.alliedacademies.org/food-technology-and-preservation/>
4. <https://www.fao.org/3/av105e/av105e.pdf>
5. <https://ncert.nic.in/textbook/pdf/lehe105.pdf>
6. <https://egyankosh.ac.in/bitstream/123456789/12397/1/Unit-15.pdf>
7. <http://www.cold.org.gr/library/downloads/Docs/Handbook%20of%20Food%20Preservation.PDF>
8. [https://www.google.co.in/books/edition/New\\_Methods\\_of\\_Food\\_Preservation/8iQBCAAAQBAJ?hl=en&gbpv=1&dq=techniques+for+food+preservation+book+pdf&print](https://www.google.co.in/books/edition/New_Methods_of_Food_Preservation/8iQBCAAAQBAJ?hl=en&gbpv=1&dq=techniques+for+food+preservation+book+pdf&print)
9. [https://www.google.co.in/books/edition/Food\\_Preservation\\_Techniques/PPGiAgAAQBAJ?hl=en&gbpv=1&dq=techniques+for+food+preservation+book+pdf&printsec=frontc](https://www.google.co.in/books/edition/Food_Preservation_Techniques/PPGiAgAAQBAJ?hl=en&gbpv=1&dq=techniques+for+food+preservation+book+pdf&printsec=frontc)
10. [https://www.google.co.in/books/edition/Food\\_Preservation/jgctEAAAQBAJ?hl=en&gbpv=1&dq=techniques+for+food+preservation+book+pdf&printsec=frontcover](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:**

- Enumerate the techniques of food preservation.
- Outline the appropriate preservative method for each type of food
- Formulate preserved foods by employing one or more techniques of preservation.
- Develop new products to improve the shelf life based on the perishability of the food.
- Evaluate quality and troubleshoot issues in preserved food products.

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**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 insight in the research process and report preparation.

**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.

#### **TEXT BOOKS:**

- 1 Kothari, Chakravanti Rajagopalachari. Research methodology: Methods and techniques. New Age International, 2004.
- 2 Statistical Methods – S.P. Gupta, Sultan Chand & Sons Publisher- New Delhi, 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.

#### **REFERENCE BOOKS:**

- 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](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](https://www.iare.ac.in/sites/default/files/IARE_RM_Lecture%20Notes.pdf)

#### **COURSE OUTCOMES:**

- Examine the concepts and application of research.
- Analyze the process of developing a research plan.
- Apply efficient methods to document data and prepare reports.
- Test the usage of different statistical tools and interpretation of data.
- Review and follow research ethics.

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**OBJECTIVES – To enable the students to**

- Explore career alternatives prior to graduation and integrate theory and practice.
- Assess interests and abilities in their field of study and learn to appreciate work and its function in the economy.
- Develop work habits, attitudes necessary for job success and to develop communication, interpersonal and other critical skills in the job interview process.
- Build a record of work experience; acquire employment contacts leading directly to a full-time job following graduation.
- Identify, write down, and carry out performance objectives (mutually agreed upon by the employer, the supervisor, and the student) related to their job assignment.

**CONTENT**

- 1 Internships may be full-time or part-time for a minimum period of **30 days (1 MONTH) full-time (6 hrs/day)**; if it is part-time, the number of working hours should be **not less than 180 hrs** during the summer vacation of the II semester. University curriculum is flexible to adjust internship duration. Therefore, opportunities must be provided for experiences that cannot be anticipated when planning the course. The institutes have the flexibility to schedule internship, project work, seminar etc. according to the availability of the opportunities. However, minimum requirement regarding internship duration for earning the necessary credits is one month.
- 2 Every student is required to prepare a file containing documentary proofs of the activities done by her/him. The evaluation of these activities will be done by Department Head / Cell In-charge / Project Head / Mentor or Industry Supervisor.
- 3 Request Letter / E mail from the office of Training & Placement Cell / Head of the Institution should be sent to industry in advance to facilitate the students to undertake their internship without any hurdles for a period of MINIMUM OF ONE MONTH during summer vacation following the second semester as the internship period for the students. Students request letter / profile / areas of interest may be scrutinised by the institution and forward it to the relevant industry for the internship.
- 4 Industry will confirm the duration and the number of seats allotted for internships through Confirmation Letter / E mail. In case the students arrange the training by themselves the confirmation letter should be submitted by the student to the office of Training & Placement / Head of the Institution through concerned Department Head and Supervisor. In addition, the internship period may be conveyed through Telephonic or Written Communication by the TP cell or other members of the T&P cell / Faculty members who are particularly looking after the Final/Summer Internship of the students.

- 5 Students on joining internship at the respective Industry / Organization should submit the joining report / letters / e mail.
- 6 During the internship at the Industry / Organization, faculty member(s) should make spot visit and evaluate the performance of students once/twice by visiting the Industry / Organization
- 7 The confidential evaluation report of the student is to be submitted in Department / TP CELL as applicable by the Trainers/Mentors of the Industry / Hospital / Research Centre.
- 8 Students' internship report should conform to the following. **Font size 12, font : Times New Roman, space 1.15, justified, Headings and side headings in bold, Hard Bound note - 3 copies, one soft copy in CD/pendrive; Minimum of 75 pages including interleaves**
  - i. Acknowledgement, Certification
  - ii. Brief Description of the Institution- include location, history, year of establishment, organization chart, departments, facilities
  - iii. Date wise training schedule with activity
  - iv. Case studies
  - v. Include layouts, graphs, charts, pictures, photos (if permitted)
  - vi. Conclusion
- 9 Internship Certificate to be obtained from Industry / Hospital / Research Centre.
- 10 List of students who have completed their internship successfully to be updated to the Training and Placement Cell.

#### **COURSE OUTCOMES:**

- Determine the challenges and future potential for his / her internship organization in particular and the sector in general.
- Apply theoretical learning in practical situations by accomplishing the tasks assigned during the internship period.
- Analyze the functioning of the organization.
- Recommend changes for improvement.
- Exhibit proficiency in communication and professional skills in tasks assigned during internship.

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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 EVALUATION (Both Internal & External):**

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

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

**TOTAL** - 100 marks

### **PASSING MINIMUM:**

	<b>Vivo-Voce 20 Marks</b> 40% out of 20 Marks (i.e. 8 Marks)	<b>Dissertation 80 Marks</b> 40% out of 80 marks (i.e. 32 marks)
Project		

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 the resubmitted Project at the Viva-voce within a month. A maximum of 2 chances will be given to the candidate.

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**OBJECTIVES:** To enable the students to

- Understand the basic concepts of design applicable to interior spaces.
- Develop comprehension on the nuances of design, design elements and principles.
- Learn the application of different materials and finishes for interior design.
- Create sustainable interior and exterior spaces.

#### **UNIT – I DESIGN:**

Definition, types – structural and decorative design, their characteristics, classification of decorative design. Elements of design, principles of design and its application.

#### **UNIT – II COLORS:**

Colour in the home –concept, qualities – hue, value, intensity. Classification of colors, color harmonies psychology of color. Application of colour in interiors.

#### **UNIT – III LIGHTING:**

Lighting in interiors – classification of lighting, types of lighting; Effects of lighting in interiors.

#### **UNIT – IV FLOWER ARRANGEMENT:**

Importance, steps, components of flower arrangement, mechanism, flowers and containers; Basic principles, shapes- materials required, general rules and basic styles - Ikebana and dry arrangement

#### **UNIT – V WINDOW TREATMENTS:**

Window treatments: Hard – blinds, shades; Soft – curtains and draperies –one-way draw, tieback, crisscross; decorative curtain head – swag, cascade, valance.

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

- 1 Prepare and develop a complete record for element of design and principles of design.
- 2 Hands-on experiences – collage, decoupage, papermache objects, macramé, posters, greeting cards, Bonzai, hydroponics
- 3 Visits – To appreciate the concepts of interior decoration.

#### **TEXT BOOKS:**

- 1 Premavathy, Seetharam. &Pannu, Parveen (2005). Interior Design and Decoration. CBS Publishers & Distributers, New Delhi.

- 2 Bhatt P.D., and Goenka S. (1990). Foundation of Arts Design. Bombay: Lakhari Book Depot,
- 3 Bonda P. and Sonsnowchik K. (2007).Sustainable Commercial Interiors. Jaipur: John Wiley and Book House Ltd.
- 4 Crafti. (2004). The office – Designing for Success. Jaipur: Images Publication.

#### **REFERENCE BOOKS:**

- 1 Lawrence M, (1987), Interior Decoration, New Jersey: Chartwell Books.
- 2 Riley &Bayen., (2003), The Elements of Design, Mitchell Beazley.
- 3 Harmon. S., and Kennon, K. (2018).The Codes Guidebook for Interiors (5thEd.).New York: Wiley (ISBN: 978-1-119-34319-6)
- 4 Karen, G., and Robert, Y. (1983). Corporate Design, London: Thomas and Hudson.
- 5 Kasu, A.A.(2005). Interior Design. Mumbai: Ashish Book Center.

#### **E RESOURCES:**

1. <https://egyankosh.ac.in/bitstream/123456789/61099/3/Block-2.pdf>
2. <https://egyankosh.ac.in/bitstream/123456789/28728/1/Unit-6.pdf>
3. <https://www.britannica.com/art/interior-design>
4. [https://agritech.tnau.ac.in/horticulture/horti\\_Landscaping\\_freshflower.html](https://agritech.tnau.ac.in/horticulture/horti_Landscaping_freshflower.html)
5. [https://www.youtube.com/watch?v=0h\\_n4SgJ2t8](https://www.youtube.com/watch?v=0h_n4SgJ2t8)
6. <https://ihmnotessite.com/index.php/home/hmct-notes/bhmct-3rd-year/housekeeping-6th- sem/lighting/>
7. <https://ihmnotessite.com/index.php/home/hmct-notes/bhmct-3rd-year/housekeeping-6th-sem/colour-colour-scheme/>

#### **COURSE OUTCOMES:**

- Quote the elements and principles of design
- Classify colours and apply different colour harmonies to the interiors.
- Outline the appropriate lighting and lighting fixtures suitable for a particular interior.
- Organise flowers aesthetically according to appropriate theme
- Design window treatments suitable to different types of interiors.

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