



BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI -620 024.

M.Sc. FOOD SERVICE MANAGEMENT AND DIETETICS

CHOICE BASED CREDIT SYSTEM -

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

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

onwards)

Sem.	Course	Course Title	Ins. Hrs.	Credit	Exam Hrs.	Marks		Total
						Int.	Ext.	
I	Core Course - 1 (CC - 1)	Advanced Nutrition	6	4	3	30	70	100
	Core Course - 2 (CC - 2)	Nutrition in Life Span	6	4	3	30	70	100
	Core Practical -1 (CP - 1)	Techniques of Food Analysis	6	4	3	40	60	100
	Discipline Centric Elective Course - 1 (DCEC-1)	Any one from the list	5	4	3	30	70	100
	Generic Elective Course - 1 (GEC - 1)	Any one from the list	5	3	3	30	70	100
	Skill Enhancement Course - 1 (SEC - 1)	Sports Nutrition	2	2	3	30	70	100
	Value Added Course - 1 (VAC - 1)*	Waste Management in Food Industries	-	2*		30	70	100*
	Total		30	21	-	-	-	600
II	Core Course - 3 (CC - 3)	Advanced Dietetics	6	4	3	30	70	100
	Core Course - 4 (CC - 4)	Applied Human Physiology	6	4	3	30	70	100
	Core Practical - 2 (CP - 2)	Dietetics (P)	6	4	3	40	60	100
	Discipline Centric Elective Course - 2 (DCEC - 2)	Any one from the list	4	4	3	30	70	100
	Generic Elective Course - 2 (GEC - 2)	Any one from the list	4	3	3	30	70	100
	Skill Enhancement Course - 2 (SEC - 2)	Food Evaluation and Quality Control	2	2	-	30	70	100
	Non-Major Elective Course - 1 (NMEC - 1)	One Course from Outside department	2	2	3	30	70	100
	Total		30	23	-	-	-	700
Summer Internship / Industrial Activity during the Summer Vacation after 1 st Year								

III	Core Course - 5 (CC - 5)	Quantity Food Production	6	4	3	30	70	100
	Core Course - 6 (CC - 6)	Research Methodology and Statistics	6	4	3	30	70	100
	Core Practical -3 (CP - 3)	Quantity Food Production (P)	6	4	2	40	60	100
	Discipline Centric Elective Course - 3 (DCEC - 3)	Any one from the list	5	4	2	30	70	100
	Generic Elective Course - 3 (GEC - 3)	Any one from the list	5	3	3	40	60	100
	Non-Major Elective Course - 2 (NMEC - 2)	One Course from Outside department	2	2	3	30	70	100
	Internship / Industrial Activity @		-	2	-	20	80	100
	Total			30	23	-	-	-
IV	Core Course - 7 (CC - 7)	Management Accounting in Hospital Industry	6	4	3	30	70	100
	Core Course - 8 (CC - 8)	Public Health Nutrition	6	4	3	30	70	100
	Core Course - 9 (CC - 9)	Food Service Management	6	4	3	30	70	100
	Discipline Centric Elective Course - 4 (DCEC - 4)	Any one from the list	4	4	2	30	70	100
	Entrepreneurship / Industry Based Course @	Food Product Development	3	3	3	30	70	100
	Project Work @		5	5	-	20	80	100
	Value Added Course - 2 (VAC - 2)*	Food Toxicology	-	2*	-	30	70	100*
	Total			30	24	-	-	-
Grand Total				91				2600

LIST OF DISCIPLINE CENTRIC ELECTIVE COURSE

Discipline Centric Elective Course - 1 (DCEC - 1)	
1.	Clinical Biochemistry
2.	Nutritional Biochemistry
Discipline Centric Elective Course - 2 (DCEC - 2)	
1.	Advanced Food Science
2.	Food Processing and Preservation
Discipline Centric Elective Course - 3 (DCEC - 3)	
1.	Competitive Examination in Home Science
2.	Human Resource Management
Discipline Centric Elective Course - 4 (DCEC - 4)	
1.	Functional Foods and Nutraceuticals
2.	Food Biotechnology

LIST OF NON-MAJOR ELECTIVE COURSE

(for other Department Students only)

NON-MAJOR ELECTIVE COURSE - 1 (NME-1)	
1	Fundamentals of Nutrition
NON-MAJOR ELECTIVE COURSE - 2 (NME-2)	
2	Nutrition Through Life Cycle

LIST OF GENERIC ELECTIVE COURSE (GEC)

GENERIC ELECTIVE COURSE - 1 (GEC - 1)	
1.	Front Office and Housekeeping Management
2.	House Keeping and Interior Design
3.	Dietary Guidance and Counselling
GENERIC ELECTIVE COURSE - 2 (GEC - 2)	
1.	Food Microbiology
2.	Palliative Care
3.	Food Service Facilities
GENERIC ELECTIVE COURSE - 3 (GEC - 3)	
1.	Computer Application in Nutrition Research (P)
2.	Food Adulteration (P)
3.	Sensory Evaluation (P)

SUMMARY OF CURRICULUM STRUCTURE OF PG PROGRAMMES: SCIENCE

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

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

PO 1	Disciplinary Knowledge: Broad and in-depth knowledge of advanced scientific concepts, principles, and methodologies within the chosen domain. Ability to critically explain, integrate, and apply scientific knowledge to theoretical and practical problems. Opportunities to earn additional credits through specialized and interdisciplinary courses further enhance expertise and broaden disciplinary understanding.
PO 2	Critical Thinking: Field visits, academic interactions, and experiential learning activities will help students develop critical observation, interpretation, and analytical skills. Ability to evaluate and interpret scientific data, formulate hypotheses, and draw logical conclusions. Encourages independent thinking and the ability to assess scientific problems from multiple perspectives.
PO 3	Analytical Reasoning: Through classroom discussions, scientific literature reviews, and interactive learning environments, students will strengthen their analytical reasoning abilities. Ability to critically evaluate scientific texts, identify gaps in existing knowledge, formulate research questions, and synthesize new ideas and concepts. Promotes evidence-based reasoning and logical interpretation of scientific information.
PO 4	Scientific Reasoning: Strong foundation in scientific methods, experimental design, and data interpretation through laboratory-based courses. Enhances practical knowledge of scientific instrumentation, calibration procedures, laboratory safety, and appropriate research techniques. Ability to conduct scientifically sound experiments and interpret results accurately.
PO 5	Self-Directed Learning: Encourages independent and self-directed learning through assignments, field reports, project work, and literature-based studies. Ability to organize, analyze, and present scientific findings in professional formats relevant to academic and industrial settings. Fosters responsibility, time management, and continuous self-improvement in learning.
PO 6	Reflective Thinking: Laboratory-intensive core courses will expose students to a broad range of research methodologies and experimental techniques. Ability to reflect on learning experiences, evaluate the effectiveness of scientific approaches, and understand the broader applications of scientific techniques within the discipline.
PO 7	Problem-Solving Skills: Ability to develop and apply scientific principles, quantitative reasoning, and mathematical concepts to solve discipline-specific problems. Ability to analyze experimental data, interpret scientific observations, and derive meaningful conclusions. Prepares students to

	address real-world scientific and societal challenges effectively.
PO 8	Research-Related Skills: Internships, dissertation work, and research-oriented projects provide opportunities to design, develop, and execute independent research studies. Students gain hands-on experience in research methodology, experimental techniques, data analysis, scientific writing, and ethical research practices. These experiences strengthen laboratory competence and prepare students for advanced research and professional careers.
PO 9	Lifelong Learning: Cultivates a mindset of continuous learning and professional adaptability. Ability to identify gaps in knowledge and skills, adapt to emerging technologies and scientific advancements, and pursue self-directed learning throughout their careers. Encourages lifelong learning that supports academic growth, employability, and professional excellence.
PO 10	Leadership Readiness: Ability to take initiative, work collaboratively, and manage academic and research responsibilities effectively. Through seminars, group projects, internships, and research activities, students develop decision-making, problem-solving, organizational, and interpersonal skills. Ability to lead scientific teams, communicate effectively in professional environments, and contribute responsibly to academic, industrial, and societal development.

Year: I

CORE COURSE 1

Semester: I

Code:

ADVANCED NUTRITION (Theory)

Credits: 4

COURSE OBJECTIVES: To enable the students to

- Provide comprehensive knowledge on energy metabolism, energy requirements, and energy balance in human nutrition.
- Develop an understanding of the digestion, absorption, metabolism, and physiological functions of macronutrients and micronutrients.
- Familiarize students with nutrient interactions and the role of non-nutritive food components in health and disease prevention.
- Enable students to analyze nutritional requirements under special physiological and environmental conditions.
- Develop the ability to apply advanced nutritional concepts in health promotion, disease prevention, and nutrition management.

UNIT – I: ENERGY:

Definition of Energy, Energy content of food, physiological fuel value, Energy balance, Basal Metabolic Rate, Resting Metabolic Rate, Measurement of energy expenditure: Components of Energy requirements, factors affecting Energy requirement, Specific Dynamic action and physical activity, method of Energy measurement. Energy utilization in cells, Energy metabolism during activity, Cellular Energy Deficiency and obesity energy requirements.

UNIT – II: MACRO NUTRIENTS:

Carbohydrate - Classification, digestion and transport- review, dietary fibre, fructoligo saccharides, resistant starch- chemical composition and physiological effect, sweetness- nutritive and non nutritive. Protein- Classification, digestion, absorption - review, metabolism of proteins, protein quality, methods of evaluation protein quality. Protein turn over, Inter organ flux. Fate of amino acids. Lipids - Classification, digestion, absorption, transport - review, functions of EFA. Role of n- 3,n-6, fatty acids in health and disease. Trans-fatty acids, prostaglandins.

UNIT – III: MICRO NUTRIENTS:

Vitamins - Functions, RDA, sources, deficiency and excess - Fat Soluble Vitamins (A, D, E & K), Water Soluble Vitamins (B & C). Minerals - Functions, RDA, sources, deficiency and excess effects – Macro Minerals and Micro Minerals. Trace minerals - functions, sources, deficiency

UNIT – IV: WATER, NON NUTRITIVE FOODS AND NUTRIENT INTERRELATIONSHIPS

Water - Regulation of intra and extra cellular volume. Osmolality, water balance and its regulation. Non-nutritive food components with potential health effect: polyphenols, tannins, phytate, phytoestrogens, cyanogenic compound, lectins and saponins. Metabolic interrelationship between nutrients, concept of nutritional interrelationship. Protein Energy, carbohydrates, fat, and vitamins interrelationships. Effects of Protein quality and quantity on protein utilization.

UNIT – V: NUTRITION IN SPECIAL CONDITIONS

Disaster management; Nutrition in Special Conditions - High Altitudes, Low Temperature and Submarines Nutritional requirement for Calamity and Emergency management. Nutritional requirements for extreme environments; Space nutrition

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

Analyze current dietary guidelines and nutrition policies issued by national and international organizations.

Explore digital nutrition tools and mobile applications used for dietary assessment, nutrient analysis, and nutrition counselling.

Recommended Books:

1. Raheena Begum, M. (2009), Textbook of Foods, Nutrition and Dietetics Sterling Publishers, New Delhi
2. Mahtab S. Bamji, (2017), Textbook of Human Nutrition Oxford & IBH Publishing Co. Pvt. Ltd
3. Bogert, J.G.V. Briggs, D.H. Calloway (1985). Nutrition and physical fitness. 11th edition – W.B. Saunders Co., Philadelphia. London. Toronto.
4. Wardlaw, G.M. Insel, P.H. (1990). Perspectives in Nutrition Times Mirror / Mosby College Publishing Co. St. Louis, Toronto, Boston.
5. William, S.R. (1985). Nutrition and Diet Therapy (1985) 5th edition, Mosbey Co. St. Louis.

References:

1. M. Swaminathan (1993). Principles of Nutrition and Dietetic. Bappco Mysore Road, Bangalore-560 018.
2. Maurice E. Shils, James A. Olson, Moshe Shike (1994) Modern Nutrition in health and disease. eighth edition, Vol. I & II Lea & Febiger Philadelphia A waverly Company.
3. Martin East wood (2013) Principles of Human Nutrition Wiley Publishing
4. Mahan Kathleen L, Sylvia Escott Stump (2001) Krause's, Food nutrition and Therapy, W.B. Saunders Co.

E-Reference:

1. <https://egyankosh.ac.in/bitstream/123456789/33312/1/Unit-18.pdf>
2. <https://egyankosh.ac.in/bitstream/123456789/33348/1/Unit-11.pdf>

COURSE OUTCOMES (With Mapping):

CO1	Explain the concepts of energy metabolism, energy balance, energy expenditure, and factors influencing energy requirements.
CO2	Analyze the digestion, absorption, transport, metabolism, and physiological functions of carbohydrates, proteins, and lipids in human nutrition.
CO3	Evaluate the functions, requirements, food sources, deficiency manifestations, and toxicity of vitamins and minerals.
CO4	Examine the role of water, non-nutritive food components, and nutrient interrelationships in maintaining health and nutritional status.
CO5	Analyze the effects of nutrient interactions and their implications for nutrient utilization and metabolic regulation.
CO6	Formulate nutritional strategies and dietary recommendations for individuals in special conditions such as disasters, extreme environments, high altitudes, low temperatures, submarines, and space missions.

Mapping with Program Outcomes:

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

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

Year: I

CORE COURSE 2

Semester: I

Code:

**NUTRITION IN LIFE SPAN
(Theory)**

Credits: 4

COURSE OBJECTIVES: To enable the students to

- Provide comprehensive knowledge of nutritional requirements and dietary needs during different stages of the life cycle.
- Develop an understanding of physiological, psychological, and developmental changes influencing nutrition from infancy to old age.
- Enable students to apply principles of meal planning and dietary recommendations for individuals across various age groups.
- Familiarize students with nutrition-related problems, deficiencies, and disorders occurring during different stages of life.
- Develop skills in nutrition education, counseling, and promotion of healthy dietary practices among diverse population groups.

UNIT – I: MEAL PLANNING AND NUTRITION IN ADULTHOOD:

Acceptable Dietary Intake, Use of ICMR, RDA in planning balanced diet, Basic principles of meal planning, RDA, food allowance for different age groups, factors influencing nutritional requirements for all age groups. Nutrition in adulthood – reference man and reference women, body composition, nutritional and food requirements of an adult man and women, nutrition and work efficiency, nutrition and health issues, meal planning to suit different income levels.

UNIT – II: NUTRITION IN PREGNANCY AND LACTATION:

Nutrition during pregnancy – stages of pregnancy, physiological changes, weight gain in pregnancy, Foetal under nutrition and consequences, Energy and calorie relationship in pregnancy, weight gain, complications, factors influencing the outcome of pregnancy, pre-pregnancy nutritional care, nutritional requirements and meal planning for pregnant women.

Nutrition for lactating women – Physiology and psychology of lactation, hormonal control, colostrum – composition, composition of breast milk, factors affecting the volume and composition of breast milk, problems in breast feeding, galactagogues, nutritional requirements of a nursing mother, meal planning, factors responsible for lactation failure.

UNIT – III: NUTRITION IN INFANCY:

Nutrition in infancy – birth weight of infants, rate of growth, milestones in development, immunization schedule, nutritional requirements, process of breast feeding, superiority of breast milk, advantages of breast feeding, comparison of human milk with cow's milk, formula feeding, weaning and supplementary foods, weaning problems and complications. growth monitoring. Characteristics of

low-birth weight infant, small for date babies, pre-term babies- Feeding of preterminfants.

UNIT – IV: NUTRITION FOR PRESCHOOLERS AND SCHOOL AGE CHILDREN:

Nutrition in preschool age – Growth and development, nutritional requirements, factors affecting nutritional status, nutrition and cognitive development, food requirement, low cost supplementary foods, nutrition related problems among the preschool children, meal planning for the preschool child. Nutrition in the school age children – Growth pattern in school children, nutritional and food requirement, packed lunch – factors to be considered, nutritional problems, meal plan for the school children.

UNIT – V: NUTRITION IN ADOLESCENCE AND ELDERLY:

Nutrition in adolescence - growth and development, body composition, puberty, secondary sexual characteristics, psychological changes, nutritional requirements, nutritional problems, mal nutrition due to early marriage, food habits and meal plan. Eating disorders - Binge eating, anorexia nervosa, bulimia nervosa.

Nutrition in elderly – definition of geriatrics, changes in body composition, physiological changes, theories of aging, psychological and socio- economic factors in relation to food intake, menopausal and postmenopausal women- hormonal changes, nutritional requirement, food modification in old age. Nutrition related problems.

UNIT – VI: CURRENT CONTOURS (Self-directed learning activities For Continuous Internal Assessment Only):

Dissemination of nutrition knowledge for chosen target groups through e content. Sensitising the nursing mothers on the importance of breastfeeding during World Breast Feeding Day.

Recommended Books:

1. Mahtab, S., Bamji, Krishnasamy, K., Brahmam, G.N.V., (2012) Text Book of Human Nutrition, Third Edition, Oxford and IBH Publishing Co. P. Ltd., New Delhi.
2. Srilakshmi, B., (2013), Dietetics, New Age International (P) Ltd., New Delhi.
3. Swaminathan, M.,(2012), Advanced Textbook on Food and Nutrition,Vol.1, Second Edition, Bangalore Printing and Publishing Co. Ltd., Bangalore.
4. Shubhangini,A., Joshi(2002):NutritionandDietetics,2ndedition,Tata McGraw- Hill Publishing Company Limited, New Delhi.
5. Krishnasamy,K.andSesikeran,B.,(2013),DietaryGuidelinesforIndians, National Institute of Nutrition, ICMR, Hyderabad.

References:

1. Gopalan, C.Rama Sastri, B.V. and Balasubramanian, (2014), Nutritive Value of Indian Foods, NIN, ICMR, Hyderabad.

2. Longvah, T., Ananthan, R., Baskarachary, K. and Venkaiah, K., (2017), Indian Food Composition Table, NIN, ICMR, Hyderabad.
3. Krause, M.V. and Hunscher, M.A., (2000) Food, Nutrition and Diet Therapy, 14th Edition, W.B. Saunders, London.
4. Antia, F.P. (2005): Clinical Nutrition and Dietetics, Oxford University Press, Delhi.
5. Wardlaw, G.M., Hampi, J.S., DiSilvestro, R.A., (2004), Perspectives in Nutrition, 6th edition, McGraw Hill, New York.
6. Chadha, R. and Mathur, P., (2015), Nutrition: A Lifecycle Approach, Orient Blackswan, New Delhi.

E- Reference:

1. <https://www.pdfdrive.com/nutrition-through-the-life-cycle-e187862410.html>
2. https://ocw.ui.ac.id/pluginfile.php/12209/mod_resource/content/1/Nutrition%20Through%20the%20Life%20Cycle%20by%20Judith%20E.%20Brown%20%28z-lib.org%29.pdf
3. http://www.freebookcentre.net/medical_text_books_journals/nutrition_ebooks_online_texts_download.html
4. <https://vdoc.pub/documents/nutrition-through-the-life-cycle-3rd-edition-6krnmbdqjeq0>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the principles of meal planning and apply dietary recommendations for maintaining nutritional adequacy across different age groups.
CO2	Analyze the nutritional requirements, physiological changes, and dietary management during pregnancy and lactation.
CO3	Evaluate infant nutrition practices, including breastfeeding, complementary feeding, growth monitoring, and nutritional care of low-birth-weight and preterm infants.
CO4	Assess the nutritional needs, growth patterns, and nutrition-related problems of preschool and school-age children and formulate appropriate meal plans.
CO5	Examine the nutritional requirements, eating behaviors, and health challenges of adolescents and elderly individuals and recommend suitable dietary modifications.
CO6	Design and implement nutrition education and awareness programmes for selected target groups to promote health and well-being across the life cycle.

Mapping with Program Outcomes:

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

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

Year: I

CORE PRACTICAL 1

Semester: I

Code:

**TECHNIQUES OF FOOD ANALYSIS
(Practical)**

Credits: 4

COURSE OBJECTIVES: To enable the students to:

- Develop practical competency in the application of standard laboratory techniques for food composition and nutrient analysis.
- Understand the principles, procedures, and instrumentation used in qualitative and quantitative food analysis.
- Acquire skills in estimating major nutrients, bioactive compounds, and antioxidant properties of foods using standard analytical methods.
- Interpret analytical results for evaluating nutritional quality, composition, and functionality of food samples.

Practicals:

1. Determination of energy value of foods by using bomb calorimeter
2. Estimation of energy requirements of an individual by factorial approach
3. Qualitative tests for determination of carbohydrate
4. Estimation of crude and dietary fibre content of the foods
5. Qualitative tests for protein
6. Estimation of protein content of foods by Kjeldhal method
7. Estimation of crude fat content of foods by Soxhlet method
8. Determination of vitamin C content of the foods
9. Qualitative tests for determination of phytochemicals
10. Determination of antioxidant activity of foods

Recommended Books :

1. Nielsen, S. S. (2017). Food Analysis (5th ed.). Springer.
2. Pomeranz, Y., & Meloan, C. E. (2000). Food Analysis: Theory and Practice (3rd ed.). Springer / CBS Publishers.
3. Ranganna, S. (2010). Handbook of Analysis and Quality Control for Fruit and Vegetable Products (2nd ed.). Tata McGraw Hill Education.
4. Pearson, D. (1976). The Chemical Analysis of Foods (7th ed.). Churchill Livingstone.

Reference:

1. Damodaran, S., Parkin, K. L., & Fennema, O. R. (2017). Fennema's Food Chemistry (5th ed.). CRC Press (e-book available).
2. Wrolstad, R. E. (Ed.). (2005). Handbook of Food Analytical Chemistry. Wiley.
3. Nollet, L. M. L., & Toldrá, F. (Eds.). (2015). Handbook of Food Analysis (3rd ed.). CRC Press.
4. Ötles, S. (Ed.). (2012). Methods of Analysis of Food Components and Additives. CRC Press. Standard / Official Reference

5. AOAC International. (2023). Official Methods of Analysis of AOAC International (22nd ed.). AOAC International Food Science, Technology, and Engineering. CRC Press (e-book available).

E Reference:

1. <https://egyankosh.ac.in/bitstream/123456789/33312/1/Unit-18.pdf>
2. <https://egyankosh.ac.in/bitstream/123456789/33348/1/Unit-11.pdf>

COURSE OUTCOMES: (With Mapping)

CO1	Demonstrate proficiency in determining the energy content and estimating individual energy requirements using standard calorimetric and factorial methods.
CO2	Perform qualitative and quantitative analysis of carbohydrates, proteins, fats, and dietary fibre in food samples using established analytical procedures
CO3	Analyze micronutrient content, particularly vitamin C, in food samples using appropriate laboratory techniques.
CO4	Identify and evaluate phytochemicals and antioxidant activity in foods through qualitative and functional assessment methods.
CO5	Operate food analysis laboratory instruments and follow standard laboratory protocols with accuracy, precision, and safety.
CO6	Interpret experimental findings and prepare scientific laboratory reports for assessment of food composition and nutritional quality.

Mapping with Program Outcomes:

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

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

Year: I DISCIPLINE CENTRIC ELECTIVE COURSE 1 Semester: I

Code: 1. CLINICAL BIOCHEMISTRY Credits: 4
(Theory)

COURSE OBJECTIVES: To enable the students to

- Provide in-depth knowledge of metabolic disorders associated with carbohydrate, protein, lipid, and nucleic acid metabolism.
- Develop an understanding of biochemical alterations underlying various metabolic and endocrine disorders.
- Develop an understanding of biochemical alterations underlying various metabolic and endocrine disorders.
- Familiarize students with organ function tests and their significance in the diagnosis and monitoring of diseases.

UNIT – I: DISORDERS OF CARBOHYDRATE METABOLISM:

Diabetes mellitus, glycosylated - haemoglobins, and hypo-glycaemia, galactosemia and ketone bodies. Various types of glucose tolerance tests - Oral glucose tolerance, Intravenous glucose tolerance, cortisone stress glucose tolerance tests, multiple dose glucosetolerancetests. Glycogenstorage diseases – Glycogenstorage diseases Type I- Von Gierke disease, Type II - Pompe's disease, acid maltase deficiency, Type III - Cori's disease, Type IV - Andersen's disease, Type V -McArdle's disease, VI GSD or Hers disease and Inborn errors of carbohydrate metabolism

UNIT – II: PROTEIN AND FAT METABOLISM:

Disorders of amino acid metabolism - Phenylalanemia, homocystinuria, tyrosinemia, MSUD, phenylketonuria, alkaptonuria, albinism and aminoaciduria. Disorders of nucleic acid metabolism - Disorders in purine/ pyrimidine metabolism. Disorders of fat metabolism - Dyslipidemia, Atherosclerosis, Coronary Artery Disease, Disorders of Lipoproteins and Steatorrhea.

UNIT – III: EVALUATION OF ORGAN FUNCTION TESTS:

Assessment and clinical manifestations of renal, hepatic, pancreatic, gastric and intestinal functions. Clinical importance of bilirubin. Enzymes of clinical importance, Enzymes of pancreatic origin and biliary tract.

UNIT – IV: HORMONAL DISTURBANCES:

Protein hormones (anterior pituitary hormones, posterior pituitary hormones), steroid hormones, adrenocorticosteroids, and reproductive endocrinology. Disturbances in thyroid function. Disorders of mineral metabolism: Hypercalcemia, Hypocalcemia, Hypophosphatemia and Hyperphosphatemia.

UNIT – V: BIOCHEMICAL ASPECTS OF HAEMATOLOGY:

Disorders of erythrocyte metabolism, hemoglobinopathies, thalassemia thrombosis and anaemias. Detoxification in the body: enzyme system and phases of detoxification, regulation of detoxification.

UNIT – VI: CURRENT CONTOURS (Self-directed learning activities For Continuous Internal Assessment Only):

Visit to a medical diagnostic center. Present the recent technologies in clinical biochemistry

Recommended Books:

1. Chatterjee M N. and Rana Shinde, 2015. Textbook of Medical Biochemistry, Jaypee Brothers,
2. David A Bender and Shauna MC, Cunningham 2021. Introduction to Nutrition and Metabolism.
3. David L. Nelson and Michael M.Cox, Menninger 2008. Principles of Biochemistry 5th EdWH Freeman and Company.
4. Gerhard Meisenberg and William H, Simmons, Principles of Medical Biochemistry: Publisher: Mosby
5. Sharma DC. 2017. Nutritional Biochemistry CBS Publishers and Distributors private limited.

Reference:

1. Allan Gaw, Michael Murphy, Robert Cowan, Denis O'Reilly, Michael Stewart, and James Shepherd, 2008. Clinical Biochemistry. An Illustrated Colour Text, 3rd Edition, Publisher: Churchill Livingstone.
2. Davidson LSP, MacLeod J. and Edwards CRW, Davidson's Principles and Practice of Medicine: A Textbook for Students and Doctors, 15th Edition, Publisher Churchill Livingstone.
3. John W, Baynes and Marek Dominiczak 2010. Medical Biochemistry. Publisher: Mosby.
4. Richard Luxton, 2008. Clinical Biochemistry. Scion Publishing Limited.
5. Robert K, Murray Daryl K, Granner, Peter A, Mayes and Victor W, Rodwell 2012. Harper's Biochemistry. Publisher: Appeltan and Lange.
6. Varley H. Gowenlock AH, and Bell M. 1980. Practical clinical biochemistry. William Heinemann medical books limited, Vol. 1. 5th Edition.
7. William F. Ganong 2012. Review of Medical Physiology. Publisher: McGraw-Hill.

E-Reference:

1. <https://www.biologydiscussion.com/biochemistry/carbohydrate-metabolism/glucose-tolerance-test-types-utility-and-procedure/43370>.
2. <https://www.slideshare.net/ErhardRutashobya/disorders-amino-acids>.
3. https://www.iptsalipur.org/wp-content/uploads/2020/08/BP503T_PCOL_UNIT-IV.pdf.
4. <https://www.studocu.com/en-gb/document/university-of->

5. [nottingham/cardiiovascular-respiratory-and-haematology/summaries/revision-notes-haematology-132921/view](https://www.nottingham.ac.uk/haematology/summaries/revision-notes-haematology-132921/view).
6. <https://www.sciencedirect.com/science/article/pii/S2213231715000907>.

COURSE OUTCOMES: (With Mapping)

CO1	Explain the biochemical basis, clinical manifestations, and diagnostic tests associated with disorders of carbohydrate metabolism, including diabetes mellitus, glycogen storage diseases, and inborn errors of metabolism.
CO2	Analyze the biochemical mechanisms, metabolic abnormalities, and clinical implications of disorders related to protein, amino acid, nucleic acid, and lipid metabolism.
CO3	Evaluate organ function tests and interpret biochemical markers used in assessing renal, hepatic, pancreatic, gastric, and intestinal functions.
CO4	Examine hormonal regulation and biochemical disturbances associated with endocrine disorders and abnormalities of mineral metabolism.
CO5	Assess the biochemical aspects of hematological disorders, including anaemia, hemoglobinopathies, thalassemia, and thrombosis.
CO6	Analyze detoxification mechanisms in the human body and their role in maintaining metabolic homeostasis and disease prevention.

Mapping with Program Outcomes:

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

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

Year: I DISCIPLINE CENTRIC ELECTIVE COURSE 1 Semester: I

Code: 2. NUTRITIONAL BIOCHEMISTRY Credits: 4
(Theory)

COURSE OBJECTIVES: To enable the students to

- Understand aerobic and anaerobic degradation of carbohydrates
- Develop knowledge on mechanisms of biological
- Provide insights into protein degradation, nitrogen metabolism
- Emphasize oxidative stress, free radicals, antioxidants, and their role in health and disease.
- Familiarize with the biological roles of essential minerals

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

UNIT – V: MINERALS:

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

UNIT-VI: CURRENT CONTOURS (Self-directed learning activities For Continuous Internal Assessment Only):

Role of specific nutrients in immune modulation, infection control, and management of chronic diseases.

Recommended Books:

1. Ambika Shanmugam, Fundamentals of biochemistry for medical students, 8th 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, 26th 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 Reference:

1. https://www.youtube.com/watch?v=YQV_ODVCzQQ
2. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=NuAs6SreCGryddEfs4kkBA==>
3. https://www.youtube.com/watch?v=ePZc-71PT_4
4. https://www.youtube.com/watch?v=ruPRVAQ_wrI

5. https://www.youtube.com/watch?v=HD7ErUVccJ4&list=PLyvXYqABoA5UxMmEimkcS8qOY_o1zpJWG&index=4
6. <https://www.youtube.com/watch?v=2UfjwZAGTl0&list=PLRpz4J5dUMCcj6t2g8bfzDjkbQC0nSEP9>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the metabolic pathways of carbohydrates, including glycolysis, glycogenesis, glycogenolysis, gluconeogenesis, HMP shunt pathway, and mechanisms involved in bioenergetics and ATP production.
CO2	Analyze amino acid and protein metabolism, gene expression, protein biosynthesis, and the metabolism of nucleic acids, including DNA replication, mutation, repair, and recombination.
CO3	Evaluate lipid metabolism, lipoprotein transport systems, regulation of lipid metabolism, oxidative stress mechanisms, and the role of antioxidants in health and disease.
CO4	Examine enzyme kinetics, enzyme regulation, membrane transport processes, cell signaling pathways, and the clinical significance of enzymes in diagnosis and metabolic regulation.
CO5	Assess the biological functions, metabolism, and physiological significance of major and trace minerals in maintaining health and metabolic homeostasis.
CO6	Analyze detoxification mechanisms, xenobiotic metabolism, and their significance in protecting the body from environmental and metabolic toxins.

Mapping with Program Outcomes:

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

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

Year: I

GENERIC ELECTIVE COURSE 1

Semester: I

Code:

**1. FRONT OFFICE AND
HOUSEKEEPING MANAGEMENT
(Theory)**

Credits: 3

COURSE OBJECTIVES: To enable the students to

- Provide knowledge of the organization, functions, and coordination of Front Office and Housekeeping departments in hospitality, health care, and food service establishments.
- Develop an understanding of reservation systems, guest relation services, and customer handling procedures.
- Familiarize students with front office records, reporting systems, accounting procedures, and electronic management systems.
- Impart knowledge of housekeeping operations, cleaning methods, equipment, and maintenance of guest and public areas.
- Enable students to understand linen room management, laundry operations, and the role of interior environment in enhancing guest satisfaction.

UNIT – I: FRONT OFFICE AND HOUSE KEEPING DEPARTMENTS:

Front office and housekeeping: objectives, organization and functions in Health and Food service Establishment Qualities and Etiquette of front office and house keeping staff. Inter and Intra departmental Co-ordination

UNIT – II: BASIC RESERVATION SYSTEM AND GUEST RELATION SERVICES:

Objectives, importance of an efficient front desk. Reservation Procedure, Cancellation, Penalty, Arrival and departure for individuals and groups, C form, Check-in and Check-out – Procedures and activities. Objectives and Importance of guest relation services, Communication dealing with complaints, Preventing complaints, Arranging Transportation, Foreign currency exchange and safe deposit boxes. Handling guest complaints.

UNIT – III: RECORDS FOR CONTROL:

Importance of reports, The front desk log, Maintaining room status, Maintaining account balance and monitoring availability, Electronic front office, Electronic point of sales system, check out, audit, Room status indicator, Mail and key racks, Wake up devices, Accounting equipment

UNIT – IV: HOUSEKEEPING:

Types of rooms. Lay-out of Housekeeping Department. Organizational structure of Housekeeping department. Job description of Housekeeping personnel. Classification of cleaning equipment and agents. Operational areas of housekeeping department. Guest floor & Public area operation. Sequence of housekeeping functions

UNIT – V: LINEN ROOMS AND LAUNDRY AND INTERIOR ENVIRONMENT:

Linen Room & Laundry - Linen, Uniform, Bedding, Beds – Layout, activities of the linen room. Linen, storage and control, Table linen, bed linen, bedding, bed making and turning down, uniforms, and fabric stain removal.

Laundry – Commercial, in-house, linen hire, laundry process.

Interiors – Design and Style, Colour, lighting, heating, ventilation, Flower arrangement.

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

Eco-friendly cleaning agents, water conservation, waste reduction, and energy-efficient operations

Healing environments, ergonomic design, biophilic interiors, universal accessibility, and wellness - focused spaces.

Visit to star hotels to observe the functioning of front office and housekeeping and submit a report.

Recommended Books:

1. Bardi, J.A., Hotel Front office Management, Van Nostrand Reinhold Publishing Co Ltd, New Delhi, 1982.
2. Andrew, S. Hotel Front Office – Training Manual, Tata Mac Graw Hill Publishing coltd, New Delhi, 1995.
3. Schneider, M. and Tucker, G. The Professional housekeeper, Van Nostrand Reinhold, New York, 1985.
4. Renner, P,F. Basic Hotel Front office procedures, 3rd edition, Van Nostrand Reinhold, New York, 1993. Andres, S. Hotel House Keeping, Training manual. Tata Mac Hill Publishing Co Ltd, New Delhi, 1995.
5. Marian.C. Spears, and Allene G. Vaden. Food Service organizations Macmillan Publishing co., New York, 1985.
6. Hotel, Hostel and Hospital Housekeeping – Joan C. Branson & Margaret Lennox Hodder &Stoughton-2004

Reference:

1. Professional Management of Housekeeping Operations (II Edn.)-Robert J. Martin & Tomas J.A. Jones.
2. Housekeeping Management - Margaret M. Kappa, Aleta Nitschken, Patricia B. Schappert – A.H. & L.A.
3. Hotel Housekeeping Operations and Management – G. Raghubalan & Smritee Raghubalan – Oxford University Press.
4. Housekeeping Operations, Design and Management – Malini Singh & JayaB. George – Jaico Publications.

E-Reference:

1. <https://www.pdfdrive.com/front-office-operations-management-e156913492.html>
2. https://www.ihmnotes.in/assets/Docs/Books/Hotel_Front_Office.pdf
3. <https://www.ebooknetworking.net/ebooks/hotel-housekeeping-operations-and-management.html>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the objectives, organization, functions, and coordination of Front Office and Housekeeping departments in hospitality and food service establishments
CO2	Apply reservation procedures, guest handling techniques, check-in/check-out processes, and guest relation services to ensure customer satisfaction.
CO3	Analyze the importance of front office records, reports, accounting systems, and electronic management tools in operational control.
CO4	Evaluate housekeeping operations, cleaning procedures, equipment, and maintenance practices required for efficient management of guest and public areas.
CO5	Assess linen room and laundry management systems, including linen control, stain removal, bed making, and laundry processes.
CO6	Examine the role of interior design elements such as colour, lighting, ventilation, heating, and flower arrangement in creating a comfortable and aesthetically pleasing environment.

Mapping with Program Outcomes:

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

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

Year: I

GENERIC ELECTIVE COURSE 1

Semester: I

Code:

**2. HOUSE KEEPING AND INTERIOR
DESIGN
(Theory)**

Credits: 3

COURSE OBJECTIVES: To enable the students to

- Understand the principles, functions, and management practices of housekeeping operations in hospitality, healthcare, and food service establishments.
- Develop competencies in housekeeping procedures, inventory management, control desk operations, safety measures, and emergency management.
- Acquire knowledge of linen room organization, laundry management, cleaning science, and modern housekeeping technologies.
- Apply the concepts of interior design, space planning, ergonomics, and sustainable design in hospitality and institutional environments.
- Evaluate the role of colour, lighting, furniture, furnishings, accessories, and floral design in enhancing the aesthetics and functionality of interior spaces.
- Integrate environmental sustainability, quality assurance, and customer satisfaction principles into housekeeping and interior management practices.

UNIT – I: ADVANCED HOUSEKEEPING MANAGEMENT:

a. Housekeeping Operations and Management, Evolution and scope of housekeeping

Objectives and functions of housekeeping department, Organizational structure in hotels, hospitals and food service establishments, Qualities, ethics and professional etiquette of housekeeping personnel, Interdepartmental and intradepartmental coordination

Role of housekeeping in customer satisfaction and quality assurance, Sustainability and green housekeeping practices.

b. Housekeeping Procedures and Control Desk Management

Briefing and debriefing procedures, Inventory management and indenting from stores

Housekeeping control desk operations, Key control systems and security management

Lost and found procedures, Registers, forms, formats and documentation, Guest complaint handling and service recovery, Emergency preparedness and crisis management

UNIT – II: LINEN, LAUNDRY AND CLEANING SCIENCE:

a. Linen Room and Laundry Management

Linen room organization and layout, Linen inventory control and par stock calculations

Storage and maintenance of linen and uniforms, Bed linen, table linen and specialty linen management, Bed making and turn-down services, Uniform planning, designing and management, Tailor room operations and functions, Commercial laundry, on-premises laundry and linen hire services, Laundry workflow and quality control

b. Cleaning Science and Technologies

Cleaning chemistry and cleaning science, Types and characteristics of cleaning agents

Eco-friendly cleaning products.

Cleaning and maintenance of: Occupied rooms, Departure rooms, Vacant rooms

Under-repair rooms, VIP suites

Stain removal principles and advanced techniques, Cleaning equipment: selection, operation and maintenance. Automation and smart cleaning technologies

UNIT – III: INTERIOR DESIGN PRINCIPLES AND SPACE PLANNING:

a. Fundamentals of Interior Design - Concept and significance of interior design, Design process and design thinking, Types of design, Elements of design: Line, Direction, Form, Shape, Space, Size Texture, Pattern, Colour

b. Principles of Design: Harmony and unity, Balance, Rhythm, Emphasis and focal points

Proportion and scale, Contrast and variety, Application of design principles in hospitality interiors

c. Space Planning -Ergonomics and anthropometry, Universal and barrier-free design, Space utilization in hotels, hospitals and restaurants, Sustainable and smart interiors

UNIT – IV: COLOUR, LIGHTING AND FURNISHINGS:

a. Colour Theory and Applications-Colour dimensions: Hue, Value and Intensity-Colour wheel and colour harmonies, Colour psychology and therapy, Colour forecasting and trends, Application of colour in interior and exterior environments

b. Lighting Design - Importance of lighting in hospitality environments Natural and artificial lighting, Sources and types of lighting, Ambient, task and accent lighting, Glare: causes, types and prevention, Energy-efficient lighting systems

c. Furniture and Furnishing Materials - Traditional, contemporary and modern furniture styles

Furniture selection criteria, Furniture for hotels, restaurants and healthcare institutions

Furnishing materials: selection, use and maintenance - Sustainable furnishing materials

UNIT – V: ACCESSORIES, WINDOW TREATMENTS AND FLORAL DESIGN:

a. Interior Accessories - Meaning and significance of accessories, Functional and decorative accessories, Art objects, wall décor and soft furnishings, Contemporary trends in hospitality décor

b. Window Treatments - Draperies and curtains, Types, selection and applications

Blinds, shades and modern window systems, Maintenance and care

c. Floral Design and Event Décor

Importance of flower arrangement, Selection and care of flowers, Principles of floral design

Traditional and contemporary flower arrangements, Event and banquet floral décor

Indoor landscaping and biophilic design.

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

Advanced sanitation technologies, antimicrobial surface treatments, infection control protocols, UV-C disinfection, and healthcare housekeeping standards.

Indoor plants, natural lighting, green walls, healing environments, wellness-focused hospitality design, and occupant well-being.

Recommended Books:

1. G. Raghubalan and Smritee Raghubalan, 2015, Hotel Housekeeping: Operations and Management, 3rd Edition, Oxford University Press.
2. Marilynne Robinson, 2015, Housekeeping, Faber & Faber Publishers.
3. Gary Gordon & Jamco L. Nuckolls, 2004, Interior lighting for Designers, 3rd edition, John Wiley & Sons, New York.

Reference:

1. Allen Tate, 2005, The making of interiors – An introduction, - Harper & Row Publishers, New York.
2. Simon Dodsworth, 2009, The Fundamentals of Interior Design, Bloomsbury Academic Publishers.
3. Malini Singh, 2012, Hotel Housekeeping, Tata McGraw Hill Education.
4. Joan Cameron Branson, Margaret Lennox, 1988, Hotel, Hostel and Hospital Housekeeping. Edward Arnold Publishers.

E Reference:

1. <https://www.emerald.com/insight/content/doi/10.1108/ijchm.2000.12.3.218.3/full/html>
2. <https://www.cleanindiajournal.com/category/professional/housekeeping/>
3. https://www.etsy.com/market/housekeeping_journal
4. <https://idec.org/journal-of-interior-design/>
5. <https://matjournals.com/Journal-of-Interior-Designing%20and-Regional-Planning.html>
6. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=Cdnwi2LUCCLzrJZ76d/o1A==>
7. <https://egyankosh.ac.in/simple-search?query=housekeeping>

COURSE OUTCOMES: (With Mapping)

CO1	Analyze the organizational structure, functions, and operational procedures of housekeeping departments in hospitality, healthcare, and food service Sector
CO2	Demonstrate proficiency in housekeeping control desk operations, inventory management, key control systems, guest service management, and emergency handling procedures.
CO3	Evaluate linen room operations, laundry systems, stain removal techniques, cleaning agents, and modern cleaning technologies for efficient facility management.
CO4	Apply principles and elements of interior design, ergonomics, and space planning to create functional, aesthetically pleasing, and user-friendly environments.
CO5	Assess the impact of colour schemes, lighting systems, furniture, and furnishing materials on the comfort, efficiency, and visual appeal of hospital and institutional spaces.
CO6	Design and recommend appropriate interior accessories, window treatments, floral arrangements, and sustainable décor solutions for hospital and event settings while incorporating contemporary industry trends.

Mapping with Program Outcomes:

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

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

Year: I

GENERIC ELECTIVE COURSE 1

Semester: I

Code:

**3. DIETARY GUIDANCE AND
COUNSELLING
(Theory)**

Credits: 3

COURSE OBJECTIVES: To enable the students to

- Understand the principles, scope, ethics, and professional responsibilities of diet counseling in healthcare and community settings.
- Develop competency in counseling techniques, behavioral approaches, and communication skills required for effective nutrition counseling.
- Acquire skills in establishing therapeutic relationships and rapport with patients, families, and healthcare teams.
- Utilize appropriate assessment tools and dietary evaluation methods for nutritional diagnosis and intervention planning.
- Interpret clinical and dietary information to provide evidence-based nutrition counseling and follow-up care.

UNIT – I: ROLE OF A DIETICIAN:

Counselling in India, Definition, Goals, Ethics, Scope, Characteristics of counsellor, types of counselling, objectives of counselling in health care, tools of counselling, sources of counselling, e-resources in counseling Role of a dietician in a hospital and community, team approach to nutritional care, ethical code and responsibility. Defining features of counselling psychology.

UNIT – II: DIET COUNSELING SKILL:

Tactics and techniques of counseling- evaluating and understanding the clients attitude, how to identify and express your feelings towards the client, utilizing proper counselling techniques- non-verbal behavior, verbal behavior, covert behavior.

UNIT – III: COMMUNICATION SKILLS:

Concepts and principles in communication and their application in developing skills in counseling. Use of communication aids, communication and interviewing skills. Strategies and communication skills, Rapport building and opening techniques, Questioning, listening, reflecting, acceptance, silence, leading reassurance, non-verbal behavior, terminating skills.

UNIT – IV: THERAPEUTIC RELATIONSHIPS:

Psychology of feeding the patients- Assessment of needs, education of the patient and follow up and establishing rapport with the patient and the family member. Therapeutic Techniques -Psychoanalytic therapy, group therapy, psychodrama, behavior therapy, Gestalt therapy Cognitive therapy. Nutrition counselling protocols- Involving phase, Exploration and education, resolving, closing. Exploring the expressions, use of art in therapy.

UNIT – V: DIAGNOSIS AND ASSESSMENT:

Eliciting clinical information- medical history, assessment of diet profile, techniques of obtaining relevant information; dietary diagnosis- 24 hour recall method, food diary, list of food likes and dislikes, lifestyle; interpreting clinical information, case study assessment and evaluation.

UNIT – IV: CURRENT CONTOURS (Self- directed learning for Continuous Internal Assessments Only)

Visit to Diet Counselling Unit in hospital. Prepare a Counselling Card for a particular disease.

Recommended Books:

1. Gopalan S.C Balasubramanian S.V. Ramestri and Visweswara Rao Diet Atlas. 1971, ICMR New Delhi, India.
2. Shubhangini A. Joshi. 2011. Nutrition and Dietetics, 3rd edition, Tata McGraw Hill Education private limited, New Delhi.
3. Srilakshmi B.2010. Dietetics, New Age International Publishers, New Delhi.
4. Sumati R. Mudambi MV. Rajagopal.2015. Fundamental of food, nutrition and diet therapy. New age international publishers, New Delhi.
5. Swaminathan M.1993.Principles of Nutrition and Dietetics. Bappeo 88, Mysore Road, Bangalore.

Reference:

1. Davidson & Passmore R & Brock JB.1976. Human Nutriton & dietetics. The English Languages Bood Society & Churchill Living stone.
2. Krause M V & Mahan MA.1992.Food Nutrition and Diet Therapy .W.B. Sunders company, Philadelphia London.
3. Maurice E. Shils, James A. Olson, Moshe Shike.1994. Modern Nutrition in health and disease. eighth edition, Vol I & II Lea &Febiger Philadelphia, A waverly company.
4. Micheal J. Gibney IA. Macdonald and Helan M. Roche. 2004. Nutrition and Metabolism. Blackwell Publishing Company, Bangalore.
5. Robinson CH. Lawles MR. Chenoweth WL. Garwic AE. 1990.Normal and Therapeutic Nutrition. The Macmillan Co.
6. Robinson CH. 2006. Normal and therapeutic nutrition. Macmillan Pub. Company, New York

E-Reference

1. <https://article1000.com/characteristics-of-counseling>
2. <https://www.caluniv.ac.in/academic/Education/Study/Techniques.pdf>
3. <https://pubmed.ncbi.nlm.nih.gov/6787227/>
4. https://www.researchgate.net/publication/332318698_Counselling_Skills_for_a_Dietitian/

COURSE OUTCOMES: (With Mapping)

C01	Analyze the scope, ethics, principles, and professional roles of dietitians and counselors in healthcare and community nutrition services.
C02	Demonstrate effective counseling techniques, communication strategies, and interpersonal skills for nutrition education and behavior modification.
C03	Apply verbal, non-verbal, and interviewing skills to establish rapport and facilitate successful client-centered counseling sessions.
C04	Evaluate therapeutic relationships and apply appropriate psychological and counseling approaches in nutrition care management.
C05	Assess patient needs using nutritional assessment tools, dietary surveys, and clinical information for individualized nutrition planning.
C06	Interpret dietary and clinical data to formulate nutritional diagnoses, case evaluations, and evidence-based counseling recommendations.

Mapping with Program Outcomes:

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

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

Year: I

SKILL ENHANCEMENT COURSE 1

Semester: I

Code:

**SPORTS NUTRITION
(Theory)**

Credits: 2

COURSE OBJECTIVES: To enable the students to

- Understand the principles of exercise training, body composition assessment, and weight management strategies for athletes.
- Acquire knowledge of exercise physiology, muscle function, cardiopulmonary adaptations, endocrine responses, and energy systems involved in physical activity.
- Evaluate the role of macronutrients in supporting athletic performance, training adaptations, and recovery.
- Examine the significance of vitamins, minerals, fluids, and electrolytes in exercise performance and sports health.
- Assess the use, efficacy, and safety of nutritional supplements and ergogenic aids used by athletes.

UNIT – I: EXERCISE – PRINCIPLES, ASSESSMENT AND WEIGHT MANAGEMENT:

- a. Definition of Exercise, Types of exercise, Principles of Exercise training. Type of Athlete - Resistance, Endurance and Power athlete
- b. Assessment - Methods of assessment of Body Composition, Relationship between body composition and performance. Weight Management - Weight loss and weight gain as preparation for competition.

UNIT – II: EXERCISE PHYSIOLOGY AND ENERGY SYSTEMS:

- a. Muscle Physiology - Structure of skeletal muscle, muscle fiber types, muscular contraction, muscular adaptation to exercise; Cardio pulmonary response and adaptation to exercise; Exercise training and endocrine system
- b. Energy system for exercise - Creatinine Phosphate energy system, Anaerobic glycolytic system, aerobic energy system - oxidative phosphorylation

UNIT – III: FUELLING FOR EXERCISE:

- a. Carbohydrate - utilization of carbohydrate during exercise, carbohydrate recommendations for athlete, guidelines for intake before, during and after exercise; carbohydrate loading
- b. Protein - protein recommendation for athletes, timing of protein intake, effects of inadequate and excessive protein intake on performance and health, use of protein and amino acid supplements, consideration of protein intake for vegetarian athletes.
- c. Fat - Fat as a source of energy for exercise, fat loading, at recommendation for athlete, effect of inadequate intake off at on performance and health

UNIT – IV: ROLE OF VITAMINS AND MINERALS:

- a. Vitamins - recommended intake of vitamins for athletes, Influence of exercise on vitamin requirements, antioxidant function

- b. Minerals – recommended intake of minerals for athlete; importance of Ca, Fe, Zinc and Magnesium in athletes diet; female athletic triad

UNIT – V: ROLE OF FLUID, ELECTROLYTES AND NUTRITIONAL SUPPLEMENTS:

- a. Effect of exercise on fluid and electrolyte balance; hypohydration, hyperhydration, hyponatremia, maintenance of hydration before, during and after exercise. Use of sports drinks
- b. Definition of nutritional ergogenic aids and dietary supplements. Types of dietary supplements most frequently used by athletes, benefits and/or risks in the use of supplements, mechanism of action and supplement protocol.

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

Case study analysis on athlete meal planning.

Comparative analysis of sports drinks or protein supplements.

Poster presentation on anti-doping nutrition awareness

Recommended Books:

1. L. Kathleen 2008 Krause's Food & Saunders Elsevier, Canada. Mahan Nutrition Therapy
2. Jose Antonio 2009 Essentials of Sports Humana Press et al Nutrition and Supplements
3. Wener W.K. 2012 Lifetime Physical Cengage Learning, United States. Hoeger, Sharon Fitness and Wellness: States A. Hoeger A Personalized Program
4. Jerrold S. 2013 Empowering Health Jones & Bartlett Greenberg Decisions Publishers, Burlington
5. Asker 2019 Sport Nutrition Human Kinetics, United States. Jeukendrup, Mi States. Chael Gleson Journals: •

References:

1. Bean A (2000), The complex guide to sports nutrition "A&C Black Publishers, London
2. Clark N (2003), Sports Nutrition Guidebook Human Kinetics, U.S.A.
3. Dunford M and Doyle A J, Nutrition for Sport and Exercise, Thomson Wadsworth, Australia.
4. Fink H H, Mikesky A E, Burgoon L A (2012) Practical Applications in Sports Nutrition, Jones and Bartlett Learning, U.S.A.
5. Bagchi D., Nair S., Sen C.K., Ed., (2013) Nutrition and Enhanced Sports Performance-Muscle Building, Endurance and Strength, Elsevier, Academic Press, UK, USA.
6. Srilakshmi B, Suganthi., Ashok C.K., (2016) –Exercise Physiology, Fitness and Sports Nutrition, New Age International Private Limited

E-Reference:

1. <http://www.aco.org.nz/pdf/nutrition-for-sports>
2. https://www.researchgate.net/publication/258630492_Sports_Nutrition_Book_2013<http://themedicalbiochemistrypage.org>

COURSE OUTCOMES: (With Mapping)

CO1	Analyze the principles of exercise training, body composition assessment methods, and weight management strategies for athletic performance.
CO2	Explain physiological adaptations to exercise, including muscular, cardiopulmonary, endocrine responses, and energy metabolism.
CO3	Evaluate carbohydrate, protein, and fat requirements and their role in exercise performance, recovery, and training adaptations.
CO4	Assess the influence of vitamins and minerals on athletic performance, health, and prevention of nutrient deficiencies.
CO5	Evaluate fluid and electrolyte balance during exercise and formulate hydration strategies for athletes.
CO6	Critically appraise the use of nutritional supplements and ergogenic aids and recommend evidence-based sports nutrition interventions.

Mapping with Program Outcomes:

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

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

Year: I

VALUE ADDED COURSE 1

Semester: I

Code:

**WASTE MANAGEMENT IN FOOD
INDUSTRIES
(Theory)**

Credits: 2*

COURSE OBJECTIVES: To enable the students to

- Understand the sources, characteristics, and environmental impacts of waste generated from food processing industries.
- Acquire knowledge of liquid and solid waste treatment technologies used in food and agricultural industries.
- Evaluate biological, chemical, and physical methods employed for waste management and resource recovery.
- Analyze emerging technologies for converting industrial waste into value-added products and renewable energy.
- Understand environmental legislation, environmental management systems, and sustainability frameworks applicable to food industries.

UNIT – I: WASTEEMISSION:

Waste emission from food industry – Dairy Industry, Fruit and Vegetable Industry, Meat and fish-Agricultural waste, Effects of pollution on organism, Glass, chemicals and other products.

UNIT – II: LIQUID WASTE TREATMENT METHODS:

Water quality, treatment and recycle. Biochemical Oxygen Demand, Chemical Oxygen Demand and definitions, Discharge limits for effluents. Primary treatment, secondary and tertiary treatments by physical, chemical and biological methods

UNIT – III: SOLID WASTE TREATMENT METHODS:

Effluent and solid waste utilization food processing industry by biological methods – for Single Cell Protein, biogas and other products.

UNIT – IV: EMERGING TRENDS IN WASTE MANAGEMENT:

Value added products from of agri food processing industry. Recovery of biological from dairy, meat, fish and poultry processing industry

UNIT – V: ENVIRONMENT ALLEGISLATION:

Environmental impact assessment, ISO 14000, Environmental management system, Life cycle Assessment.

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

Identify various types of waste generated by food processing industries.
Explore emerging technologies used in waste treatment and management.
Analyze value-added products obtained from food industry waste.

Evaluate sustainable waste management practices and environmental regulations.

Recommended Books:

1. Sivasankar B. "Food processing and preservation. (1sted) Prentice Hall of India Pvt. Ltd., New Delhi.
2. Herzka A & Booth R G (1981), Food Industry Wastes: Disposal and Recovery. (1sted). Applied Science Pub Ltd, London.

References:

1. Loannis S. Arvanitoyannis (2008). Waste management for the food Industry. Elsevier Academic Press
2. V. K. Joshi (2011). Food Processing waste management: Treatment and utilization, .India Publishing Agency
3. Keith waldron (2009). Hand book of waste management and co product recovery in food processing volume 2. CRC press. Wood head publishing Limited. New Delhi.
4. Maria Kosseva, Colin Webb (2013). Food Industry waste Assessment and recuperation of commodities, Elsevier.
5. Monika Thakur, V. K. Modi, Renu Khedkar(2021). Sustainable food waste management: Concepts and Innovation.Springer.

E-Reference:

1. <https://egyankosh.ac.in/handle/123456789/12399>
2. <https://www.pdfdrive.com/waste-management-for-the-food-industries-food-science-and-technology-food-science-and-technology-e184360163.html>.

COURSE OUTCOMES

C01	Analyze the types, sources, and environmental impacts of wastes generated from food, dairy, fruit and vegetable, meat, fish, and agricultural industries.
C02	Evaluate water quality parameters, effluent characteristics, and liquid waste treatment processes including primary, secondary, and tertiary treatments.
C03	Assess solid waste and effluent utilization technologies for the production of biogas, single-cell protein, and other value-added products.
C04	Examine emerging trends and innovative approaches in waste valorization and resource recovery from food processing industries.
C05	Evaluate environmental management tools such as Environmental Impact Assessment (EIA), Environmental Management Systems (EMS), ISO 14000, and Life Cycle Assessment (LCA).
C06	Design sustainable waste management strategies that comply with environmental regulations and support circular economy principles in food industries.

Mapping with Program Outcomes:

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

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

Year: I

CORE COURSE 3

Semester: II

Code:

**ADVANCED DIETETICS
(Theory)**

Credits: 4

COURSE OBJECTIVES: To enable the students to

- Understand the role of dietitians, counseling principles, hospital diets, and specialized feeding methods used in clinical practice.
- Acquire knowledge of the etiology, pathogenesis, clinical manifestations, and dietary management of infectious diseases, cancer, and developmental disabilities.
- Develop competencies in planning and implementing nutritional therapy for gastrointestinal, hepatobiliary, and pancreatic disorders.
- Evaluate dietary modifications required for obesity, diabetes mellitus, cardiovascular diseases, and other metabolic disorders.
- Understand nutritional management of renal diseases, dialysis, and drug-nutrient interactions in clinical settings.
- Apply computer-based technologies and evidence-based approaches in nutrition assessment, counseling, and therapeutic diet planning.

UNIT – I: DIETITIAN AND ROUTINE HOSPITAL DIET AND SPECIAL FEEDING METHODS:

Dietitian Definition and types of dietitians, role of dietitian in the hospital and community.

Counseling Definition, Counsellor and Client, Classification of Counseling and techniques of counseling.

Routine Hospital Diet and Special Feeding Methods Routine Hospital Diet - Clear fluid diet, full fluid, diet, soft diet, Regular diet. Special feeding methods - Enteral nutrition and Parenteral nutrition.

UNIT – II: DIET FOR FEBRILE CONDITIONS CANCER AND DEVELOPMENTAL DISABILITIES:

- a. **Diet for Febrile Conditions** -Pathogenesis, etiology, Metabolic changes, types of fever, symptoms, treatment and dietary modification for febrile condition - acute, chronic and recurrent fevers- typhoid, influenza, malaria, poliomyelitis, rheumatic fever, tuberculosis, HIV and Covid-19.
- b. **Diet for Cancer** - Development, etiology, metabolic alterations, symptoms, nutritional and dietary management of cancer patients, side effects of cancer treatment, role of anti oxidants in cancer treatment.
- c. **Diet for Developmental Disabilities** - Down's syndrome, Cerebral Palsy, Autism and Attention Deficit Hyperactivity Disorder.

UNIT – III: DIET FOR DISEASE OF GASTRO INTESTINAL TRACT, BILIARY TRACT DISORDERS PANCREATIC DISORDERS:

- a. **Diet for Disease of Gastro Intestinal Tract**

Pathogenesis, etiology, types, symptoms, treatment and dietary modification for gastro intestinal disorders – Gastritis, peptic ulcer, diarrhea, dysentery, constipation, hemorrhoids, and carcinoma of the stomach.

b. Diet for Biliary Tract Disorders

Pathogenesis, etiology, types, symptoms and clinical findings and dietary modification for Liver disorders - Fatty liver, Hepatitis and Cirrhosis, Gallbladder disorders - Cholecystitis and Cholelithiasis.

c. Diet for Pancreatic Disorders

Pathogenesis, etiology, types, symptoms and clinical findings and dietary modification for Pancreatitis

UNIT – IV: DIET FOR OBESITY AND METABOLIC DISORDERS- DIABETES MELLITUS, CARDIO VASCULAR DISEASES:

a. Diet for Obesity

Etiology, energy balance, clinical manifestation, complications, dietary and lifestyle modifications and surgical management.

b. Diet for Metabolic Disorders- Diabetes Mellitus

Types, screening and diagnostic criteria, pathogenesis, etiology, symptoms, complications, Dietary management of Diabetes Mellitus - Food Exchange system, Glycemic Index, Glycemic Load, nutritive and non-nutritive sweeteners. Lifestyle recommendations, drugs and insulin.

c. Diet for Cardio Vascular diseases - Meaning, Pathogenesis, etiology, types, symptoms, treatment and dietary modification for cardio vascular disorders – Hypo tension, hypertension, atherosclerosis, acute and chronic cardiac diseases, and congestive heart failure

UNIT – V: DIET FOR RENAL DISEASES, DRUG NUTRIENT INTERACTION COMPUTERS IN NUTRITION PRACTICE:

a) Diet for Renal diseases - Pathogenesis, etiology, types, symptoms, treatment and dietary modification for renal disorders - glomerulonephritis, nephrosis, nephrosclerosis, nephrolithiasis and ureterolithiasis. Dietary modification for dialysis.

b) Drug Nutrient Interaction

Diet effects on drug disposition, Interactions of drugs and nutrients, Effect of drugs on food intake and absorption, Effect of nutrients on drug metabolism.

c) Computers in Nutrition Practice

General information - data input, data output, data analysis, data communication, clinical care – communication in patient care, Nutritional therapy.

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

Role of microbiota in obesity, diabetes, cancer, IBS, and liver diseases with microbiome - targeted diets.

Exercise prescriptions, stress management, sleep nutrition, and holistic metabolic disease management.

Recommended Books:

1. Mahan, Kathleen, L., Krause's, (2004). *Food, Nutrition and Diet Therapy* (11th ed.), Pennsylvania; Saunders.
2. Antia, F. P., (2005). *Clinical Dietetics and Nutrition*, (5thed.). Oxford University Press, New Delhi,
3. Prakash Lohar, S., (2007). *Endocrinology–Hormones and Human Health*, MJP publishers, Chennai.
4. Srilakshmi, B., (2009). *Dietetics*, (2nded.) New Age International Publications, New Delhi.
5. Shubhangini Joshi, A., (2014), *Nutrition and Dietetics*, (5th ed.). Mc Graw Hill, Education Private Limited, New Delhi.
6. Swaminathan, M., (2012). *Essentials of Food and Nutrition*, Ganesh and Company, Madras. Maity, S.P., *Pharmacology for Second Professional Students*, (6thed.) Books & Allied Pvt. Ltd

Reference:

1. Robinson, Corrine, H., (1982). *Normal and Therapeutic Nutrition*, (16th ed.). Macmillan Mc Graw Hill School Division, New York.
2. UdaiVeer, (2007). *Elements of Food Science*, Anmol Publications Pvt Ltd, New Delhi.
3. Srilakshmi, B., (2008). *Nutrition Science*, (3rded.). New Age International Publications, New Delhi.
4. Indrani, T.K., (2008). *Nursing Manual of Nutrition and Therapeutic Diet*, (2nd ed.). Jaypee Brothers medical publishers (P) Ltd.
5. MaryMarian, (2008). *Clinical Nutrition for surgical patients*. Jones and Barletta Publishers.
6. Sangeetha Karnik, (2010). *Nutrition and Dietetics Therapy*, Biotech Pharma Publications, Hyderabad.

E-Reference:

1. <https://gpadampur.files.wordpress.com/2015/08/caft-complete-vedpal.pdf>
2. <https://sfsurgery.com/wp-content/uploads/2014/06/Pancreatitis.pdf>
3. <https://my.clevelandclinic.org/health/treatments/21098-tube-feeding--enteral-nutrition>
4. <https://my.clevelandclinic.org/health/diseases/7104-diabetes-mellitus-an-overview>
5. <https://www.mayoclinic.org/diseases-conditions/cancer/symptoms-causes/syc-20370588>

COURSE OUTCOMES: (With Mapping)

CO1	Analyze the professional role of dietitians, counseling techniques, hospital diets, and special feeding methods used in patient care.
CO2	Evaluate the nutritional and dietary management of febrile conditions, cancer, and developmental disabilities.
CO3	Assess the pathophysiology and dietary modifications required for

	gastrointestinal, hepatobiliary, and pancreatic disorders.
CO4	Formulate evidence-based dietary interventions for obesity, diabetes mellitus, and cardiovascular diseases.
CO5	Evaluate nutritional management strategies for renal diseases and analyze the impact of drug-nutrient interactions on health outcomes.
CO6	Apply computer applications and nutrition informatics tools in clinical nutrition practice, patient care, and diet planning.

Mapping with Program Outcomes:

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

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

Year: I

CORE COURSE 4

Semester: II

Code:

**APPLIED HUMAN PHYSIOLOGY
(Theory)**

Credits: 4

COURSE OBJECTIVES: To enable the student to

- Understand the structure and physiological functions of cells, nervous system, blood, and homeostatic mechanisms in the human body.
- Acquire knowledge of digestive, respiratory, and circulatory physiology and their relevance to health and disease.
- Explain the physiological functions of the renal and musculo-skeletal systems and their role in maintaining body homeostasis.
- Understand endocrine and reproductive physiology, including hormonal regulation and physiological adaptations during reproduction.
- Evaluate the functions of sensory organs and immune responses involved in maintaining health and disease prevention.

UNIT – I: APPLIED PHYSIOLOGY OF CELL, NERVOUS SYSTEM AND BLOOD:

Cell – Review of structure, types and functions, Action potential of cell, Molecular structure of cell membrane and its functions. Types of transport across cell membrane. Homeostasis, Mechanism of homeostatic system – Negative feedback, Positive feedback. Cell death -Autophagy, apoptosis, necrosis.

Nervous System - Review of structure and function of neuron, conduction of nerve impulse synapses and role of neurotransmitters. Organisation of central nervous system, structure and function of Brain and spinalcord, Afferent and efferent nerves. Blood Brain Barrier, CSF, Hypothalamus and its role in various body function-obesity, sleep, memory.

Blood - formation, composition, blood clotting and haemostasis: Formation and function of plasma proteins, Use of blood for investigation and diagnosis of specific disorders, Anaemia.

UNIT – II: APPLIED PHYSIOLOGY OF DIGESTIVE, RESPIRATORY AND CIRCULATORY SYSTEM:

Digestive system - Review of structure and function Secretary, Digestive and absorptive function. Role of liver, pancreas and gall bladder and their dysfunction Motility and hormones of GIT.

Respiratory system- Review of structure and function. Role of lungs in the exchange of gases, Transport of oxygen and CO₂, Role of haemoglobin and buffer systems. Cardio-respiratory response to exercise and physiological effects of training. Apnea hyperventilation, hypoventilation and hypoxia.

Circulatory system – Structure and function of heart and blood vessels Regulation of cardiac output and blood pressure, heart failure, hypertension.

UNIT – III: APPLIED PHYSIOLOGY OF RENAL AND MUSCULO-SKELETAL SYSTEM:

Renal system – Structure and function of nephron. Urine formation. Role of kidney in maintaining pH of blood. - Water, electrolyte and acid base balance, diuretics. Diuresis, polyuria, hypersecretion of Anti Diuretic Hormone, Nephrogenic diabetes insipidus and Bartter's syndrome.

Musculo-skeletal system - Structure and function of bone cartilage and connective tissue. Disorders of the skeletal system. – Types of muscles-structure and function

UNIT – IV: PHYSIOLOGY OF ENDOCRINOLOGY AND REPRODUCTIVE SYSTEM:

Endocrine system - Endocrine glands- structure, function, role of hormones, regulation of hormonal secretion. The neuro endocrine axis. Disorders of endocrine glands. Emphasis on physiology of diabetes and stress hormones.

Reproductive system - Menstrual cycle, Oogenesis, spermatogenesis, Fertilization, Development of Embryo, physiological changes in pregnancy. Abnormalities in menstrual cycle.

UNIT – V: APPLIED PHYSIOLOGY OF SENSE ORGANS AND IMMUNE SYSTEM:

Sense organs - Review of structure and function. Role of skin, ear, eye, nose and tongue in perception of stimuli.

Immune system - Cell mediated and humeral immunity activation of WBC and production of antibodies. Their Role in inflammation and defence.

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

Develop E-content on structure and functions of any one organ system.

Recommended Books:

1. Sembulingam, K. (2000). Essentials of Medical Physiology. Jaypee Brothers Medical Publishers (P) Ltd., New Delhi
2. Saradhasubrahmanyam and k.Madhavakutty (2020). Textbook of Human Physiology. S.Chand Publication.
3. Chatterjee C. C (2004). Human Physiology. Volume I. Medical Allied Agency. Kolkata
4. Gillian Pocock, Christopher D. Richards, David A. Richards (2018). Human Physiology. oxford University Press.(5th ed)
5. Lauralee Sherwood (2015). Human Physiology: Cells to systems. Cengage Learning
6. H S Ravi Kumar Patil, H. K. Makari, H. Gurumurthy, S. V. Sowmya, (2009). A text book of Human Physiology. I.K. International Publishing House Pvt. Limited.

Reference:

1. Guyton and Hall (2000). Textbook of Medical Physiology. Saunders. States of America

2. Wilson, Ross (2014). Anatomy and Physiology in Health and Illness. Reed Elsevier India Private Limited. New Delhi.
3. Muruges. N (2011). Anatomy and Physiology. Sathya Publishers. Madurai
4. Chaudhri, K. (1993). Concise Medical Physiology, New Central Book Agency (Parental) Ltd., Calcutta.
5. Bestand Taylor, (1992) The Physiological Basis for Medical Practice, Saunders Company.

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1. <https://www.egyankosh.ac.in/handle/123456789/32932>
2. <https://egyankosh.ac.in/handle/123456789/81726>
3. <https://ncert.nic.in/ncerts/l/kebo116.pdf>
4. https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/nursing_students/ln_human_anat_final.pdf
5. https://www.thepharmacystudy.com/human-anatomy-and-physiology-notes-pdf/#Skeletal_System

COURSE OUTCOMES: (With Mapping)

CO1	Analyze cellular functions, homeostatic mechanisms, nervous system organization, and blood physiology in maintaining normal body functions.
CO2	Explain the physiology of digestive, respiratory, and circulatory systems and relate their functions to nutritional and clinical conditions.
CO3	Evaluate renal and musculo-skeletal physiology and interpret physiological alterations associated with common disorders.
CO4	Assess endocrine and reproductive physiology, including hormonal regulation, metabolism, stress responses, and reproductive health.
CO5	Examine the structure and function of sensory organs and immune mechanisms involved in maintaining body defense and health.
CO6	Apply physiological principles to understand disease processes and support evidence-based nutrition and healthcare practices.

Mapping with Program Outcomes:

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

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

COURSE OBJECTIVES: To enable the students to

- Develop skills in clinical assessment and dietary management of patients with metabolic, gastrointestinal, renal, hepatic, cardiovascular, neurological, and immune disorders.
- Enable students to apply therapeutic nutrition principles in real clinical case scenarios.
- Train students in planning, calculating, and modifying diets based on disease conditions and patient requirements.
- Enhance understanding of pathophysiology and its relationship with nutritional therapy.
- Develop competency in evidence-based diet counselling and patient education.

Practicals:

1. Inborn errors of metabolism
2. Under weight, overweight, Diabetes Mellitus - GDM
3. Dyslipidemia, Angina Pectoris, kidney transplant, Dialysis, and End Stage Renal Disease (ESRD)
4. Gastritis, Malabsorption syndrome, Ulcerative Colitis
5. Primary Biliary Cholangitis, NAFLD, AFLD, NASH, Acute & chronic pancreatic disorder
6. Cancer, Surgery, Burns
7. Allergy, Asthma
8. Alzheimer & Parkinson

COURSE OUTCOMES: (With Mapping)

C01	Assess nutritional status and interpret clinical data for patients with inborn errors of metabolism, underweight, overweight, diabetes mellitus, and gestational diabetes mellitus
C02	Plan and evaluate therapeutic diets for cardiovascular disorders such as dyslipidemia and angina pectoris.
C03	Formulate nutrition care plans for renal disorders including dialysis, kidney transplantation, and End Stage Renal Disease
C04	Apply medical nutrition therapy for gastrointestinal, liver, and pancreatic disorders.
C05	Design dietary interventions for cancer, burns, surgery, allergy, and asthma patients.
C06	Demonstrate nutrition counseling, case study evaluation, and dietary management for neurological disorders such as Alzheimer's disease and Parkinson's disease.

Mapping with Program Outcomes:

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

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

COURSE OBJECTIVES: To enable the students to

- Evaluate the principles and applications of modern cooking technologies used in food preparation.
- Analyze the composition, processing, storage, and cookery principles of cereals and pulses.
- Evaluate the nutritional, physical, and chemical properties of animal foods and their changes during processing and cooking.
- Examine the composition, preservation, and processing characteristics of vegetables, fruits, and beverages.
- Understand the properties and applications of nuts, oilseeds, fats, sugars, spices, and emerging concepts in food science.
- Apply food science principles to improve food quality, safety, acceptability, and nutritional value.

UNIT – I: ADVANCED FOOD SCIENCE AND COOKERY PRINCIPLES:

a. Foundations of Food Science and Nutrition

Concept, scope and significance of Food Science in health, nutrition and food service management. Food systems and food sustainability. Concepts of food, nutrients, nutritional status, malnutrition (undernutrition, overnutrition and double burden of malnutrition), balanced diet, food security, hidden hunger and public health nutrition. Contemporary concepts in nutrition and wellness.

b. Modern Cooking Technologies:

Microwave cooking, Ohmic heating, Induction cooking, Solar cooking, Sous-vide cooking

Infrared cooking, Air frying technology, Effects of cooking methods on nutrient retention, sensory quality, food safety and consumer acceptability.

UNIT – II: CEREALS AND PULSES:

- a. Cereals - Rice, Wheat, Millets-structure, composition, nutritive value, and processing- cereal products. Storage of grains. Nutritional significance of pseudocereals - quinoa, amaranth seeds, and buckwheat.
- b. Cereal cookery-Starch- Gelatinisation, factors affecting gelatinisation - changes in cooked starches-gel formation, retrogradation and syneresis. Cereal protein-gluten, factors affecting gluten formation, nutrient changes during different processing methods of cereals. Dextrinization.
- c. Pulses-composition, nutritive value, and processing methods-pulse products, TVP, toxins in pulses- Pulse cookery-soaking, germination, fermentation, roasting and puffing process of pulses. Effect of cooking on nutritive value, quality, and quantity of legumes.

UNIT – III: ANIMAL FOODS:

- a. Milk and milk products-composition, nutritive value, physical and chemical characteristics-effect of heat, acid, enzymes and tannins. Milk cookery-problems in milk cookery. Processing of milk. Milk products. Milk storage.
- b. Meat- structure, composition, nutritive value, post-mortem changes in meat, rigormortis, ageing, tenderisation of meat. Meat cookery- selection of meat and methods of cooking, changes in meat during cooking. Poultry-classification, composition, nutritive value, selection of poultry and methods of cooking. Storage and preservation of meat.
- c. Fish- classification, composition, nutritive value, selection of fish, methods of cooking, storage and preservation of fish.
- d. Egg-structure, composition and nutritive value. Grading and selection. Egg cookery-coagulation of egg protein- factors influencing coagulation-role of egg in cookery. Egg white foam- factors influencing foam formation. Storage and preservation of egg.

UNIT – IV: VEGETABLES, FRUITS, AND BEVERAGES :

- a. Vegetables- classification, composition, nutritive value, selection, storage and preservation. Pigments-classification- effect of cooking on pigments, flavour compounds, texture.
- b. Fruits- classification, composition, nutritive value, selection, storage, and preservation. Enzymatic browning and its prevention. Physico-chemical changes in vegetables and fruits- ripening, respiration and textural changes. Changes in nutritive value due to cooking and processing.
- c. Beverages- classification, types of beverages-fermented, non- fermented beverages, fruit beverages, malted beverages. Coffee, tea and cocoa processing.

UNIT – V: NUTS, OILSEEDS, FATS, SUGAR AND SPICES, RECENT CONCEPTS IN FOOD SCIENCE:

- a. Nuts and oilseeds - composition and nutritive value, toxicants present. Fats and oils-sources and processing-fat cookery-fat as emulsifying, leavening, shortening agent, factors affecting fat absorption-rancidity, its types.
- b. Sugar-crystallisation and factors affecting crystallisation, caramelisation- Stages of sugar cookery and its role in Indian sweet preparations. Spices, herbs, and condiments used in cookery- its medicinal value.
- c. Recent concepts in Food Science- Nutraceuticals, Functional foods, sustainable alternative proteins (plant proteins, algae, and microalgae, mycoprotein), biofortification, organic food.

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

Novel Food Processing Technologies including high-pressure processing, pulsed electric fields, cold plasma, and smart preservation methods.

Food Fortification and Biofortification to address micronutrient deficiencies and hidden hunger.

COURSE OUTCOMES: (With Mapping)

C01	Assess the effects of cooking methods on nutrient retention, sensory characteristics, food safety, and consumer acceptability.
C02	Evaluate the composition, processing, storage, and cookery principles of cereals, pseudocereals, and pulses and their impact on nutritional quality
C03	Assess the physical, chemical, and nutritional properties of milk, meat, poultry, fish, and eggs and the changes occurring during processing and cooking.
C04	Examine the characteristics, preservation methods, and physicochemical changes of vegetables, fruits, and beverages during storage and processing.
C05	Evaluate the role of nuts, oilseeds, fats, sugars, spices, and condiments in food preparation and human health.
C06	Apply recent concepts in food science including nutraceuticals, functional foods, sustainable alternative proteins, biofortification, and organic foods in food product development and nutrition.

Mapping with Program Outcomes:

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

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

Year: I DISCIPLINE CENTRIC ELECTIVE COURSE 2 Semester: II

Code: 2. FOOD PROCESSING AND PRESERVATION Credits: 4
(Theory)

COURSE OBJECTIVES: To enable the students to

- Understand the principles and importance of food processing and preservation.
- Explain traditional and modern methods of food preservation and their effects on
- food quality.
- Evaluate thermal, non-thermal, and fermentation technologies used in food processing.
- Analyze food packaging systems and storage technologies for shelf-life extension.
- Examine recent advances and innovations in food processing industries.
- Apply food processing principles in product development and food entrepreneurship.

UNIT – I: INTRODUCTION TO FOOD PROCESSING AND TRADITIONAL PRESERVATION METHODS:

Introduction to Food Processing and Preservation, Definition, scope, objectives and importance of food processing, Principles of food preservation, Advantages and limitations of food processing, Classification of foods based on pH, water activity and moisture content, Food spoilage: physical, chemical and microbial causes, Traditional Methods of Food Processing and Preservation, Drying and dehydration, Smoking, Salting and curing, Pickling, Sugaring
Fermentation, Indigenous and traditional food preservation practices, Effect of traditional processing on nutritional quality

UNIT – II: LOW TEMPERATURE AND THERMAL PROCESSING TECHNOLOGIES

Processing and Preservation by Low Temperature, Principles of refrigeration and freezing Cold preservation techniques, Air freezing, Indirect contact freezing, Immersion freezing Cryogenic freezing, Dehydro-freezing, Controlled Atmosphere Storage (CAS), Modified Atmosphere Storage (MAS), Changes during refrigerated and frozen storage, Processing and Preservation by Heat, Blanching, Pasteurization, Sterilization, Ultra High Temperature (UHT) Processing, Canning technology, Dielectric heating, Baking, roasting and frying, Retort processing of Ready-to-Eat (RTE) foods, Batch and continuous thermal processing systems

UNIT – III: DRYING, CONCENTRATION AND EVAPORATION TECHNOLOGIES:

Drying and Dehydration, Water activity and shelf life, Moisture migration and microbial spoilage, Physical and chemical changes during drying.

Methods of drying:

Sun drying, Solar drying, Tray drying, Tunnel drying, Spray drying, Freeze drying,

Fluidized bed drying, Dehydration of fruits, vegetables, milk and animal products, Packaging and storage of dehydrated foods, Concentration and Evaporation, Principles and applications

Vacuum evaporation, Multiple-effect evaporation, Freeze concentration, Reverse osmosis

Ultrafiltration, Membrane processing technologies,

UNIT – IV: NON-THERMAL PROCESSING AND FERMENTATION

TECHNOLOGY:

Non-Thermal Processing Technologies, High Pressure Processing (HPP), Pulsed Electric Field (PEF), Ohmic heating, Infrared heating, Induction heating, Pulsed X-rays, Hurdle Technology

Cold Plasma Technology, Food Irradiation: Principles, Ionizing and non-ionizing radiation, Mechanism of action Cold sterilization, GRAS status and legal regulations, Permissible limits and safety aspects Fermentation Technology, Principles and mechanisms of fermentation, Microbial fermentation Industrial fermentation, Fermented foods and beverages: Yogurt, Cheese, Sauerkraut, Kimchi Kefir, Kombucha, Soy sauce, Tempeh, Fermented cereal and pulse products, Health benefits of fermented foods

UNIT – V: ADVANCED FOOD PROCESSING AND PACKAGING TECHNOLOGY:

Recent Advances in Food Processing, Extrusion technology, Breakfast cereals and snack foods

Ready-to-Cook (RTC), Ready-to-Serve (RTS) and Ready-to-Eat (RTE) products, Protein concentrates and protein isolates, Functional foods and nutraceutical products, Biofortification and food fortification, Genetically Modified Foods, Application of enzymes in food processing

Artificial Intelligence and automation in food industries. Sustainable food processing technologies, Packaging in Food Processing and Preservation, Functions and importance of packaging

Packaging materials: Glass, Metal, Paper and paperboard, Plastics, Biodegradable packaging

Active packaging, Intelligent packaging, Modified atmosphere packaging, Vacuum packaging

Aseptic packaging, Selection of packaging material, Packaging requirements for processed foods, Storage and shelf-life evaluation

Recommended Books:

1. Srilakshmi B. (2007), Food Science (4th ed) New Age International (P) Limited, New Delhi.
2. Subhulakshmi G., Udipi A. Shobha and Ghugre S. Padmini (2021), Food Processing and Preservation (2nded) New Age International Publishers, New Delhi.
3. Sankhla A., Mogra R. and Avinash P (2014) A Practical Guide to Food Preservation (1sted) Agrotech Publishing Academy, Udaipur.

Reference:

1. Manoranjan Kalia (2014) Food Quality Management (2nd ed), Agrotech Publishing Academy, Udaipur.
2. Potter N Food Technology, (5th ed), Cornell University, Ithaca, New York.
3. Shakunthala Manay, N. and N. Shadaksaraswamy, (2024), Food facts and Principles (5th ed) New Age International Publishers, New Delhi.

E Reference:

1. <https://nchfp.uga.edu/#gsc.tab=0>
2. <https://www.terrafoodtech.com/en/food-preservation-methods-comparison/>
3. <https://www.ndsu.edu/agriculture/extension/extension-topics/food-and-nutrition/foodpreservationand-wild-game>

COURSE OUTCOMES: (With Mapping)

CO1	Analyze the principles of food processing, preservation, and traditional preservation methods used in food industries.
CO2	Evaluate low-temperature and thermal processing technologies for enhancing food safety and shelf life.
CO3	Assess drying, concentration, and evaporation technologies and their effects on food quality
CO4	Examine non-thermal processing and fermentation technologies for food preservation and product development.
CO5	Evaluate advanced food processing techniques and modern packaging systems used in commercial food production.
CO6	Apply innovative food processing and packaging technologies for sustainable food production and entrepreneurship

Mapping with Program Outcomes:

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

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

Year: I

GENERIC ELECTIVE COURSE 2

Semester: II

Code:

**1. FOOD MICROBIOLOGY
(Theory)**

Credits: 3

COURSE OBJECTIVES: To enable the student to:

- Gain deeper knowledge of role of microorganisms in humans and environment.
- Understand the importance of microorganisms in food spoilage and to learn advanced, techniques used in food preservation.
- Understand the latest procedures adopted in various food operations to prevent food-borne, disorders and legal aspects involved in these areas.

UNIT – I: INTRODUCTION TO FOOD MICROBIOLOGY:

Food Microbiology – Basic Concept and History of Food Microbiology. Role of Microbiology in Biotechnology Role of Microorganisms in Fermented Foods. Indicators of food safety and quality: Microbiological criteria of foods and their significance.

UNIT – II: FACTORS AFFECTING FOOD SAFETY:

Physical Hazards, Biological, Hazards, Chemical Hazards, Microorganisms in Foods, Bacteria, Fungi, Yeasts, Moulds, Viruses, Parasites, Recent Concerns of Food Safety Prions, Concern of Genetically Modified Foods. Concern of Dioxin-Contaminated Foods. HACCP system and food safety used in controlling microbiological hazards.

UNIT – III: MICROBIOLOGY OF AIR, WATER, SOIL AND FOOD:

Microbiology of Air, Water and soil, Sources of food contamination, Factors Affecting the growth of Microorganisms – Nutrition, Oxygen, Temperature, Moisture Requirement – The concept of Water Activity, Osmotic Pressure, Hydrogen Ion Concentration- pH and light. Control and Destruction of Microorganisms.

UNIT – IV: FACTORS RESPONSIBLE FOR FOOD SPOILAGE:

Chemical Changes due to Spoilage-cereals and cereal products, Fruits and Vegetables, Soft Drinks, Fruits Juices, Fruit Preserves and Miscellaneous Products, Milk and Milk Products, Meat, Poultry and Poultry Products, Fish and Other Sea Foods.

UNIT – V: FOOD BORNE INFECTIONS AND DISEASES:

Food Borne Diseases – types, Definition–intoxication infection, Food Borne Intoxications – Staphylococcal Poisoning, Bacillus Cereus Poisoning and Botulism. Food Borne Infections – Salmonellosis, Shigellosis (Bacillarydysentery), Vibrio Parahaemolyticus Gastroenteritis, Enteropathogenic E.coli Diarrhoea, Hepatitis A and Shellfish Poisoning. Food Borne Diseases Due to Naturally occurring Toxicants – Lathyrism, Veno- occlusive Disease (VOD), Epidemic Dropsy

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

Tabulate the sources, mode of transmit and prevention of food borne infections.
Lab visit to food microbiological laboratory.

Recommended Books :

1. ShakuntalaManay, N. (2013). *Foods: Facts and Principles*. (3rded.). New Age International Publishers, New Delhi.
2. Swaminathan. M. (2019). *Advanced Text Book on Food and Nutrition*. (2nded.). Bangalore Printing and Publishing Co. Ltd, Bangalore.
3. Srilakshmi. B. (2020). *Food Science*. (8thed). New Age International Publishers, New Delhi.
4. AvantikaSharma. (2019). *Textbook of Food Science and Technology*. (3rded.). CBS Publishers and Distributors, New Delhi.
5. Iqbal, Syed Aftab. (2011). *Advanced Food Chemistry*. Discovery Publishing House, New Delhi.
6. Chopra H, K and Panesar P,S.,(2015). *Food Chemistry*. Narosa Publishing House (P) Ltd, New Delhi.

Reference:

1. Norman N. Potter, (2007). *Food Science*, (5thed). CBS Publishers and Distributors Pvt. Ltd.
2. Sadasivam. S .A, Manickam, (2008). *Biochemical methods for agricultural sciences*. New Age International Publishers, New Delhi.
3. Vickie, A., Vaclavik Elizabeth, W., Christian, (2014). *Essentials of Food Science*,(4th ed.), Springer Science and Business Media, New York.
4. Raheena Begum, M., (2015). *Textbook of Foods, Nutrition and Dietetics*, (3rded.), Sterling Publishers Pvt. Ltd, New Delhi.
5. Rick Parker, Miriah Pace (2020), *Introduction to Food Science and Food Systems* (2nded.),CBS Publishers

E-Reference:

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

COURSE OUTCOMES: (With Mapping)

CO1	Trace the history of food microbiology, and the basic concept of Food Microbiology, Food Safety, Foods Food Spoilage and Food Hazards.
CO2	Identify the different types of microbes and sources of microbial spoilage and contamination of food.
CO3	Analyze the role of microbes in food spoilage, Biotechnology and fermented foods, Indicators of food safety and quality.
CO4	Deduct different microbes and recommend the various measures to prevent the spoilage.
CO5	Propose the latest procedures adopted in various food operations to prevent food-borne, disorders and legal aspects involved in these

	areas.
CO6	Apply microbiological principles in food safety monitoring, hazard control and quality assurance systems

Mapping with Program Outcomes:

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

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

Year: I

GENERIC ELECTIVE COURSE 2

Semester: II

Code:

**2. PALLIATIVE CARE
(Theory)**

Credits: 3

COURSE OBJECTIVES: To enable the students to

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

UNIT – I: PRINCIPLES AND PRACTICE OF PALLIATIVE CARE:

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

UNIT – II: PAIN AND ITS MANAGEMENT:

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

UNIT – III: PHYSICAL SYMPTOMS AND ITS MANAGEMENT:

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

UNIT – IV: PSYCHOSOCIAL SYMPTOMS AND ITS MANAGEMENT:

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

UNIT – V: COMMUNICATION AND ETHICAL ISSUES IN PALLIATIVE CARE:

Communication - definition, need for good communication, barriers to communication – lack of time, lack of privacy, uncertainty, embarrassment,

collusion; Problems in inter professional communication, ways to improve communication. Ethical Issues - Principles of medical ethics, communication and disclosure, withholding and withdrawing treatments, artificial nutrition, artificial hydration, euthanasia and physician-assisted suicide, ethics in research.

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

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

COURSE OUTCOMES: (With Mapping)

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

Mapping with Program Outcomes:

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

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

Year: I

GENERIC ELECTIVE COURSE 2

Semester: II

Code:

**3. FOOD SERVICE FACILITIES
(Theory)**

Credits: 3

COURSE OBJECTIVES:

- Understand the structure, functions, and operations of food service institutions.
- Develop knowledge of kitchen planning, layout design, and space utilization principles.
- Familiarize students with types, selection, and functioning of food service equipment.
- Analyze physical and operational characteristics of different food service systems.
- Develop awareness of safety, security, and hygiene practices in food service areas.
- Enable students to apply design and planning concepts for efficient and sustainable food service operations.

UNIT – I: FOOD SERVICE INSTITUTION AND FACILITY PLANNING:

Overview of types and objectives of food service institutions. Functional areas of food Service Institution – receiving, storage, pre-preparation, production and service, cleaning and disposal area. Flow of traffic– entry and exit. Space allocation for food plant according to different capacities.

UNIT – II: KITCHEN DESIGN AND LAYOUT:

General Kitchen layout – Size & Types of kitchen, Developing kitchen plans, Designing kitchens, Finishes used for walls and floors. Work Simplification - Work area, Workers area of reach, Work & storage heights, Work space, centers& their size, Equipment, materials & supplies, Movements & work flow.

UNIT – III: EQUIPMENT IN FOOD SERVICE:

Classification of Equipment, Design and functions of Equipment's in receiving, storage, preparation, serving, Dishwashing and Laundry. Functions of equipment in Ancillary Departments - Pantry, Food pick-up area, Store, Linen room, Kitchen stewarding Base Materials and Finishes in Equipment's-Materials used for finishers. Factors influencing and affecting the use of equipment in the food service institutions. Types of fuel – factors affecting fuel selection.

UNIT – IV: PHYSICAL AND OPERTIONAL CHARACTERISTICS OF FOOD SERVICE AREA:

Organization type, Size and Physical layout, Space requirement, Equipment requirement, Timing required for meal service, Energy usage in Banquet Service, Bar Service, Cafeteria Service, Coffee Shop Service, Fast Food Service, Room Service, Specialty Restaurants, Vending Machines, Robotic service. Computer aided design/ computer –aided manufacturing (CAD/CAM) in designing food service area.

UNIT – V: SAFETY AND SECURITY:

Safety & security in Kitchen area, service area & storage area. Causes of accidents, safety procedure, safety training, legal responsibilities of a food service manager. Safety & security aspects – electricity, lighting and ventilation. Pest control management in production and storage area & garbage disposal.

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

Designing a kitchen with modern equipment's.

Visit to local kitchen to understand the traditional use of equipment's vs modernised.

Analysing eco-friendly concepts and recent trends in kitchen layout, fuel.

Operation of cloud kitchen.

Observe the operation of kitchen during the pandemic and post pandemic situation.

COURSE OUTCOMES: (With Mapping)

CO 1	Explain the types, objectives, and functional areas of food service institutions and their operational flow.
CO 2	Apply principles of kitchen design and layout for effective space utilization and workflow optimization.
CO 3	Analyze classification, design, and functional aspects of food service equipment and fuel systems.
CO 4	Evaluate operational characteristics of various food service areas including cafeterias, banquets, fast food, and specialty restaurants.
CO 5	Assess safety, security, pest control, and waste management practices in food service establishments.
CO6	Develop integrated food service facility plans using design principles, equipment planning, and safety standards for efficient operations.

Mapping with Program Outcomes:

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

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

Year: I

SKILL ENHANCEMENT COURSE 2

Semester: II

Code:

**FOOD EVALUATION AND QUALITY
CONTROL
(Theory)**

Credits: 2

COURSE OBJECTIVES: To enable the students to

- Provide in-depth knowledge of food quality attributes and evaluation techniques.
- Develop skills in sensory evaluation and objective assessment of food products.
- Understand quality control and quality assurance systems in food production and service establishments.
- Familiarize students with food standards, regulations, and quality management systems.
- Enable students to evaluate food products using physical, chemical, microbiological, and sensory methods

UNIT – I: CONCEPTS OF FOOD QUALITY:

Definition and importance of food quality, Quality attributes of foods: appearance, color, texture, flavor, aroma, consistency, and acceptability, Factors influencing food quality.

Quality deterioration in foods, Principles of food evaluation, Subjective and objective methods of food quality assessment.

UNIT – II: SENSORY EVALUATION OF FOODS:

Introduction to sensory evaluation, Physiology of sensory perception, Sensory characteristics of foods. Sensory laboratory design and requirements, Selection and training of panel members.

Types of sensory tests: Discrimination tests, Difference tests, Descriptive tests, Hedonic rating tests

Ranking tests, Development of sensory score cards. Interpretation and analysis of sensory data.

UNIT – III: OBJECTIVE METHODS OF FOOD QUALITY EVALUATION:

Physical evaluation of foods: Color measurement, Texture analysis, Viscosity and consistency

Specific gravity and volume

Chemical evaluation: Moisture, Acidity, pH, Total soluble solids, Nutrient retention

Instrumental methods used in food quality assessment.

UNIT – IV: FOOD QUALITY ASSURANCE AND STANDARDS:

Quality control and quality assurance concepts. Good Manufacturing Practices (GMP).

Good Hygienic Practices (GHP). Hazard Analysis and Critical Control Points (HACCP).

Quality Management Systems: ISO 9001, ISO 22000

Food safety regulations and standards. Role of Food Safety and Standards Authority of India (FSSAI), Bureau of Indian Standards (BIS), Codex Alimentarius, and AGMARK.

UNIT – V: QUALITY EVALUATION OF FOOD PRODUCTS:

Quality evaluation of: Cereals and cereal products, Pulses and pulse products, Milk and milk products, Fruits and vegetables, Meat, poultry, and fish products, Bakery and confectionery products

Shelf-life evaluation and storage quality assessment, Consumer acceptability studies.

Product quality improvement and standardization.

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

Prepare power point presentation on subjective and objective methods of evaluation. Prepare chart on food standards.

COURSE OUTCOMES: (With Mapping)

CO1	Explain the principles and attributes of food quality and evaluation.
CO2	Apply sensory evaluation techniques to assess food quality and consumer acceptability.
CO3	Perform objective quality assessment using physical, chemical, and instrumental methods.
CO4	Analyze food quality data and interpret evaluation results for product improvement.
CO5	Evaluate food quality assurance systems, standards, and food safety regulations.
CO6	Design and conduct quality assessment studies for food products and food service operations.

Mapping with Program Outcomes:

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

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

Year: I

NON-MAJOR ELECTIVE COURSE 1

Semester: II

Code:

**FUNDAMENTALS OF NUTRITION
(Theory)**

Credits: 2

COURSE OBJECTIVES: To enable the students to

- Understand the basic concepts of nutrition, health, nutrients, balanced diet, and recommended dietary allowances.
- Explain the classification, functions, sources, requirements, and nutritional significance of carbohydrates, proteins, and fats.
- Acquire knowledge of energy metabolism, energy requirements, and factors influencing energy expenditure.
- Understand the physiological functions, sources, requirements, and deficiency disorders of vitamins and water.
- Explain the role of macro and micro minerals in maintaining health and preventing deficiency disorders.

UNIT – I: INTRODUCTION TO NUTRITION, NUTRIENTS AND RDA:

Introduction to Nutrition - Definition of Nutrition and Health. Inter relationship between nutrition and health, adequate/optimum nutrition and Malnutrition. Nutrients and RDA - Classification and basic functions of nutrients. Basic five food group, My plate and concept of balanced diet, RDA, Factors affecting RDA.

UNIT – II: CARBOHYDRATES AND ENERGY:

Carbohydrates - Nutritional classification, functions, sources, deficiency and excess effects. Dietary Fibre – classification, sources, physiological role in human nutrition

Energy - Units of measurement, Total Energy Requirement, Basal Metabolic Rate, Factors affecting Basal Metabolic Rate, Energy content of foods.

UNIT – III: PROTEIN AND FAT

Protein - Nutritional classification, functions, sources and requirements. Essential amino acids, their importance.

Fat/Lipids – Classification of Fatty acids. Functions, sources and requirement of lipids. Importance of essential fatty acids, their requirement and effect of deficiency.

UNIT – IV: VITAMINS AND WATER:

Vitamins – Fat soluble vitamins - A, D, E and K - functions, sources, requirements, deficiency disorders.

Water soluble vitamins - B – complex vitamins – Thiamine, Riboflavin, Niacin, Folic acid, Biotin, Pantothenic acid, B12 and Vitamin C - functions, sources, requirements and deficiency disorders.

Water - Functions of water in human body, water distribution, maintenance of water and regulation of acid-base balance in the body.

UNIT – V: MINERALS-MACRO AND MICROMINERALS:

Minerals – Macrominerals - Calcium, Phosphorus, Sodium, Potassium-functions, sources, requirements, deficiency and toxicity.

Microminerals - Iron, Fluorine, Zinc, Copper, Iodine-functions, requirements, deficiency and toxicity.

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

Maintain a 3-day food diary and compare nutrient intake with RDA.

Prepare educational material on prevention of obesity and malnutrition.

Recommended Books:

1. Brown Judith, E. (2008) Nutrition. (3rd ed.) Thomson Wadsworth USA.
2. Park, K. (2008) Essentials of Community Health Nursing(5th ed.). M/ s Banarsidas Bhanot Publishers. Jabalpur.
3. Josephine Martin and Charlotte Beckett Oakley, (2008). Managing Child Nutrition Programs. (2nd ed.) Jones & Bartlett Publishers.
4. Seema Sonkar and Doreas L. Essiamah, (2008) Food and Nutrition Security challenges towards combating malnutrition. Chandralok Prakashan. Kanpur.
5. Bamji M.S, Prahlad Rao N, Reddy. (2016) Textbook of Human Nutrition. (4th ed.). Oxford and PBH Publishing Co. Pvt. Ltd. New Delhi.

Reference:

1. Prakash Shetty, (2002). Nutrition through the lifecycle. (1st ed.). Leather head publishing. Leather head International Ltd. UK.
2. Gibney, M.J., Margetts, B.M., Kearney, J.M., Arab, L., (2004). Public Health Nutrition. (2nd ed.). UK. Blackwell Publishing Co.
3. Carolyn D. Berdanice., (2009), Advanced Nutrition, (2nd ed.). CRC Press.
4. M. Swaminathan., (2012), Advanced Textbook on Food and Nutrition. (2nd ed.). Bangalore Printing and Publishing Co. Ltd., Bangalore,
5. Raheena Begum.M., (2015), A textbook of Foods, Nutrition and Dietetics. (3rd ed.). Sterling Publishers Pvt. Ltd., New Delhi.
6. Park K., (2021), Park's Textbook of Preventive and Social. (26th ed.). M/S Banarasidas, Bharat Publishers, Jabalpur, India.

E-Reference:

1. <https://www.who.int/>
2. <https://www.encyclopedia.com/food/encyclopedias-almanacs-transcripts-and-maps/assessment-nutritional-status>
3. <https://www.fao.org/about/en/>
4. <https://www.nin.res.in/downloads/NNMBREPORT2001-web.pdf>
5. <https://www.icmr.gov.in/>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the concepts of nutrition, health, nutrients, balanced diet, food groups, and Recommended Dietary Allowances (RDA)
CO2	Analyze the nutritional importance of carbohydrates, dietary fiber, and energy requirements in human nutrition.
CO3	Evaluate the functions, requirements, sources, and nutritional significance of proteins and fats in maintaining health.
CO4	Assess the role of vitamins and water in physiological functions and prevention of deficiency disorders
CO5	Examine the importance of macro and micro minerals, their requirements, deficiency manifestations, and toxicity effects.
CO6	Apply nutrition knowledge for promoting health, preventing malnutrition, and planning balanced diets

Mapping with Program Outcomes:

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

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

Year: II

CORE COURSE 5

Semester: III

Code:

**QUANTITY FOOD PRODUCTION
(Theory)**

Credits: 4

COURSE OBJECTIVES: To enable the students to

- Understand the evolution, principles, objectives, and types of food service industries and food service systems.
- Develop knowledge and skills in menu planning, menu construction, and menu display techniques.
- Apply principles of recipe standardization, portion control, food costing, yield analysis, and menu pricing.
- Understand purchasing, receiving, storage, inventory management, and stock control procedures in food service establishments.
- Acquire knowledge of quantity food production systems, quality control measures, food safety, and HACCP principles.

UNIT – I: EVOLUTION OF FOOD SERVICE:

Evolution of the food service industry, Principles of food service industry, Objectives, Types of food service industry - Commercial, Non-commercial, Kinds of food service systems-Conventional, Commissary, Ready prepared, Assembly/serve.

UNIT – II: MENU PLANNING:

Definition and types of menu, Principle involved in Menu Planning, Functions of menu planning, Techniques of writing menu, Construction of Menu and Menu Display.

UNIT – III: STANDARDIZATION OF RECIPES:

Forecasting and Scheduling, Standardization of Recipes, Portion Control in Standardized Recipes, Methods of Calculation of Food Cost, Yield Analysis, Market report standard costing, Menu pricing, Recipe Card, Recycling of Food.

UNIT – IV: COMPUTERS IN PURCHASE AND STORAGE:

Raw material - Selection and procurement. Product specification and standards. Methods of Purchase and Purchasing Process, Transportation, Receiving. Storage and Stock Control - Indent, Store Requisition, Store Receipt, BIN card, Stock Registers, store keepers Log Book, Issuing – Inventory & Inventory Control, Stock Valuation, LIFO, FIFO

UNIT – V: QUANTITY FOOD PRODUCTION AND QUALITY CONTROL:

Methods of Food Production. Techniques of food production, Types of fuel – Factors affecting fuel selection, Fuel Economy and Equipment Product Control – Quality and Quantity Control HACCP Food safety. Ecofriendly practices in food production

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

Visit to food industry. Prepare e-content for different Food Service.

Recommended Books:

1. Negi J. 2000. Professional Hotel Management. S. Chand and Company Limited, New Delhi.
2. Palacio J P. Harger V. Shugari G. 2001. West and Woods Introduction to Food Service. Mac Millan Pub Co., New York.
3. Krishna Arora 2005. Theory of cookery. Fronk Bros and co. Publishers, New Delhi
4. Vijay Dhawan 2007. Food & Beverage Service. Frank Bros &co, New Delhi.
5. Singaravelavan R. 2006. Food & Beverage Service. Oxford University press.
6. Cessarani V. Kinton R., 2002. Practical Cookery. Seventh edition. Hodder and Stoughton publishers.
7. Khan M A. 2003. Food Service Operations. AVI Publications Co., Connecticut.

Reference:

1. Thangam Philip 2005. Modern Cookery. Orient Longman Limited. Third edition.
2. Sethi M. and Malhan S. M. 2007. Catering Management-An Integrated Approach. Wiley Eastern Limited, Mumbai.
3. Tharun Bansal 2015. Hotel Facility Planning, Oxford University Press
4. Pearson, 2016, Principles and Practices. 13th Edition Pub. Harlow:.
5. John B. Knight, Lendal H. Kotschevar., Quantity: food Production, Planning and Management, 3rd Edition, John Wiley and Sons, 2017

E-Reference:

1. [https://www.ihmbbs.org/upload/CHAPTER-%20\(MEALS%20&%20MENU%20PLANNING\).pdf](https://www.ihmbbs.org/upload/CHAPTER-%20(MEALS%20&%20MENU%20PLANNING).pdf)
2. <https://psu.pb.unizin.org/hmd329/chapter/chapter-6-standardized-recipes/>
3. <https://dpi.wi.gov/sites/default/files/imce/school-nutrition/pdf/recipe-standardization-steps.pdf>
4. <file:///C:/Users/svharishram/Downloads/Unit-7.pdf>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the evolution, objectives, principles, and various types of food service industries and food service systems.
CO2	Analyze menu planning principles, menu construction, and menu presentation techniques for different food service operations.
CO3	Apply recipe standardization, portion control, food costing, yield analysis, and menu pricing techniques in food service management.
CO4	Evaluate purchasing, receiving, storage, inventory control, and stock valuation methods used in food service establishments.
CO5	Analyze quantity food production systems, quality assurance practices, and HACCP principles in food production.
CO6	Apply sustainable food service practices, food safety measures, and eco-friendly production techniques in food service operations.

Mapping with Program Outcomes:

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

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

Year: II

CORE COURSE 6

Semester: III

Code:

**RESEARCH METHODOLOGY AND
STATISTICS
(Theory)**

Credits: 4

COURSE OBJECTIVES: To enable the students to

- Understand the fundamental concepts, principles, ethics, and processes involved in scientific research.
- Differentiate various types of research designs and their applications in nutrition, food science, and health-related studies.
- Develop skills in sampling techniques, tool development, validation, and data collection procedures.
- Apply statistical methods for organizing, analyzing, and interpreting research data.
- Understand the use of parametric and non-parametric statistical tests in hypothesis testing.

UNIT – I: FUNDAMENTAL CONCEPT IN RESEARCH:

Research: Meaning, definition, function, nature, importance and characteristics of research; research ethics, Steps in research process: Identification, selection and formulation of problem, sources and criterion for selection; review of literature and summarizing, objectives, hypothesis formulation, research design, research questions, type I and type II errors, Variables and its types.

UNIT – II: TYPES OF RESEARCH:

Types of Research: Applied, pure/fundamental, action, developmental, evaluative, interdisciplinary and participatory research; qualitative and quantitative research; historical research; descriptive research methods – survey, case study, cross sectional surveys, correlation study, content analysis, causal - comparative research; analytic studies - observational and interventional studies - cohort, case control, re-experimental, experimental research, quasi experimental research.

UNIT – III: SAMPLING TECHNIQUES AND DATA COLLECTION:

Sampling: meaning, concept of population and sample, census Vs sample methods; types of sampling: Probability sampling - simple random sample, systematic random sample, stratified random sampling etc.-random and non-random samples, random numbers and use; Non-probability sampling-purposive samples, incidental samples, quota samples, snow ball samples; general consideration in determination of sample size. Data: Primary and secondary methods of data collection; tools used of data collection: questionnaires, rating scales, check lists, interview schedules; procedure for preparation of the tool, administration of tools for data collection. Validation

UNIT – IV: DATA ANALYSIS:

Measures of central tendency- mean median, mode arithmetic mean and its uses, mid - range, geometric mean, weighted mean; measures of dispersion /variability - range, variance, standard deviation, standard error, coefficient of variation, Skewness and Kurtosis, histogram, frequency polygons.

UNIT – V: PARAMETRIC AND NON PARAMETRIC TESTS:

Bivariate analysis - correlation and regression - Karl Pearson's product moment - correlation co-efficient by ranks, bi-serial correlation, regression analysis - Fitting of regression lines; chi-square, Multiple and partial curve and uses - Test of significance: Parametric tests - large and small samples; Non-parametric test - Analysis of variance - one way and two way classification.

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

To get hands on training on any one software used for research in Food Service Management and Dietetics

Recommended Books:

1. Kothari, C. R. (2000): Research Methodology: Methods and Techniques, Wishwa Prakashan, New Delhi.
2. Kumar, A. (1997): Social Research Method (The Art of Scientific Investigation), Anmol Publication, New Delhi.
3. Kumar, A. (2002): Research Methodology in Social Sciences, Sarup and Sons, New Delhi.
4. Devadass, R. P and Kulandaivel. K (1989). A Hand Book of Methodology of Research, RKMV, Coimbatore.
5. Gupta S.P (2010), Statistical Methods., Sullan Chand & Sons, Daryang, New Delhi.
6. McBurney, D.H. (2001): Research Methodology, Thomson-Wadsworth, Australia.
7. Bell, J. (1997): Doing Your Research Project: A Guide for First-time Researchers in Education and Social Science, Viva Books, New Delhi.

Reference:

1. Bulmer, M.C.(1984): Sociological Research Methods: An Introduction, Macmillan, Hong Kong.
2. Festinger, L. and Katz, D.(ed.) (1977): Research Methods in the Behavioral Sciences, Amerind Publishing, New Delhi.
3. Holloway, I. (1997): Basic Concepts of Qualitative Research, Blackwell Science, London.
4. Jain, G. (1998): Research Methodology: Methods and Techniques, Mangal Deep, Jaipur.
5. Hooda, R.P. (2003) "Statistics for Business and Economics", 3rd ed., Macmillan India Ltd., Delhi,

E-Reference:

1. <https://www.youtube.com/watch?v=6rgwgwv8qdA>
2. <https://www.ibm.com/docs/en/ias?topic=spss-tutorial-analyzing-statistics>
3. <https://www.pdfdrive.com/research-methodology-books.html>
4. <https://ccsuniversity.ac.in/bridge-library/pdf/Research-Methodology-CR-Kothari.pdf>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the concepts, ethics, principles, research process, variables, hypotheses, and research designs used in scientific investigations.
CO2	Differentiate various qualitative, quantitative, descriptive, analytical, experimental, and epidemiological research methods.
CO3	Apply appropriate sampling techniques, data collection tools, and validation procedures in research studies.
CO4	Analyze research data using measures of central tendency, dispersion, graphical presentation, and descriptive statistical techniques.
CO5	Evaluate relationships among variables using correlation, regression, and other inferential statistical methods.
CO6	Apply parametric and non-parametric statistical tests for hypothesis testing and interpretation of research findings.

Mapping with Program Outcomes:

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

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

COURSE OBJECTIVES: To enable the students to

- Understand the principles of menu planning, standardization, portion control, and pricing of Indian and international cuisines.
- Develop skills in planning and preparing regional Indian cuisines and international cuisines.
- Apply menu engineering concepts for banquet and buffet food service operations.
- Demonstrate competency in table setting, cover layouts, and napkin folding techniques.
- Acquire practical knowledge of food service procedures, waiter etiquettes, and customer service skills.
- Integrate culinary, costing, and service management skills in hospitality and food service establishments.

Practicals

- Indian Cuisines Menu planning, Standardization and enlargement and pricing of cuisines 12 Starter, Main course, accompaniments and desserts - North, South, East, West-Service techniques of Respective cuisines.
- International Cuisines Menu planning, Standardization, enlargement and Pricing of cuisines, Starter, 9 Main course, accompaniments and desserts - Chinese, Continental, French, Italian - Service techniques of respective cuisines.
- Banquet & Buffet Menu planning, Standardization, enlargement and Pricing of cuisines for Banquet 6 and Buffet.
- Table Setting and Napkin Folds Basic napkin folds, Table setting - Ala carte, Table d hote, Breakfast cover, High tea 6 and Lunch. Role play - waiter etiquettes

Recommended Books:

1. Negi J. 2000. Professional Hotel Management. S. Chand and Company Limited, New Delhi.
2. Palacio J P. Harger V. Shugari G. 2001. West and Woods Introduction to Food Service. Mac Millan Pub Co., New York.
3. Krishna Arora 2005. Theory of cookery. Fronk Bros and co. Publishers, New Delhi
4. Vijay Dhawan 2007. Food & Beverage Service. Frank Bros & co, New Delhi.
5. Singaravelavan R.2006. Food & Beverage Service. Oxford University press.
6. Cessarani V. Kinton R., 2002. Practical Cookery. Seventh edition.

- Hodder and Stoughton publishers.
7. Khan M A. 2003. Food Service Operations. AVI Publications Co., Connecticut.

Reference:

1. Thangam Philip 2005. Modern Cookery. Orient Longman Limited. Third edition.
2. Sethi M. and Malhan S.M. 2007. Catering Management-An Integrated Approach. Wiley Eastern Limited, Mumbai.
3. Tharun Bansal 2015. Hotel Facility Planning, Oxford University Press
4. Pearson, 2016, Principles and Practices. 13th Edition Pub. Harlow:.
5. John B. Knight, Lendal H. Kotschevar., Quantity: food Production, Planning and Management, 3rd Edition, John Wiley and Sons, 2017

E-Reference:

1. [https://www.ihmbbs.org/upload/CHAPTER-%20\(MEALS%20&%20MENU%20PLANNING\).pdf](https://www.ihmbbs.org/upload/CHAPTER-%20(MEALS%20&%20MENU%20PLANNING).pdf)
2. <https://psu.pb.unizin.org/hmd329/chapter/chapter-6-standardized-recipes/>
3. <https://dpi.wi.gov/sites/default/files/imce/school-nutrition/pdf/recipe-standardization-steps.pdf>

COURSE OUTCOMES: (With Mapping)

C01	Plan, standardize, enlarge, and cost menus for regional Indian cuisines with appropriate starters, main courses, accompaniments, and desserts.
C02	Design and price menus for international cuisines and demonstrate appropriate service techniques.
C03	Develop banquet and buffet menus considering portion size, standardization, and cost control.
C04	Demonstrate professional table setting and napkin folding techniques for various food service occasions.
C05	Apply food service etiquettes, communication skills, and customer service practices through role-play activities
C06	Evaluate menu quality, presentation standards, pricing strategies, and service efficiency in hospitality operations.

Mapping with Program Outcomes:

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

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

COURSE OBJECTIVES: To enable the students to

- Understand the fundamental concepts, principles, and recent developments in Food Science, Food Service Management, Nutrition, and Dietetics.
- Acquire knowledge of textiles, apparel designing, fabric construction, quality evaluation, and clothing care.
- Develop an understanding of resource management, consumer issues, entrepreneurship, housing, and interior design principles.
- Examine theories and concepts related to child development, family studies, family welfare, and special needs management.
- Understand communication processes, extension management, and community development approaches for societal well-being.
- Apply interdisciplinary knowledge of Family and Community Sciences for professional practice, research, entrepreneurship, and community development.

UNIT – I: FOOD SCIENCE, FOOD SERVICE MANAGEMENT, NUTRITION AND DIETETICS

Food Science - Properties of food, quality evaluation of food, new product development, food packaging.

Food Service Management - Menu planning, food cost analysis. Food standards, microbiological safety of food, HACCP. Perspectives of food service nanotechnology.

Nutrition and Dietetics – Principles of nutrition, nutrition through lifespan, community nutrition, sports nutrition, nutrition in emergencies and disasters, nutritional intervention, clinical and therapeutic nutrition.

UNIT – II: TEXTILES, APPAREL DESIGNING

Textiles - Textile terminologies, classification of fibres, yarns and weaves, identification of fibres and weaves. Manufacturing process, properties and their uses. Fabric construction their properties and uses. Textiles finishes - classification, processing and purposes of finishes. Types of dyeing and printing. Textile testing and quality control, textile and environment. Traditional textiles of India. Recent developments in textiles.

Apparel designing - Body measurements, equipment and tools used for manufacturing garments, elements and principles of design and its application to apparel. Factors affecting fashion, patternmaking, apparel manufacturing and quality testing. Care and maintenance of clothing.

UNIT – III: RESOURCE MANAGEMENT AND CONSUMER ISSUES, HOUSING AND INTERIOR DESIGN RESOURCE MANAGEMENT

Management of time, energy, money, space, motivating factors, motivation theories, decision making, functions of management. Management of natural resources, money management, human resource management, ergonomics.

Consumer Issues - Definition, role, rights and responsibilities, consumer behaviour, consumer problems, education and empowerment. Consumer protection and legislation. Entrepreneurship - concept, process, barriers, entrepreneurial motivation, challenges, enterprise setting, project planning and appraisal, enterprise management, Food economics.

Housing and Interior Design Housing – Building regulations, Furniture and furnishing, housing finance, Housing and environment. Design - principles, elements of interior design.

UNIT – IV: CHILD/HUMAN DEVELOPMENT, FAMILY STUDIES

Child Development - Theories of human development and behaviour. Children and persons with special needs, care and support, special education, prevention of disabilities, rehabilitation. Children at risk-child labour, street children, children of destitute, orphans, child abuse and trafficking.

Family Studies

Family studies - Dynamics of marriage and family relationships. Role of family welfare in national development. Domestic violence, marital disharmony, resolution of conflict. Parent education, positive parenting, community education. Family disorganization.

UNIT – V: COMMUNICATION FOR DEVELOPMENT, EXTENSION MANAGEMENT AND COMMUNITY DEVELOPMENT

Communication for Development - Basics of communication - nature, characteristics, functions, process, models, elements, principles, barriers, perception, persuasion and empathy, types of communication, levels (settings) of communication transactions, process of listening. Communication systems and communication theories. Role of communication in development - Theories, models, need and importance. Writing for development, social marketing. Traditional, modern and new media for development. Theories in advocacy and behaviour change.

Extension Management and Community Development

Programme management, Extension methods and materials, Curriculum development and planning for extension education and development activities, Bloom's taxonomy of educational objectives and learning. Non-Formal, adult and lifelong education - perspectives, concept, theories, approaches, scope, methods and materials used, challenges of implementation and evaluation, issues to be addressed. Training, skill development and capacity building for human resource development-methods of training, entrepreneurship development. Community development, programmes for nutrition, health and education, People's participation and stakeholders perspectives, Participatory Learning and Action-methods and techniques.

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

Development of sustainable textiles, smart fabrics, wearable technology, and eco-friendly apparel manufacturing.

Integration of the Sustainable Development Goals (SDGs), climate resilience, and community participation in nutrition, health, and development programmes.

Recommended Books:

1. Trueman Team. (2019). NTA-UGC NET. Home Science. Danika Publishing Company.
2. Upkar Prakashan. (2015). Upkar's UGC NET/JRF Exam. Solved Papers Home Science, Pratiyogita Darpan.
3. Premalatha Mullick. (2012). Textbook of Home Science. Kalyani Publishers.

Reference:

1. Atlantic Research Division. (2014). Home Science for UGC-NET/SLET/JRF. Atlantic Publishers & Distributors Pvt Ltd.
2. Nandini Sharma. (2019). NTA UGC NET/JRF/SET. Home Science. Arihant publisher.
3. Editorial Board. (2019). NTA UGC-NET/JRF. Solved Papers. Home Science, Sahitya Bhawan.
4. Sunita Mishra. (2013). UGC NET Study Manual. Home Science. Selective and Scientific Books.

E-Reference:

1. <https://www.examrace.com/NTA-UGC-NET/NTA-UGC-NET-Previous-Years-Papers/HomeScience/>
2. <http://www.deepugcnet.com/home-science.html>
3. <http://www.ugcnetjrf.com/ugc-net-home-science-studymaterials.html>
4. <https://iasexamportal.com/Download/UGC-NET-Previous-Year-Exam-Question-Paper-Home-Science>

COURSE OUTCOMES: (With Mapping)

	At the end of the course, the students will have the ability
CO1	Explain the concepts, principles, and applications of Food Science, Food Service Management, Nutrition, and Dietetics in promoting health and food safety.
CO2	Analyze textile materials, apparel designing principles, garment construction processes, and quality assessment techniques.
CO3	Apply resource management principles, consumer protection measures, entrepreneurial concepts, and interior design practices in daily life and professional settings.

C04	Examine theories of child and human development, family dynamics, and issues related to children and persons with special needs.
C05	Evaluate communication strategies, extension methods, and community development programmes for effective social change and human resource development.
C06	Integrate multidisciplinary knowledge of Family and Community Sciences to address contemporary challenges in health, family welfare, consumer education, and community development.

Mapping with Program Outcomes:

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

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

COURSE OBJECTIVES: To enable the students to

- Understand the fundamental concepts, scope, and functions of Human Resource Management (HRM) in organizations.
- Develop knowledge of managerial roles, leadership styles, and human relations in workplace settings.
- Gain skills in recruitment, selection, training, and employee development processes.
- Understand job analysis, manpower planning, and performance appraisal systems.
- Study employee welfare measures, motivation theories, and wage administration.
- Develop awareness of labour laws, ethics, and grievance handling in hospitality and food service sectors.

UNIT – I: INTRODUCTION TO HUMAN RESOURCE MANAGEMENT:

Definition of Human resource Management; Nature, Scope, Functions, Objectives, significance of human resource management. Role of HRM, Four key roles. Current classification of HR roles Human Resource Management in the New Millennium

UNIT – II: MANAGER POLICY AND HUMAN RELATIONS:

Qualities of a Human resource Manager - Evaluation, Growth and functions, Policies of Human resource Management. Importance of human relations, human needs. Role of Human Relations. Professional ethics in work areas. Leadership - types, styles, skills and qualities of a leader. Communication - types, importance and barriers.

UNIT – III: REQUIREMENT, SELECTION AND TRAINING:

Requirements and Selection: Process, Techniques- Placement and Induction Methods of training – Internal and external methods, merits and demerits. Evaluation of training. Motivation- Human needs, methods and theories of motivation.

UNIT – IV: JOB ANALYSIS AND PERFORMANCE APPRAISAL:

Job analysis, Job specifications and Job description. Man power Planning; Objectives, process. Performance of Appraisal- Essentials of a Good Appraisal System Performance appraisal methods- merits and demerits, promotion, demotion, transfer, separation and retirement. Grievances and grievances handling.

UNIT – V: EMPLOYEE WELFARE AND BENEFITS:

Fixation of wages and wage policy. Welfare measures at work place. Labour laws – Catering Establishment Act, Shop and Establishment Act, Factories Act, Minimum Wages Act, Industrial Disputes Act

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

Role play of leadership style.

Methods to overcome Communication barriers Self evaluation as human resource manager for a star hotel

Recommended Books:

1. Aswathappa. K. (2008), Human Resource and Personnel Management (5th edition), Tata McGraw-Hill Publishing Company Ltd., New Delhi.
2. Biswajeet Pattanayak (2001), Human Resource Management, Prentice Hall of India Pvt. Ltd., New Delhi.
3. Mamoria C.B., Gankar S.V., (2006), “A Textbook of Human Resource Management”, Himalaya Publishing House, New Delhi.
4. Dwivedi R.S., (1997), “Personnel Management in Indian Enterprises”, Galgotia Publishing Company, New Delhi.
5. Tripathi, P.C (2003). Personnel Management – Industrial Relation. Sultan Chand and Sons, New Delhi.

Reference:

1. Sharma, A.M (2003). Personnel and Human Resource Management. Himalaya Publishing House, Mumbai.
2. Chhabra T.N. “Human Resources Management – Concepts and Issues, Fourth Edition”, Shampat Rai & Co., Delhi.
3. Gupta, C. B. (2004), “Human Resource Management”, Sixth Edition, Sultan Chand & Sons, New Delhi.
4. Rudrabasavaraj, M.N (2001). Dynamic Personnel Administration Management of Human Resources. Himalaya Publishing House, Mumbai.
5. Rao, V.S.P (2002). Human Resource Management Text and cases. Excel books.
6. Lloyed L. Byers and Leslie W. Rue (1997), Human Resource Management (5th edition), The Mc Graw-Hill Companies, USA.
7. Michael Armstrong (1999), A Handbook of Human Resource Management Practice (7th edition), Kogan Page Limited, 120 Pentonville Road, London.

E Reference:

1. <https://brauss.in/hrm-basic-notes.pdf> 14.
2. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=8x0nJkh/R0vHkX1U70Z/CQ==> 15.
3. <https://www.pdfdrive.com/human-resource-books.html>.
4. https://www.academia.edu/31368081/E_BOOK_ON_HUMAN_RESOURCE_MANAGEMENT_HRM_pdf .

5. <http://www.freebookcentre.net/Business/Human-Resources-And-PersonnelManagement.html>

COURSE OUTCOMES: (With Mapping)

CO 1	Explain the nature, scope, functions, and evolving role of Human Resource Management in modern organizations.
CO 2	Analyze managerial policies, leadership styles, communication systems, and human relations in workplace environments.
CO 3	Apply recruitment, selection, training, and motivation techniques in human resource development.
CO 4	Evaluate job analysis, manpower planning, and performance appraisal systems for effective employee management.
CO 5	Assess employee welfare measures, wage policies, labour laws, and grievance handling mechanisms.
CO6	Develop integrated HR strategies to improve organizational efficiency, employee satisfaction, and workplace productivity.

Mapping with Program Outcomes:

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

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

COURSE OBJECTIVES: To enable the students to

- Develop skills in designing research tools such as questionnaires and interview schedules.
- Understand methods of data processing, coding, classification, and tabulation.
- Apply computer applications such as MS Excel and SPSS for data management and statistical analysis.
- Perform descriptive and inferential statistical analyses using appropriate statistical techniques.
- Develop competencies in research proposal writing, journal identification, and academic writing.
- Understand research ethics, plagiarism detection, and responsible conduct of research.

Practicals:

1. Formulation of Interview schedule/Questionnaire.
2. Processing of data-editing, coding, classification and tabulation.
3. Applying Excel for nutritive value calculation and formatting chart and encryption of document.
4. Data Analysis – Computation of Mean, Median, Standard deviation.
5. Data Analysis – Graphical and diagrammatic representation of data.
6. BiVariate correlation.
7. Thet -test procedure using SPSS.
8. Non-parametrictest-Chi-square test.
9. Oneway ANOVA procedure using SPSS.
10. Simple Regression, Multiple Regression.
11. Identification of Indexed journal.
12. Research proposal preparation.
13. Check plagiarism using software.

Recommended Books:

1. Kothari G.R. (2004). Research Methodology. New Age International(P) Ltd.
2. Dr.Rajamohan.S. and Thilagaraj A. (2010). Introduction to Statistics (2nded). Learntech Press.
3. Saravanavel P. (2013). Research Methodology. Kitab Mahal Allahabad.

Reference Books:

1. Vijayalakshmi G. and Sivapragasam. C. (2008) Research Methodology. MJP Publishers.
2. Borse. M.N. (2004). Hand Book of Research Methodology. Shree Niwas publications, Jaipur(India).
3. GrumaniN. (2014). Research Methodology for Biological Sciences. MJP Publishers.
4. Ramadas. R. and Wilson. A. (2014) Research and Writing. MJP Publishers.
5. Gupta S.P. (2002) Statistical Methods. Sultan Chand & Sons, New Delhi.
6. Chawla D. and Sondhi N. (2016). Research Methodology. Vikas.
7. Paneersevam.R.ResearchMethodology.PrenticeHallIndiaLearningPrivate Limited.

COURSE OUTCOMES: (With Mapping)

CO 1	Develop and validate research tools including questionnaires and interview schedules for data collection.
CO 2	Process, code, classify, tabulate, and organize research data using appropriate techniques
CO 3	Apply Excel and SPSS software for nutritional calculations, data management, and statistical analysis.
CO 4	Analyze and interpret data using descriptive statistics, graphical presentations, correlation, and regression techniques.
CO 5	Perform inferential statistical tests such as t-test, Chi-square test, and ANOVA using SPSS and interpret the results.
CO6	Prepare research proposals, identify indexed journals, and evaluate plagiarism using research software tools.

Mapping with Program Outcomes:

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

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

Year: II

GENERIC ELECTIVE COURSE 3

Semester: III

Code:

**2. FOOD ADULTERATION
(Practical)**

Credits: 3

COURSE OBJECTIVES: To enable the students to

- Develop practical skills in identifying common adulterants present in food commodities.
- Familiarize students with simple laboratory techniques used for detecting food adulteration.
- Create awareness about food safety standards and the public health implications of food adulteration.
- Enable students to evaluate the quality and authenticity of food products through qualitative tests.
- Develop competency in interpreting test results and promoting consumer awareness regarding safe food choices.

Practicals:

- Detection of adulterants in rice, wheat flour, and cereals.
- Detection of Kesari dhal in pulses.
- Detection of artificial colors in pulses.
- Detection of starch adulteration.
- Detection of brick powder, sawdust, and artificial colors in chili powder.
- Detection of metanil yellow in turmeric powder.
- Detection of adulterants in coriander and cumin powder.
- Detection of water in milk.
- Detection of starch in milk.
- Detection of detergent and urea in milk.
- Detection of vanaspati in ghee.
- Detection of chalk powder in sugar.
- Detection of artificial sweeteners.
- Detection of synthetic colors in sweets and beverages.
- Detection of iron filings in tea powder.
- Detection of exhausted tea leaves.
- Detection of adulterants in coffee powder.

COURSE OUTCOMES: (With Mapping)

CO 1	Identify common adulterants present in cereals, pulses, spices, milk, fats, oils, and processed foods.
CO 2	Perform laboratory tests for the detection of food adulterants using standard procedures.
CO 3	Evaluate the quality and authenticity of food products based on practical observations and test results.
CO 4	Analyze the health hazards and public health implications associated with food adulteration.
CO 5	Interpret food quality standards, food labels, and regulatory requirements related to food safety.
CO6	Develop consumer awareness programmes and educational materials to promote food safety and prevent food adulteration.

Mapping with Program Outcomes:

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

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

Year: II

GENERIC ELECTIVE COURSE 3

Semester: III

Code:

**3. SENSORY EVALUATION
(Practical)**

Credits: 3

COURSE OBJECTIVES: To enable the students to

- Provide practical knowledge of sensory evaluation principles and sensory attributes of food products.
- Develop skills in conducting discrimination, descriptive, and consumer acceptance tests for food quality assessment.
- Familiarize students with the development of sensory score cards and the evaluation of food products using standardized sensory techniques.
- Enable students to analyze, interpret, and statistically evaluate sensory data using appropriate tools and software.
- Develop competency in applying sensory evaluation techniques for food product development, quality control, and consumer research.

Practicals:

- Identification of basic tastes (sweet, sour, salty, bitter, umami).
- Recognition of food aromas and flavors.
- Paired comparison test for food products.
- Triangle test for product differentiation.
- Duo-trio test for sensory discrimination.
- Ranking test for quality assessment.
- Development of sensory score cards.
- Hedonic rating test for a food product.
- Consumer preference test.
- Sensory evaluation of bakery products.
- Sensory evaluation of beverages.
- Sensory evaluation of traditional and value-added foods.
- Statistical analysis and interpretation of sensory data.
- Compilation and interpretation of sensory evaluation data.
- Statistical analysis of sensory scores using MS Excel/SPSS.
- Preparation of sensory evaluation reports.
- Application of sensory evaluation in food product development and quality control.
- Consumer acceptability studies of innovative food products.

COURSE OUTCOMES: (With Mapping)

CO 1	Identify and evaluate basic taste sensations, food aromas, and flavor characteristics using sensory perception techniques.
CO 2	Perform discrimination tests such as paired comparison, triangle, duo-trio, and ranking tests for assessing differences among food products.
CO 3	Develop sensory score cards and conduct hedonic rating, consumer preference, and acceptability studies for various food products.
CO 4	Assess the sensory quality of bakery products, beverages, traditional foods, and value-added food products using standard evaluation methods.
CO 5	Compile, analyze, and interpret sensory evaluation data using statistical tools such as MS Excel and SPSS.
CO6	Apply sensory evaluation findings in food product development, quality improvement, quality control, and consumer acceptability research.

Mapping with Program Outcomes:

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

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

Year: II NON-MAJOR ELECTIVE COURSE 2 Semester: III

Code: NUTRITION THROUGH LIFE CYCLE Credits: 2
(Theory)

COURSE OBJECTIVES: To enable the students to

- Understand the basic principles of nutrition and the relationship between nutrition and health.
- Acquire knowledge on nutritional requirements during pregnancy and lactation.
- Understand the nutritional needs, feeding practices, and growth requirements of infants and preschool children.
- Study the nutritional requirements and common nutritional problems of school-age children and adolescents.
- Understand the dietary requirements and nutritional concerns during adulthood and old age.
- Apply principles of nutrition in planning age-specific diets for promoting health and preventing nutritional disorders.

UNIT – I: PRINCIPLES OF NUTRITION:

Principles of Nutrition – Inter relationship between health and nutrition, malnutrition, over nutrition, under nutrition. Principles of meal planning, RDA. Classification and functions of Nutrients,

UNIT – II: NUTRITION FOR PREGNANCY AND LACTATION:

Nutrition for Pregnancy - Physiological changes and complications during Pregnancy, food and nutritional requirements during pregnancy.
Nutrition for Lactation - Physiology of Lactation, food and nutritional requirements of lactating women

UNIT – III: NUTRITION FOR INFANTS AND PRESCHOOLERS:

Nutrition for Infants - Importance of breast milk, food and nutritional requirements for infants, weaning and supplementary foods for infants.
Nutrition for Preschoolers Food habits of preschoolers, food and nutritional requirements for preschool children.

UNIT – IV: NUTRITION FOR SCHOOL AGE AND ADOLESCENTS:

Nutrition for School Age – Food and Nutritional requirements for school going children, nutritional problems.
Nutrition for Adolescents – Food and Nutritional requirements for adolescence and eating disorders

UNIT – V: NUTRITION DURING ADULTHOOD AND OLD AGE:

Nutrition during Adulthood – Reference man and Reference woman, Food and nutritional requirements for adults.
Nutrition during Old age – Nutritional requirements, nutritional problems and dietary management.

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

Develop E-content on food and nutritional requirements of different age groups.

Recommended Books:

1. Brown Judith, E. (2008) Nutrition. (3rd ed.) Thomson Wadsworth USA.
2. Park, K. (2008) Essentials of Community Health Nursing (5th ed.). M/s Banarsidas Bhanot Publishers. Jabalpur.
3. Josephine Martin and Charlotte Beckett Oakley, (2008). Managing Child Nutrition Programs. (2nd ed.) Jones & Bartlett Publishers.
4. Seema Sonkar and Doreas L. Essiamah, (2008) Food and Nutrition Security challenges towards combating malnutrition. Chandralok Prakashan. Kanpur.
5. Bamji M.S, Prahlad Rao N, Reddy. (2016) Textbook of Human Nutrition. (4th ed.). Oxford and PBH Publishing Co. Pvt. Ltd. New Delhi.

Reference:

1. Prakash Shetty, (2002). Nutrition through the lifecycle. (1st ed.). Leather head publishing. Leather head International Ltd. UK.
2. Gibney, M.J., Margetts, B.M., Kearney, J.M., Arab, L., (2004). Public Health Nutrition. (2nd ed.) .UK. Blackwell Publishing Co.
3. Carolyn D. Berdanice., (2009), Advanced Nutrition, (2nd ed.). CRC Press.
4. M. Swaminathan., (2012), Advanced Textbook on Food and Nutrition. (2nd ed.). Bangalore Printing and Publishing Co. Ltd., Bangalore,
5. Raheena Begum. M., (2015), A textbook of Foods, Nutrition and Dietetics. (3rd ed.). Sterling Publishers Pvt. Ltd., New Delhi.
6. Park K., (2021), Park's Textbook of Preventive and Social. (26th ed.). M/S Banarasidas, Bharat Publishers, Jabalpur, India.

E-Reference:

1. <https://www.who.int/>
2. <https://www.encyclopedia.com/food/encyclopedias-almanacs-transcripts-and-maps/assessment-nutritional-status>
3. <https://www.fao.org/about/en/>
4. <https://www.nin.res.in/downloads/NNMBREPORT2001-web.pdf>
5. <https://www.icmr.gov.in/>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the principles of nutrition, functions of nutrients, RDA, and the relationship between nutrition and health.
CO2	Analyze the physiological changes and nutritional requirements during pregnancy and lactation.
CO3	Examine the nutritional needs, infant feeding practices, weaning, and dietary requirements of preschool children
CO4	Assess the nutritional requirements and common nutritional problems of school-age children and adolescents.
CO5	Evaluate the nutritional requirements and dietary management during adulthood and old age.
CO6	Apply nutritional principles to plan balanced diets for different stages of the life cycle.

Mapping with Program Outcomes:

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

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

Year: II

INTERNSHIP/INDUSTRIAL ACTIVITY

Semester: III

Code:

Credits: 2

COURSE OBJECTIVES: To enable the students to

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

DIETARY INTERNSHIP - MULTISPECIALTY REPUTED HOSPITAL FOR ONE MONTH:

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

COURSE OUTCOMES: (With Mapping)

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

Mapping with Program Outcomes:

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

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

Year: II

CORE COURSE 7

Semester: IV

Code:

**MANAGEMENT ACCOUNTING IN
HOSPITAL INDUSTRY
(Theory)**

Credits: 4

COURSE OBJECTIVES: To enable the students to

- Understand the concepts, principles, and applications of management accounting, cost accounting, and working capital management in hospitality organizations.
- Gain knowledge of hospitality marketing, marketing communication, public relations, market research, and sales management.
- Develop skills in accounting procedures, financial statement preparation, ratio analysis, and budgetary control.
- Understand front office accounting systems, guest accounting procedures, and the role of automation technologies in hospitality operations.
- Apply accounting, financial, marketing, and cost control principles to support effective decision-making and organizational performance in the hospitality industry.

UNIT – I: INTRODUCTION TO MANAGEMENT ACCOUNTING:

Definition, need and importance of management accounting, cost accounting, difference between management accounting and cost accounting, working capital management, importance of working capital management, Total Quality Management in hospitality industry.

UNIT – II: HOSPITALITY MARKETING AND MARKETING COMMUNICATION:

Definition of sales and marketing, marketing activities, relationship between sales and marketing, elements of marketing, role of sales department. Marketing communication, media analysis, public relations, press releases, market research and planning, supply and demand.

UNIT – III: BASIC ACCOUNTING:

Sources of Finance- classification, need for accounting, cash flow analysis, book - keeping and accounting, single entry book keeping system, double-entry system, journal - sub divisions of journal, ledger, trial balance, balance sheet, cashbook – profit and loss account, accrual accounting, cash basis accounting, depreciation and amortization, profitability ratios, liquidity ratios, lever age ratios, budgetary control.

UNIT – IV: FRONT OFFICE ACCOUNTING AND AUTOMATION IN HOSPITALITY INDUSTRY:

Guest accounting, non guest accounting, main function of accounts and its system, types of folios and accounts maintained by the front office cashier, front office accounting cycle, types of postings, methods of handling guest accounts, methods of account settlements. Automation in Hospitality Industry -

Advantages of using computers in food service institutions, Record keeping systems. Point of sale (POS) and Property Management Systems (PMS).

UNIT – V: FOOD AND BEVERAGE COST CONTROL:

Food and Beverage cost, cost analysis, cost control methods, market reports, inventory control, food and beverage cost reconciliation – ingredient control, preparation control, beverage control techniques, waste reduction and sustainability

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

Application of artificial intelligence and data analytics for budgeting, cost control, and financial decision-making.

Adoption of telemedicine and digital health financing models to improve healthcare accessibility and financial efficiency.

Recommended Books:

1. L. Dennis Foster. (1993). Food and Beverage: Methods and Cost controls. McGraw–Hill International Editions, United States
2. Paul R. Dittmer. (2002). Dimensions of the hospitality industry. John Wiley and Sons Inc.

Reference:

1. A. Murthy and S. Gurusamy. (2008). Essentials of Management Accounting. McGraw–Hill International Editions, United States
2. Rajni Sofat and Preeti Hird. (2008). Basic Accounting. Prentice Hall of India Pvt. Ltd.
3. S.K. Bhatnagar. (2005). Front Office Management. Frank Bros and Co.

E-Reference:

1. <https://www.investopedia.com>
2. https://link.springer.com/chapter/10.1057/9780230353275_19
3. <https://www.toppr.com/guides/business-environment/business-functions/financial-management>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the concepts, importance, and applications of management accounting, cost accounting, working capital management, and total quality management in hospitality organizations.
CO2	Describe hospitality marketing functions, marketing communication strategies, market research techniques, and the relationship between sales and marketing.
CO3	Apply accounting principles and procedures including bookkeeping, journal entries, ledger preparation, trial balance, financial statements, ratio analysis, and budgetary control.
CO4	Analyze front office accounting systems, guest accounting procedures, folio management, account settlement methods, and hospitality automation technologies such as POS and PMS.

C05	Evaluate food and beverage cost control systems, inventory management practices, cost reconciliation procedures, and waste reduction strategies for operational efficiency.
C06	Apply accounting, marketing, financial management, and cost control principles for effective decision-making, profitability, and sustainable hospitality operations.

Mapping with Program Outcomes:

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

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

Year: II

CORE COURSE 8

Semester: IV

Code:

**PUBLIC HEALTH NUTRITION
(Theory)**

Credits: 4

COURSE OBJECTIVES: To enable the students to

- Understand the concept of Public Health Nutrition.
- Orient the students with the methodologies applied in nutritional assessment of individuals and communities.
- Know the impact of under nutrition and lifestyle related disorders.
- Gain knowledge in the international and national nutrition intervention Programmes.
- Conceptualise the role of national and international agencies in combating malnutrition.

UNIT – I: PUBLIC HEALTH NUTRITION AND ASSESSMENT OF NUTRITIONAL STATUS:

Aim, scope and content of Public Health Nutrition; Role of Public Health Nutritionist in National development; Health – Definition, dimensions, determinants and indicators.

National Health Care Delivery System - Health care of the community, Health care systems

Assessment of Nutritional Status of Individual and Community

Direct methods – anthropometry, biochemical, biophysical and clinical methods; Indirect methods – dietary intake and ecological variables including socio-cultural, biologic, environmental and economic; Errors in methods of assessing nutritional status Vital statistics

UNIT – II: PUBLIC HEALTH ASPECTS OF UNDER NUTRITION AND LIFESTYLE RELATED DISORDERS:

Nutritional problems affecting the community - Etiology, prevalence, clinical features and preventive strategies for malnutrition related problem and deficiency disorders: PEM/CED, Vitamin A deficiency, Nutritional Anemias, Iodine Deficiency Disorders, Vitamin D deficiency and Osteoporosis, Zinc deficiency; Intra burden, Double burden, Triple burden.

Public Health Aspects of Lifestyle Related Disorders

Public health implications and preventive strategies for: Obesity, Hypertension, Coronary heart disease, Diabetes, Cancer, Dental Caries, Public health aspects of H.I.V/ AIDS.

UNIT – III: NUTRITION EDUCATION:

Objectives, principles and scope of nutrition and health education and promotion. Role of audio-visual aids in nutrition education- Information Electronics Communication Technology. Organization of nutrition education programmes, principles of planning, executing and evaluating nutrition education programmes, problems encountered in conducting nutrition education programmes.

UNIT – IV: INTERNATIONAL AND NATIONAL NUTRITION

INTERVENTIONS:

International nutritional Policy – Global nutrition policy, Sustainable development goals, Scaling nutrition, Global Nutrition Cluster, World food Programme.

National nutritional policy - Integrated child development scheme (ICDS), Midday Meal Program, Public Distribution System (PDS), National programs for the prevention of anemia, National Prophylaxis Programme against Vitamin A Deficiency Diseases, Goitre Control Programme, National Nutrition Policy and Food Security, Poshan Abhiyan 2.0, Annapoorna Scheme.

UNIT – V: NATIONAL AND INTERNATIONAL AGENCIES IN COMBATING MALNUTRITION:

National Organization concerned with food and nutrition – Indian Council of Medical Research (ICMR), National Institute of Nutrition (NIN), National Nutrition Monitoring Bureau (NNMB), Central Food Technological Research Institute (CFTRI), Defence Food Research Laboratory (DFRL), and National Institute of Public Cooperation and Child Development (NIPCCD), Food and Nutrition Board (FNB).

International Organization concerned with Food and Nutrition – Food and Agricultural Organization (FAO), United Nations International Children's Emergency Fund (UNICEF), World Bank, World Health Organization (WHO).

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

Development nutrition education modules for population groups vulnerable to nutritional deficiencies. Commemorate any two nutrition related events

Recommended Books:

1. Bamji. M.S, Prahlad Rao. N, Reddy V (2016). Textbook of Human Nutrition. Oxford and PBH Publishing Co. Pvt. Ltd, New Delhi.
2. Park K (2011). Park's Textbook of Preventive and Social Medicine, 21st Edition. M/s Banarasidas Bhanot Publishers. Jabalpur. India
3. Gibney M.J., Margetts, B.M., Kearney, J.M. Arab, I. eds (2004) Public Health Nutrition, NS Blackwell Publishing. .
4. Jelliffe, D. Band Jelliffe, E.F.P. (1989) Community Nutritional Assessment, Oxford University Press.
5. Owen, A.Y. and Frankle, R.T. (1986) Nutrition in the Community. The Art of Delivering Services, 2nd ed. Times Mirror/Mosby.
6. Park. K. (2009) Park's Textbook of Preventive and Social Medicine, 20th ed. M/S Banarsida Bhanot, Jabalpur.
7. Wadhwa, A. and Sharma, S. (2003) Nutrition in the Community. A text book. SCN News, UN ACC/SCN Subcommittee on Nutrition

Reference:

1. Wadhwa A and Sharma S (2003). Nutrition in the Community-A textbook. Elite Publishing House Pvt. Ltd. New Delhi.
2. Park K (2011). Park's Textbook of Preventive and Social Medicine, 21st Edition. M/S Banarasidas Bhanot Publishers. Jabalpur. India.

3. WHO (2006). Child Growth Standards: Methods and development: height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age.
4. Margaret Barth Ronny A Bell Karen Grimmer (2021). Public Health Nutrition, Rural Urban and Global based practice. Springer Publishing Company.
5. Bamji .M.S, Prahlad Rao. N, Reddy V (2016). Textbook of Human Nutrition. Oxford and PBH Publishing Co. Pvt. Ltd, New Delhi.
6. Swaminathan. M. (2014). Advanced Textbook of Food and Nutrition. The Bangalore Printing and Publishing Co. Ltd. Bangalore.

E-Reference:

1. <https://egyankosh.ac.in/bitstream/123456789/44220/3/Unit-2.pdf>
2. <https://www.unicef.org/media/60806/file/SOWC-2019.pdf>
3. <https://www.who.int/health-topics/nutrition>
4. <http://www.ignouhelp.in/ignou-mfn-06-study-material/>
5. <http://www.who.int/childgrowth/standards/en/>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the concepts of public health nutrition, healthcare systems, and methods of nutritional assessment.
CO2	Apply different methods to assess the nutritional status of individuals and communities.
CO3	Analyze the causes, prevention, and public health impact of undernutrition, micronutrient deficiencies, and lifestyle-related diseases.
CO4	Evaluate the role and effectiveness of nutrition education and health promotion programmes.
CO5	Assess national and international nutrition policies, programmes, and interventions for improving community nutrition
CO6	Develop appropriate public health nutrition strategies to promote health and prevent nutrition-related disorders.

Mapping with Program Outcomes:

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

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

Year: II

CORE COURSE 9

Semester: IV

Code:

**FOOD SERVICE MANAGEMENT
(Theory)**

Credits: 4

COURSE OBJECTIVES: To enable the students to

- Understand the evolution of management thought and various approaches to management.
- Gain knowledge of management principles, functions, tools, leadership, communication, motivation, and decision-making.
- Develop skills in manpower planning, recruitment, training, performance appraisal, and labour management.
- Understand marketing concepts, product development, pricing, promotion, distribution, and e-business practices.
- Apply financial management principles including budgeting, costing, food cost control, and computerized record management.
- Develop managerial competencies required for effective administration and decision-making in food service and hospitality organizations.

UNIT – I: THEORIES OF MANAGEMENT AND APPROACHES:

Evolution of Management Thoughts: Classical or traditional theory & Neoclassical approach. Approaches of Management Quantitative approach, MBO approach, System approach, Behavioral and Human relations Contingency approach, Just in Time approach, Total quality management approach, and Management science or operation research.

UNIT – II: PRINCIPLES AND TOOLS OF MANAGEMENT:

Principles of Management, Definition of management. Principles of management, Functions of management, Managerial roles & responsibilities, Manager & leadership quality. Definition of Organization and steps in organizing.

Tools of Management Tangible Tools - Organization chart, Job description, Job specification, Job analysis, Path way chart, Process chart, Work schedule, Production schedule, Staff and service analysis, Budget

Intangible tools – Communication Leadership Decision making and Motivation

UNIT – III: MANPOWER MANAGEMENT:

Recruitment: Process and Sources –Internal and External, Selection: Process interview, Tests, Orientation, Importance, Content of programme, Developing an Orientation programme. Training: Importance, Types–On the Job Training, Group; continuous training, Training for development, Developing a training programme, Contract negotiation with employee: appointment letter, establishment of wages, components of wages, rules and regulations, duties, and service and benefits, contact with vendors

Performance appraisal: Importance, Methods, Limitations. Dealing with organizational behaviour. Absenteeism, Labour turnover, conflict. Trade unions and collective bargaining, Labor Laws and policies.

UNIT – IV: MARKETING MANAGEMENT:

Definition, function marketing mix (6P's) Product – Introduction, Life Cycles, New product development. Place – Channels of distribution, Types of distribution Price – Strategies and types, promotion mix – Sales Promotion – Personal Selling – advertisement publicity. E-business – Telemarketing, Automatic Vending, E-business, E-commerce, Electronic data exchange, E-mail, Internet.

UNIT – V: FINANCIAL MANAGEMENT:

Concept – Food budget. Steps in budget planning, Costing and food cost control, Food Cost Analysis - Objectives of Food Costing, Daily Food Cost Report, Cumulative Food Cost Report, and Daily Cumulative Food Cost Report. Computer aided record maintenance and management

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

Emerging trends in cloud kitchens, ghost kitchens, virtual restaurants, and online food delivery platforms.

Visit to Food service establishments and understanding the management of resources

Recommended Books:

1. Sethi, M., Mathan, S. (1993): Catering Management: An integrated approach, Wiley Eastern; New Delhi,
2. West B.B. wood, L. Revised by Harger V.F. Shugart, G.S. Payne Palacio, J. (1989): Food Service Institution, 6th Ed. Macmillan Publishing Co., New York.
3. Dr. T.N. Chhabra, Principles & Practice of Management, Published by Dhanpat Rai & Co.(P) Ltd, Reprint 2006, ISBN: 81-7700-032-2.
4. Mamoria.C/Band Gankar. S.V, Personnel Management, Published by Himalaya Publishing House, 23rd Edition, 2003, 583-633.
5. Boella, M.J. (1983): Personnel Management in the Hotel and Catering Industry, 3rd Ed., Hutchinson, London.

Reference:

1. Koontz, H., O Donnel, C., Weihrich, H. (1983): Essentials of Management, Indian Ed.
2. Moore, C.L. and Jaedicke, R.K. Management Accounting, South Western Publishing Co.
3. Palacio J.P. Harger, V. Shugart, Gand Thesis, (1994) Introduction to Food Service Mac Millian Pub. Co. New York.
4. R D Agarwal, Organisation and Management, Published by Tata Mc Graw-Hill Publishing Company limited, ISBN 0-07-451506-3.
5. Dinkar Pagare, Business Organisation and Management, Published by Sultan
6. Chand & Sons, Reprint 2002, ISBN 81-7014-675-5

E-Reference:

1. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=8x0nJkh/R0vHkX1U70Z/CQ=>
2. https://www.researchgate.net/publication/356160598_E-BUSINESS_PROCESSES_IN_FOOD_SERVICES
3. <https://www.fssai.gov.in/upload/advisories/2018/02/5a968f14cc994189.pdf>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the evolution of management thought, major management theories, and contemporary approaches applicable to food service and hospitality organizations
CO2	Apply the principles, functions, managerial roles, organizational structure, and management tools to effectively plan and organize food service operations.
CO3	Analyze manpower management practices, including recruitment, selection, training, performance appraisal, labor relations, and organizational behavior for effective human resource management.
CO4	Evaluate marketing strategies, marketing mix elements, product life cycle, pricing, promotion, distribution channels, and e-business applications in food service enterprises.
CO5	Assess financial management practices, including budgeting, food costing, cost control, food cost analysis, and computerized record management for efficient food service administration.
CO6	Develop integrated management strategies by applying managerial, financial, marketing, and human resource principles to improve the quality, productivity, and sustainability of food service organizations

Mapping with Program Outcomes:

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

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

Year: II DISCIPLINE CENTRIC ELECTIVE COURSE 4 Semester: IV

Code: 1. FUNCTIONAL FOODS AND NUTRACEUTICALS Credits: 4
(Theory)

COURSE OBJECTIVES: To enable the students to

- Understand the basics of nutraceutical and functional foods
- Recognize the types & sources of nutraceutical and functional foods
- Explain and discuss the potential of various nutraceuticals and functional foods in promoting human health
- Understand the safety issues and consumer acceptance of nutraceutical and functional foods
- Critically analyse labeling, marketing and regulatory issues related to nutraceutical and functional food

UNIT – I: INTRODUCTION TO NUTRACEUTICALS AND FUNCTIONAL FOODS:

Definitions and history; Difference between nutraceuticals and functional foods; Concept and Current status of nutraceuticals and functional foods in India; Market trends of nutraceuticals and functional food

UNIT – II: NUTRACEUTICALS:

Types of nutraceuticals: phytochemicals - isoprenoids, polyphenolics, phytosterols; carbohydrates - (dietary fibers, oligosaccharides and resistant starch); proteins and peptides, lipids- conjugated linoleic Acid, omega-3 fatty acids, fat replacers; vitamins and minerals; microbial - prebiotics, probiotics and synbiotic; sources and stability of nutraceuticals

UNIT – III: NUTRACEUTICALS & HEALTH:

Health benefits - cardiovascular diseases, cancer, diabetes, cholesterol management, obesity, Arthritis, immune enhancement, age-related macular degeneration, endurance performance and mood disorders – compounds and their mechanisms of action

UNIT – IV: FUNCTIONAL FOODS:

Types of functional foods - Cereal and cereal products, milk and milk products, egg, oils, meat and products, sea foods, nuts and oilseeds, functional fruits and vegetables, herbs and spices, beverages (tea, wine), fermented foods; Potential health benefits and role in cardiovascular diseases, hypertension and diabetes Development; Anti-Nutritional Factors Present In Foods - Types of inhibitors present in various foods and their inactivation. Assessment of nutritional status and recommended daily allowances. Effects of processing, storage and interactions of various environmental factors on the potentials of such foods.

UNIT – V: LEGAL ASPECTS:

Safety; Consumer acceptance; Assessment of health claims; Labeling, marketing and regulatory issues; Future prospects, Recent development and advances in the areas of nutraceutical and functional foods.

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

Identification of various nutraceuticals and functional foods available in the market.

Trace the growth/Company profile of a specific nutraceutical industry.

Recommended Books:

1. Wildman, R.E.C. (2019). Handbook of Nutraceutical and Functional Foods. CRC Press,
2. Gibson, G.R. and Williams, M.C. (2001). Functional Foods Concept to Product. CRC Press.
3. Vatter, D.A. and Maitin V. (2016). Functional Foods, Nutraceuticals and Natural Products, Concepts and Applications. DES tech Publications, Inc
4. Gupta, R.C. (2016). Nutraceuticals: Efficacy, Safety and Toxicity. Academic Press.
5. Giuseppe Mazza; Functional Foods: Biochemical and Processing Aspects, Volume 1; CRC Press
6. Robert E.C. Wildman; Handbook of Nutraceuticals and Functional Foods, Second Edition; CRC Press 2019

Reference:

1. Massimo Maffei; Dietary Supplements of Plant Origin; CRC Press
2. Fereidoon Sahidi, Deepthi K. Weerasinghe; Nutraceutical Beverages, Chemistry, Nutrition and Health Effects; American Chemical Society
3. Ronald R. Watson; Vegetables, Fruits, and Herbs in Health Promotion; CRC Press.
4. Susan Sungsoo Cho, Mark L. Dreher; Marcel; Dekker Handbook of Dietary Fibre

E-Reference:

5. https://odp.inflibnet.ac.in/index.php/module_details?course=functional%20functional%20foods%20and%20nutraceuticals&source=swayam&subsource=UGC
6. https://ciet.nic.in/swayam_FNHL_module20.php
7. <https://www.pdfdrive.com/handbook-of-nutraceuticals-and-functional-foods-e156824746.html>
8. <https://infolearners.com/books/handbook-of-nutraceuticals-and-functional-foods-pdf/>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the concepts, history, classification, and market trends of nutraceuticals and functional foods.
CO2	Analyze the sources, characteristics, stability, and physiological functions of various nutraceutical components including phytochemicals, dietary fibers, probiotics, prebiotics, lipids, proteins, vitamins, and minerals.
CO3	Evaluate the role of nutraceuticals in health promotion and the prevention and management of chronic diseases such as cardiovascular diseases, diabetes, cancer, obesity, and arthritis.
CO4	Assess the nutritional and functional properties of functional foods, including their health benefits, anti-nutritional factors, and effects of processing and storage.

C05	Examine methods for assessing nutritional status, recommended dietary allowances, and the application of functional foods in dietary management.
C06	Analyze legal, regulatory, safety, labeling, marketing, and consumer acceptance issues related to nutraceuticals and functional foods.

Mapping with Program Outcomes:

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

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

COURSE OBJECTIVES: To enable the students to

- Understand the principles, scope, applications, and significance of food biotechnology in food production, quality assurance, and food safety.
- Gain knowledge of microbial cultures, food fermentation processes, and their role in the production of traditional and industrial fermented foods.
- Analyze the biochemical, microbiological, and technological aspects involved in the manufacture of fermented dairy, fruit, vegetable, meat, and fish products.
- Understand the health benefits, quality characteristics, defects, spoilage, and recent technological advancements in fermented food products.
- Examine the concepts, applications, regulations, biosafety concerns, ethical issues, and public perception of genetically modified foods.
- Develop critical thinking and scientific reasoning skills for evaluating biotechnology-based innovations and their impact on food systems and society.

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 (Self-directed learning activities for Continuous Internal Assessments only):

Development of next-generation probiotics, postbiotics, and synbiotics for functional foods and personalized nutrition.

Recent developments in plant-based fermented foods and cultured dairy alternatives to promote sustainable food systems.

Recommended 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:

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

E Reference:

1. <https://www.fao.org/biotechnology/en/>
2. <https://www.fao.org/food-safety/en/>
3. <https://www.who.int/health-topics/food-safety>
4. <https://www.fssai.gov.in/>
5. <https://www.dbtindia.gov.in/>
6. <https://ibkp.dbtindia.gov.in/>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the principles, scope, applications, and importance of food biotechnology, microbial cultures, food safety, and microbiological quality control in foods
CO2	Describe the processes, substrates, biochemical changes, and health benefits associated with traditional and industrial fermented foods and beverages.
CO3	Analyze the production technologies, microbial activities, quality characteristics, and spoilage factors of fermented dairy, fruit, vegetable, meat, and fish products.
CO4	Evaluate the technological advances, nutritional significance, health benefits, and industrial applications of fermented food products.
CO5	Examine the concepts, applications, biosafety issues, ethical concerns, labeling requirements, regulations, and public perception related to genetically modified foods.
CO6	Apply principles of food biotechnology in food processing, fermentation technology, quality assurance, food safety, and biotechnology-based product development.

Mapping with Program Outcomes:

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

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

Year: II	ENTREPRENEURSHIP / INDUSTRY BASED COURSE	Semester: IV
Code:	FOOD PRODUCT DEVELOPMENT (Theory)	Credits: 3

COURSE OBJECTIVES: To enable the students to

- Provide knowledge on the principles, concepts, and processes involved in food product development.
- Develop skills in generating, evaluating, and standardizing innovative food products for diverse consumer groups.
- Familiarize students with sensory evaluation techniques, quality assessment methods, and product life cycle management.
- Impart knowledge on food packaging, labeling requirements, and emerging packaging technologies.
- Enable students to understand intellectual property rights, patents, branding, and commercialization aspects of food products

UNIT – I: BASICS OF PRODUCT DEVELOPMENT:

New food product development: definition, classification, characterization, phases in food product development factors influencing new product development – social concerns, health concerns, impact of technology and market place influence.

Generation of new product ideas: internal and external sources of ideas, market place analysis, standardization methods involved in product development; portion size and portion control, calculation of nutritive value & cost of production, shelf life & storage stability evaluation procedure of developed food products.

UNIT – II: STAGES AND PRODUCT LIFECYCLE:

Stages of food product development, formulation of new food products for specific target groups. idea generation, screening and evaluation, business analysis, development.

Product management/ product life cycle - introduction, growth, maturity and decline stages market testing and commercialization, feasibility study and promotion of new products, food product planning-modifying the product, modifying the market, repositioning the product.

UNIT – III: SUBJECTIVE AND OBJECTIVE EVALUATION OF FOODS:

Sensory characteristics of food, types of evaluation, reasons for testing food quality.

Overview of the subjective tests with its advantages and disadvantages. Basic guidelines for conducting objective evaluation of foods: advantages and disadvantages, types of tests and equipments. Sensory analysis softwares-Overview

UNIT – IV: FOOD PACKAGING AND LABELING:

Packaging - definition, functions, packaging environment, selection of packaging; Basic packaging materials and films; Packaging methods –traditional food packaging, retortable, lined cartons, bag in box, aseptic, modified atmosphere, vacuum, gas packaging, controlled atmospheric, microwave packaging, active, intelligent, edible packaging, nano packaging, green packaging, antimicrobial packaging, shrink and stretch packaging.

Labeling - definition, purpose, types, materials, adhesives; food and nutritional labeling; barcoding, labeling laws and regulations.

UNIT – V: INTELLECTUAL PROPERTY RIGHTS AND PATENT:

Research and new product development – patents - patent laws. International code for intellectual property rights, branding, licensing and acquisition franchising, product warranty.

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

Case study of micro enterprise preparing and marketing food products. Case study of the selfhelp groups preparing and marketing food products.

Recommended Books :

1. Srilakshmi. B., (2010), Food Science, New Age International Publishers, New Delhi.
2. Earle, R., & Anderson, A. (Eds.), (2001), Food product development: Maximizing success, CRC press, New Delhi.
3. Charis Galanakis., (2016), Innovation Strategies in the Food Industry, 1st Edition, Academic Press, Cambridge.
4. Robertson, G.L. (2006), Food Packaging: Principles and Practice, 2nd edition, CRC Press, Taylor & Francis.
5. NIIR, (2003), Food Packaging Technology Handbook, National Institute of Industrial Research Board, Asia Pacific Business Press Inc, New Delhi.

Reference:

1. Ahvenainen, R. (Ed.) (2003), Novel Food Packaging Techniques, CRC Press, New Delhi.
2. Fuller, G.W. New Food Product Development from Concept to Marketplace, CRC Press, Boca Raton.
3. Carpenter, R. P., Lyon, D. H., & Hasdell, T. A. (2012), Guidelines for sensory analysis in food product development and quality control, Springer Science & Business Media.
4. MacFie, H. (Ed.), (2007), Consumer - led food product development, Elsevier, Cambridge.
5. Food Packaging Technology Handbook, (2003), NIIR Board of Consultants and Engineers, National Institute of Research, New Delhi.
6. Modern Packaging Industries, (2004), NIIR Board of Consultants and Engineers, National Institute of Industrial Research, New Delhi.
7. Robertson, G.L., (2012), Food Packaging: Principles and Practice, 3rd Edition, CRC Press, New Delhi.
8. Han, J.H., (2014), Innovations in Packaging, Elsevier Academic Press, Cambridge.

E-Reference:

1. <https://www.yumpu.com/en/document/view/63773543/pdf-online-food-product-development-maximising-success-woodhead-publishing-series-in-food-science-technology-and-nutrition-full-books>
2. <https://www.pdfdrive.com/new-food-product-development-from-concept-to-marketplace-third-edition-e157054094.html>
3. <https://vdoc.pub/documents/food-product-development-1p3jnv9o209o>
4. <https://open.umn.edu/opentextbooks/textbooks/1052>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the principles, phases, and factors influencing food product development and innovation in the food industry.
CO2	Apply techniques for idea generation, product formulation, standardization, nutritive value calculation, cost estimation, and shelf-life evaluation of food products.
CO3	Analyze the stages of product development, product life cycle, market feasibility, and commercialization strategies for food products.
CO4	Evaluate food products using subjective and objective methods, including sensory evaluation techniques and quality assessment tools.
CO5	Assess packaging materials, packaging technologies, labeling requirements, and regulatory aspects related to food products.
CO6	Examine the role of intellectual property rights, patents, branding, licensing, franchising, and product protection in food product development and marketing.

Mapping with Program Outcomes:

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

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

COURSE OBJECTIVES: To enable the students to

- To identify research problems reviewing available literature.
- To Study different techniques used to analyze the identified problem.
- To work on the available solutions given and present solution by using his/her technique applying knowledge gained during the course of study.

CONTENTS

1. Project will have mid semester review and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.
2. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.
3. Continuous assessment of Project at Mid Sem and End Sem will be monitored by the departmental candidate supervisor.
4. Dissertation title to be extension of the course studied during their course of study period
5. Standard project format should be followed; proper documentation and statistical analysis and interpretation of the data should be followed.
6. INSTITUTIONAL ETHICAL COMMITTEE CLEARANCE is mandatory for the studies involving human and animal subjects
7. Registration in CTRI involving human subjects with supplementation trial.
8. Viva- Voce Examination – To be conducted by the external examiner presentation should have maximum of 12 – 15 slides followed by a Presentation (PPT) for 10 minutes.

The supervisor is Advised to check for the documentation, progress, formatting of the data, conduct mock presentation and check for the attendance of the students. Regular review of the progress to be monitored by the supervisor.

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.

ASSESSMENT/EVALUATION/VIVA-VOCE:

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

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

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

TOTAL -100marks

PASSING MINIMUM:

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

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

COURSE OUTCOMES: (With Mapping)

C01	Identify a research problem through literature review and formulate clear research objectives and hypotheses.
C02	Design and conduct research using appropriate methodologies, sampling techniques, and ethical practices.
C03	Collect, analyze, and interpret research data using suitable statistical and analytical tools.
C04	Critically evaluate research findings and relate them to existing scientific knowledge.
C05	Prepare and present a scientific dissertation demonstrating effective scientific writing, communication, and ethical reporting.
C06	Demonstrate independent research capability, problem-solving skills, leadership, and lifelong learning through successful completion of the research project.

Mapping with Program Outcomes:

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

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

Year: II

VALUE ADDED COURSE 2

Semester: IV

Code:

**FOOD TOXICOLOGY
(Theory)**

Credits: 2*

COURSE OBJECTIVES: To enable the students to

- Understand the fundamental principles of toxicology, mechanisms of toxicity, toxicity evaluation methods, and regulatory guidelines used in toxicological studies.
- Gain knowledge of naturally occurring food toxins, microbial toxins, their health effects, analytical detection methods, and preventive management strategies.
- Develop an understanding of food allergies, food sensitivities, allergen management, genetically modified food safety, and the toxicological concerns related to children's foods.
- Examine environmental contaminants, pesticide residues, heavy metals, veterinary drug residues, endocrine disruptors, microplastics, and food adulterants affecting food safety.

UNIT – I: PRINCIPLES OF TOXICOLOGY :

Classification of toxic agents. Characteristics of exposure. The spectrum of undesirable effects. Interaction and tolerance. Biotransformation and mechanisms of toxicity. Evaluation of toxicity- risk vs. benefit. Experimental design and evaluation- Prospective and retrospective studies. Controls: Statistics (descriptive and inferential). Animal models as predictors of human toxicity. Legal requirements and specific screening methods as per OECD guidelines in vitro and in vivo studies. Clinical trials.

UNIT – II: NATURAL TOXINS IN FOOD:

Natural toxins of importance in food - toxins of plant and animal origin. Microbial toxins (e.g., bacterial toxins, fungal toxins and Algal toxins) - Natural occurrence, toxicity and significance. Determination of toxicants in foods and their management.

UNIT – III: FOOD ALLERGIES AND SENSITIVITIES:

Natural sources and chemistry of food allergens, True/untrue food allergies. Handling of food allergies. Food sensitivities (anaphylactoid reactions, metabolic food disorders, and idiosyncratic reactions). Safety of genetically modified food-potential toxicity and allergenicity of GM foods. Safety of children's consumables.

UNIT – IV: ENVIRONMENTAL CONTAMINANTS AND DRUG RESIDUES IN FOOD:

Fungicide and pesticide residues in foods; heavy metal and their health impacts. Use of veterinary drugs (e.g. Malachite green in fish and β agonists in pork). Radioactive contamination of food, Food adulteration and potential toxicity of food adulterants. Endocrine disruptors in food. Microplastics in food: Health risks and solutions.

UNIT – V: TOXINS GENERATED DURING FOOD PROCESSING:

Safety of food additives. Toxicological evaluation of food additives. Food processing generated toxicants – Nitroso - compounds, heterocyclic amines. Dietary Supplements and toxicity related to dose- common dietary supplements. Relevance of the dose. Possible toxic effects.

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

One Health approach for integrated management of foodborne toxicological hazards.

Sustainable food processing technologies aimed at reducing the formation of processing-induced toxicants.

Recommended Books:

1. Klaassen, Curtis, Watkins III, John B. (2021). Essentials of Toxicology, 4th Edition, McGraw-Hill Medical, USA.
2. Casarett & Doull's. (2019). Toxicology: The Basic Science of Poisons, 9th McGraw-Hill Medical, New York.
3. Galanakis M. (2020). Food Toxicology and Forensics. Academic Press, USA.

Reference:

1. Fletcher and Netzel G. (2020). Food Safety and Natural Toxins. Mdpi AG publishers, Switzerland.

E Reference:

1. <https://www.who.int/health-topics/food-safety>
2. <https://www.fao.org/food-safety/en/>
3. <https://www.codexalimentarius.org/>
4. <https://www.fssai.gov.in/>
5. <https://www.oecd.org/chemicalsafety/testing/oecd-guidelines-testing-chemicals.htm>

COURSE OUTCOMES: (With Mapping)

CO1	Explain the principles of toxicology, classification of toxic agents, mechanisms of toxicity, biotransformation, dose-response relationships, and methods used for toxicity evaluation.
CO2	Apply toxicological study designs, statistical methods, OECD guidelines, animal models, in vitro and in vivo screening methods, and clinical trial principles in the assessment of food safety.
CO3	Analyze the occurrence, chemistry, health effects, detection methods, and management strategies of natural toxins, microbial toxins, and food allergens.
CO4	Evaluate food allergies, food sensitivities, genetically modified food safety, allergenicity, and the safety of foods intended for vulnerable populations, particularly children.
CO5	Assess the health risks associated with environmental contaminants, pesticide residues, heavy metals, veterinary drug residues, radioactive contamination, food adulterants, endocrine disruptors, and microplastics in foods.

CO6	Critically evaluate toxicants generated during food processing, the safety of food additives and dietary supplements, and recommend evidence-based strategies to minimize toxicological risks and ensure food safety.
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Mapping with Program Outcomes:

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

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