# MARUDHAR KESARI JAIN COLLEGE FOR WOMEN (AUTONOMOUS)

**Vaniyambadi – 635 751**

## PG and Research Department Foods and Nutrition

**for**

**Postgraduate Programme**

**Master of Science in Foods and Nutrition**

## From the Academic Year 2024-25

# CONTENT

# LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION

## 1. Preamble

Nutrition plays a major role in fostering optimal health and well-being of an individual, and provides an absolute understanding of the intricate interplay between food, nourishment and human physiology. The Department of Nutrition, FSM & Dietetics of Marudhar Kesari Jain College for Women, Vaniyambadi strives to produce young budding nutritionists and dietitians who through rigorous research, education and outreach empower individuals to make informed choices about their diet and lifestyles, promoting longevity, vitality and resilience.

Nutrition is not only a cornerstone of preventive healthcare but also a catalyst for social change and sustainable development. We, the Department of Nutrition, Food Service Management& Dietetics engage with communities, policymakers and industry partners to address predominant nutritional challenges, foster food security and promote environmental stewardship.

The programme is aimed at training undergraduate graduate students who would have adequate background knowledge and practical skills for application in postgraduate research, teaching, industrial production, medical, hospital and environmental management

The Department aims to equip the undergraduate students with a sound knowledge of the fundamental principles involved in the study of Nutrition, FSM and Dietetics, to produce graduates who would create an impact in the diverse fields of human endeavors, considering the ubiquitous nature of food and the wide – ranging applications of the knowledge of Nutrition.

The main objective of the Department is to provide focus for a career in various fields of applied science including Food Industries, Medical Coding, Research Institution, Hospital Administration, Food Service Sectors, Free Lancing, Health Sectors, Quality Control, Biotechnology, Government and Non-Government agencies.

# PROGRAMME OUTCOMES (PO)

| | |
|---|---|
| **Programme** | **M.Sc Foods and Nutrition** |
| **Programme Code** | **PS08** |
| **Duration** | **2 years [PG]** |
| **Programme Outcomes** | **PO1: Disciplinary Knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study.<br>**PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself / himself; demonstrate the ability to listen carefully, read and write analytically , and present complex information in a clear and concise manner to different groups.<br>**PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.<br>**PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.<br>**PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints.<br>**PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the result so fan experiment or investigation.<br>**PO7: Cooperation / Teamwork:** Ability to work effectively and respect fully with diverse teams; facilitate cooperative or coordinate effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.<br>**PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence, and experiences from an open-minded and reasoned perspective |

| | |
|---|---|
| **Programme Specific Outcomes:** | This program provides comprehensive knowledge and nutritional practical skills in the area of Food Microbiology, Food Science, Menu Planning, Human Physiology and Nutritional Biochemistry.<br><br>Students will be able to show case their expertise on food standards and quality control, Formulation of novel food products and sensory evaluation.<br><br>Students will be able to demonstrate their practical skills by analyzing disease condition and prescribed diet for necessary conditions |

**Eligibility for Admission:**

Candidate for admission to the first year of M.Sc Foods & Nutrition., Department of Foods & Nutrition shall be required to have passed the UG with Nutrition & Dietetics / Nutrition, Food Service Management & Dietetics/ Foods & Nutrition / Clinical Nutrition / Food Process & Technology / Home Science are eligible.

# Methods of Evaluation and Assessment

| **Methods of Evaluation** | | |
|---|---|---|
| Internal Evaluation | | 25 Marks |
| External Evaluation | End Semester Examination | 75 Marks |
| | **Total** | **100 Marks** |
| **Methods of Assessment** | | |
| Recall (K1) | Simple definitions, MCQ, Recall steps, Concept definitions | |
| Understand / Comprehend (K2) | MCQ, True/False, Short essays, Concept explanations, short summary or overview | |
| Application (K3) | Suggest idea/concept with examples, suggest formulae, solve problems, Observe, Explain | |
| Analyze (K4) | Problem- solving questions, finish a procedure in many steps, Differentiate Between various ideas, Map knowledge | |
| Evaluate (K5) | Longer essay/Evaluation essay, Critique or justify with pros and cons | |
| Create (K6) | Check knowledge in specific or of beat situations, Discussion, Debating or Presentations | |

| Semester – I | | | | | | |
|---|---|---|---|---|---|---|
| Code | Course Title | Hours Distribution | | | | C |
| | | L | T | P | S | |
| 24PNDC11 | CC – 1 Advanced Food Science | 3 | 1 | 2 | 0 | 4 |
| 24PNDC12 | CC – 2 Advanced Human Physiology | 3 | 1 | 2 | 0 | 4 |
| 24PNDC13P | CC - 3 Practical – Advanced Food Science | 0 | 0 | 4 | 0 | 3 |
| 24PNDE11 | EC - 1 Macro Nutrients | 3 | 1 | 1 | 0 | 3 |
| 24PNDE12 | EC – 2Food Processing and Technology | 3 | 1 | 1 | 0 | 3 |
| 24PNDEA11 | AECC – 1Home Scale Preservation of Fruits and Vegetables | 1 | 1 | 0 | 0 | 2 |
| 24PCHR11 | VE - 1 Human Rights | 1 | 1 | 0 | 0 | 2 |
| | | | | | 30 | 21 |

| Semester – II | | | | | | |
|---|---|---|---|---|---|---|
| Code | Course Title | Hours Distribution | | | | C |
| | | L | T | P | S | |
| 24PNDC21 | CC – 4 Micro Nutrients | 3 | 1 | 2 | 0 | 4 |
| 24PNDC22 | CC – 5 Clinical Biochemistry | 3 | 1 | 2 | 0 | 4 |
| 24PNDC23P | CC - 6 Techniques In Food Analysis Practical | 0 | 0 | 4 | 0 | 3 |
| 24PNDC24 | CC – 7 Research Methods in Nutrition | 2 | 1 | 1 | 0 | 3 |
| 24PNDE21<br>24PNDE22 | EC 3 –Food Preservation<br>EC-4 – Bakery Science | 2 | 1 | 1 | 0 | 3 |
| 24PNDE23<br>24PNDE24 | EC – 5 Perspectives of Home Science<br>EC-6 Life style practice | 2 | 1 | 1 | 0 | 3 |
| 24PNDS21 | SEC - 1 (NME) Basic in Food Science | 1 | 1 | 0 | 0 | 2 |
| | | | | | 30 | 22 |

Students must complete at least one online course (MOOC) from platforms like SWAYAM, NPTEL, or Nan mudalvan within the fifth semester. Additionally, engaging in a specified Self-learning Course is mandatory to qualify for the degree, and successful participation will be acknowledged with an extra credit of 2*.

**L-Lecture T-Tutorial P-Practical S-Seminar C-Credit**

## 1ST YEAR: FIRST SEMESTER

| Subject Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| **24PNDC101** | **Core Course -1 Advanced Food Science** | Core | **3** | **1** | 2 | 0 | 5 | 6 | 25 | 75 | 100 |

| **Learning Objectives** | |
|---|---|
| LO1 | In depth understanding of Food and composition and structure: Gain knowledge about all the Nutrients |
| LO2 | Students learn about various Food Processing methods and how they affect Nutritional content |
| LO3 | Understand the Principles of Nutrition and Dietary guidelines |
| LO4 | Explore methods for Sensory analysis to assess the Organoleptic Properties of Food Products |
| LO5 | Understand the knowledge about food colors and Flavours |

| Unit | Content | Hours |
|---|---|---|
| 1 | **Properties of food** - Food nutrients, solids, solutions and colloids, Solutions - Physical properties of solutions, Food dispersion; Types of colloids and properties of colloid and rheology of food dispersion, structure formation and stability of gels, sols, and emulsion foams. **Starch**– Classification, structure and physio chemical properties. Modified food starches- Structure and composition. Gelatinization of starch, syneresis and hydrolysis. Dextrinization and factors affecting gelatinization. | 14 |
| 2 | **Proteins** - Structure and composition, Classification and properties of proteins. Role of proteins in food products. Pulses and legumes, millets, vegetables, meat and fish, dairy products by product utilization. Functional properties - protein denaturation, hydration, solubility, interfacial properties, gelatin and dough formation. **Amino acids**- structure, classification and physio chemical properties of amino acids | 14 |
| 3 | **Fats and oil** - Structure, composition and properties of fats and oil; storage of fat, smoking point, Rancidity Types, Mechanism and prevention. Role of fat/oil in food products and fat replaces.<br>**Sugar and sugar products** -Types of sugar, Physical and chemical properties, various forms of sugar used in cookery and Crystallization of sugar. **Sweeteners** -Properties, Artificial and Natural sweeteners and role of sweeteners in food industry. | 14 |
| 4 | **Milk and Milk products:**<br>Physiochemical properties of milk, Effect of physical and chemical factors on milk components. (Effect of heat, protein factors affecting coagulation, casein coagulation. Non-enzymatic browning) (Effect of acid), Effect of enzyme- Rennin. Fermented and non- fermented milk product. **Egg**<br>Structure, composition and nutritive value. Quality check- grading and deterioration. Functional properties- Foaming, Factors affecting foam formation. Utilization of wastages of egg shell. | 14 |
| 5 | **Food Additives** - Definition, Classification and need for food additives. Flavors Compounds in vegetables, fruits and spices; Effect of processing on food colours and flavors; Role of colours and flavours in food products**.** | 14 |

| CO | Course Outcomes |
|---|---|
| CO1 | Over view the relationship between the chemical structure and the properties of the main components in food like starch, protein and lipids |
| CO2 | Understand the Composition and characteristics of various food commodities |
| CO3 | Explain the cooking quality of foods and apply food science knowledge in food industries |
| CO4 | Identify and understand the nutrients and functions of foods in maintaining health |
| CO5 | Analyze the proper use of food colors and food additives in safe food preparation |

| **Text book** | |
|---|---|
| 1 | Srilakshmi B. (2015). Food Science. New Age International (P) Ltd. Publishers. |
| 2 | Reddy. S.M (2015). Basic Food Science and Technology. New Age International publishers. Avantina Sharma (2017).T ex |
| 3 | Swaminathan A. (2018).Hand book of Food and Nutrition, Bangalore press. |
| 4 | Serpil Sahin and Servet Gulum Sumnu. (2006). Physical properties of Foods. Springer publications |
| 5 | Norman N. Potter (2007). Food Science |
| **Reference Books:** | |
| 1 | Gerard L. Hanchett, Richard W. Hartel (2019). Food Emulsifiers and Their Applications. Springer publications.3rd edition |
| 2 | Vickie. A. Vaclavik.(2021).Essentials of Food science. Springer publications. 5th edition |
| 3 | Dr. M. Swaminathan. (2015). Advanced text book of Food and Nutrition. Volume 2. Bapco Publications |
| 4 | Eskein (2012). Biochemistry of Food. Elsevier Publications |
| 5 | Lyn Obrien Nabors. (2001). Alternative Sweeteners. Taylor and Francis Publications |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| **Total** | 15 | 15 | 13 | 15 | 14 | 13 | 14 | 13 | 15 | 15 | 15 |
| **Average** | 3 | 3 | 2.6 | 3 | 2.8 | 2.6 | 2.8 | 2.6 | 3 | 3 | 3 |

**3 – Strong, 2- Medium, 1- Low**

## 1ST YEAR: FIRST SEMESTER

| Course Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| **24PNDC102** | **Core Course 2-Advanced Human Physiology** | Core | **3** | **1** | 1 | 0 | 4 | 6 | 25 | 75 | 100 |

| **Learning Objectives** | |
|---|---|
| LO1 | Understand the Structure of Cell and Tissue |
| LO2 | Understand the integrated function of the system. |
| LO3 | Understand alterations of structure and function in various organs and systems in disease conditions. |
| LO4 | To understand the Physiological Principles and Pathophysiology of common medical conditions and diseases. |
| LO5 | To Gain Knowledge about the Various physiological systems and to maintain homeostasis. |

| Unit | Content | Hours |
|---|---|---|
| 1 | **Cell and Tissue: Cell** – Structure and Function. Difference between Meiotic and Mitotic cell, Stem cells-types and functions.<br>**Tissue:** Structure, Types and Function. | 14 |
| 2 | **Blood and Circulatory System**<br>**Blood**-Composition and Functions, Blood Group – ABO system and Rh factor. Blood plasma protein-types and Functions.<br>**Circulatory System**–Structure and Function of Heart and Blood Vessels. Systemic and Pulmonary circulation. Cardiac cycle. , ECG, Blood pressure. | 14 |
| 3 | **Respiratory System and Endocrine System**<br>**Respiratory System** –Mechanism of respiration. Circulation and Exchange of respiratory gases. Internal and External respiratory system. Ventilation and Artificial Respiration.<br>**Endocrine System**–Hormones and its type. Syndromes resulting from hypo and hyperactivity of Pituitary, Thyroid, Adrenals and Pancreas | 14 |
| 4 | **Gastro Intestinal System and Reproductive System**<br>**Gastrointestinal System** Structure and function of GI tract and its accessory organs.<br>**Reproductive System**–Male and Female Reproductive Organs. Menstrual Cycle and Menopause. | 14 |
| 5 | **Nervous System and Excretory System**<br>**Nervous System** – Structure and Function of Neuron. Cerebrospinal fluid (CSF) – composition and function. Renal Nerve Function, Nerve Regeneration, Neuro transmitters and its role.<br>**Excretory Systems**–Organs in the Urinary System. Mechanism of formation of urine.<br>**Skin**–Structure and function. | 14 |

| CO | Course Outcomes |
|---|---|
| CO1 | Develop in sight of normal function in go fall the organ system so the body and their interaction. Understand the current state of knowledge about the functional organization of Human cell and histology |
| CO2 | Understand the structural and functional organization of Blood and Cardiac System |
| CO3 | Understand the structural and functional organization of respiration Immunity and Endocrine system. |
| CO4 | Comprehend the structural and functional organization of GIT, Digestive System and Reproductive System |
| CO5 | Understand the structural and functional organization of Skin, Nervous and Excretory System |

| **Textbooks:** | |
|---|---|
| 1 | CC Chatterjee (2020). Human Physiology CBSpublishers.13thedition |
| 2 | K.Sem bulingam & Prema Sembulingam (2019),Essentials of Medical Physiology. Jaypee publications.8th edition |
| 3 | Pal GK (2019).Text book of human physiology, Elsevier publications. 3rdedition |
| 4 | Jain, A.K. Text book of Physiology. A vichal Publishing Co., New Delhi. Vol. I and II. |
| 5 | Chatterjee Chandi Charan: Text Book of Medical Physiology, London W.B. |
| **Reference Books:** | |
| 1 | Waugh A, Ross and Wilson (2018). Anatomy and Physiology in Health and Illness. Elsevier publications.13th edition |
| 2 | Indu Khurana (2020). Medical Physiology for Under graduate Students. Elsevier Publication .2nd edition |
| 3 | Wilson, K.J. Wand Waugh, A. (2003): Ross and Wilson Anatomy and Physiology in Heath and Illness. Churchill Living stone.8th edition. |
| 4 | Ganong, W.F. (1985):Review of Medical Physiology. Lange Medical Publication.,12thedition |
| 5 | Win word. Sear's Antomy and Physiology for nurses. London, Edward Arnell |

## Mapping with Programme Outcomes and Programme Specific Outcomes

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **Total** | 15 | 14 | 15 | 14 | 15 | 14 | 14 | 14 | 15 | 15 | 15 |
| **Average** | 3 | 2.8 | 3 | 2.8 | 3 | 2.8 | 2.8 | 2.8 | 3 | 3 | 3 |

**3 – Strong, 2- Medium, 1- Low**

## 1ST YEAR: FIRST SEMESTER

| Course Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| **24PNDP103** | **CORE COURSE-3 ADVANCED FOOD SCIENCE PRACTICAL** | Core | **0** | **0** | 4 | 0 | 4 | 4 | 25 | 75 | 100 |

| **Learning Objectives** | |
|---|---|
| LO1 | To understand the concept of TGV and its role in determining the bulk density and packing properties of grains. |
| LO2 | Apply the properties of food in various food processing and preparations. |
| LO3 | Analyze the factors affecting cooking quality of foods. |
| LO4 | Create appropriate food preparation and processing methods to ensure quality standards |
| LO5 | Comprehend the knowledge gained on characteristics and properties of foods during cooking. |

| Unit | Content | Hours |
|---|---|---|
| 1 | **Physical properties** –Thousand grain weight, Thousand grain volume, Hydration capacity, Hydration index, Swelling capacity. **Starch**–Microscopic Structure and Gelatinization. Factors affecting gelatinization –sag test. Gluten Formation. Viscosity -Viscometer. | 12 |
| 2 | **Pluses**: Factors affecting cooking quality. **Fruit:** Enzymatic browning, Pectin test. | 12 |
| 3 | **Sugar:** Stages of sugar cookery –Prepare Different stages of Recipe. **Fats and oils:** Smoking point– Groundnut oil, coconut oil, gingerly oil, Olive oil, Vanaspati, Ghee, Refined Sunflower oil. | 12 |
| 4 | **Vegetable:** Various method of cooking fat soluble and water-soluble pigment. **Milk:** Detecting the presence of starch, urea in milk sample. pH of Milk. Effect of acid on milk Maillard reaction | 12 |
| 5 | **Adulteration** **Sensory method**–Analysis of taste sensitivity-Threshold test. Duo–Trio test, Multiple sample difference tests | 12 |

| CO | Course Outcomes |
|---|---|
| CO1 | Gain knowledge on sensory analysis and cereal cookery Concept |
| CO2 | Understand the properties of various food |
| CO3 | Analyze the cooking quality of foods and apply knowledge in food industries. |
| CO4 | Identify and understand the Physical characteristics. |
| CO5 | Revise appropriate food preparation and processing methods to ensure standards in food industry |

| **Text books:** | |
|---|---|
| 1 | Srilakshmi B. (2015). Food Science, New Age International (P) Ltd. Publishers. |
| 2 | Potter N. and Hotchkiss J.H. (1996). Food Science, Fifth ed., CBS Publishers and Distributors, New Delhi |
| 3 | Avantina sharma (2017). Text book of food science and Technology. |
| 4 | CBS Publisheres and distributes ltd. 3rd Edition. |
| 5 | Reddy S M. (2015). Basic Food science and technology. New Age International publishers. 2nd edition. |
| **Reference Books:** | |
| 1 | Swaminathan A (1979). Food Science and Experimental Foods, Ganesh And Company Madras. 3rd edition |
| 2 | Bennion, Marion and O. Hughes (2001). Introductory Foods. Edi: mac millian N. Y. 1st edition. |
| 3 | Eskein. (2012). Biochemistry of Food. Elsevier publications |
| 4 | Desrosier, N.W. and James N. (2007). Technology of food preservation.AVI Publishers. |
| 5 | Manay, S. and Shada Sharama samy, (2004). Food: Facts and Principles, New Age International Publishers, New Delhi. 1st edition |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO3** | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **Total** | 13 | 14 | 14 | 14 | 14 | 13 | 14 | 13 | 15 | 15 | 15 |
| **Average** | 2.6 | 2.8 | 2.8 | 2.8 | 2.8 | 2.6 | 2.8 | 2.6 | 3 | 3 | 3 |

**3 – Strong, 2- Medium, 1- Low**

## 1ST YEAR: FIRST SEMESTER

| Course Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| **24PNDE101** | **Elective course-1 Macro Nutrients** | Core | **3** | **1** | 1 | 0 | 3 | 5 | 25 | 75 | 100 |

| **Learning Objectives** | |
|---|---|
| LO1 | To understand the relationship between lipid, carbohydrate, protein and mineral metabolism. |
| LO2 | To learn about the therapeutic uses of carbohydrates, protein and fat in prevention of non- communicable disease |
| LO3 | To get insights in the inborn errors of metabolism. |
| LO4 | To identify primary functions of Macronutrients and Biological Functions |
| LO5 | To learn about the regulatory mechanisms that maintains water balance in the body. |

| **Unit** | **Content** | **Hours** |
|---|---|---|
| 1 | **Energy**<br>Energy content of foods, physiological fuel value, Estimation of total energy requirements (BMR, REE and physical cost of activities) TEE, Basal metabolic rate, total energy requirements, BMR& RMR, Factors affecting BMR. | 12 |
| 2 | **Carbohydrates**<br>Classification, Therapeutic uses of carbohydrates. Role of dietary fiber in health and disease. Role of carbohydrates in health and disease. Glycemic index of foods and its uses. | 12 |
| 3 | **Protein**<br>Amino acid patterns in protein of animals and vegetable origin, Essential Amino Acids, amino acid balance and imbalance, Role of protein in health and disease. | 12 |
| 4 | **Lipids**<br>Concepts of visible and invisible fats, EFA, SFA, MUFA, PUFA, omega–6<br>to omega–3 ratios. – Sources and physiological functions and their role in health and disease. | 12 |
| 5 | **Water**<br>Sources, Function, Requirement, Distribution of water in the body, Factors<br>influencing distribution of body fluid. Exchange of water in the body. | 12 |

| CO | Course Outcomes |
|---|---|
| CO1 | Understand the essentials of nutrients in growth and development of humans |
| CO2 | Appreciate the importance of major nutrients in maintaining human health and leading active life style |
| CO3 | Plan for enhancement of nutritional quality of the diet. |
| CO4 | Identify the various types & sources of food borne illness and methods of prevention |
| CO5 | Evaluate the role of nutrients in health and diseases. |


| **Text books:** | |
|---|---|
| 1 | Satyanarayana, & Chakrapani, U. (2013). Biochemistry, Book and Allied Pvt. Ltd., Kolkata |
| 2 | Williams, S.R. (2004). Nutrition and diet therapy. Nutrition and diet therapy |
| 3 | Mahan, L.K., & Stump, S.E.(2002).Krause's Food Nutrition and Diet Therapy. W.B. Saunder's company, Philadelphia.10$^{th}$edition |
| 4 | Brown, J.E., (2002). Nutrition Now. Wads worth Thomson Learning New York. 3rd edition. |
| 5 | Jain, J.L., Jain, S., & Jain, N., (2005). Fundamentals of Biochemistry. S.Chand & Company Ltd. Ramnagar, New Delhi-110055.6$^{th}$ revised edition. |
| **Reference Books:** | |
| 1 | Tadeja, G.S. (2004). Micro nutrient profile of Indian population. Indian Council of Medical Research Publication, New Delhi |
| 2 | Bogert, J.G. V., Briggs D.H., & Calloway, (2000). Nutrition and physical fitness. W.B. Saunders Co., Philadelphia, London, Toronto.11thedition. |
| 3 | Sizer, F., Whitney, E., & Webb, F.(2003).Nutrition Concepts and Controversy, Thomas Wadsworth, Australia .9$^{th}$ edition |
| 4 | Wardlaw, G.M., Byrd-Bred Benner, C., Moe, G., Berning, J.R., & Kelley, D. S. (2013). Ward law's perspectives in nutrition. McGraw-Hill |
| 5 | Swaminathan, M., (2002). Principles of Nutrition and Dietetics. BAPPCO, 88, Mysore |


**Mapping with Programme Outcomes and Programme Specific Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO4** | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| **Total** | 14 | 14 | 14 | 14 | 14 | 12 | 14 | 13 | 14 | 13 | 15 |
| **Average** | 2.8 | 2.8 | 2.8 | 2.8 | 2.8 | 2.4 | 2.8 | 2.6 | 2.8 | 2.6 | 3 |

**3 – Strong, 2- Medium, 1- Low**

## 1ST YEAR: FIRST SEMESTER

| Course Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| **24PNDE102** | **Elective Course-2 Food Processing and Technology** | EC-2 | **3** | **1** | 1 | 0 | 3 | 5 | 25 | 75 | 100 |

| **Learning Objectives** | |
|---|---|
| LO1 | Understand the science behind processing of foods and its impact on nutritive value of food stuffs. |
| LO2 | Acquire in depth knowledge on production of processed food products and the waste utilization techniques |
| LO3 | Learning the food preservation and its effect on microbiological growth, enzyme activity and food quality |
| LO4 | Understand the changes in physicochemical properties of foods due to processing condition. |
| LO5 | To identify the need for effective post-harvest technology in modern agriculture. |

| Unit | Content | Hours |
|---|---|---|
| 1 | **Processing of Foods**<br>Primary, secondary and tertiary processing, historical perspective, traditional technologies used in food processing. **Enzymes in Food Processing**<br>Enzyme - Review of classification, enzyme inhibitors, enzymatic browning | 12 |
| 2 | **Cereal Processing and Technology:**<br>**Rice:** Parboiling, milling and pearling; Processing and milling of wheat, maize & Barley. **Cereal Products:** Flours and its quality; processed products of rice, wheat and Maize.<br>**Pulse Processing and Technology:** Dals, flours, protein concentrates, isolates and hydrolysates; Byproducts utilization | 12 |
| 3 | **Vegetables processing and Technology**<br>**Pigments:** Classification, effects on processing of vegetables; preliminary processing of vegetables.<br>**Fruits Processing and Technology:** Concept of maturity, ripening and senescence; Methods of fruit processing technologies.<br>**Milk Processing and Technology:** Milk types, composition, Milk processing - Separation, centrifugal process, pasteurization, sterilization, homogenization. | 12 |
| 4 | **Egg Processing and Technology:**<br>Egg processing and storage; Effect of processing on nutritive value and Physiochemical properties of eggs. **Meat Processing and Technology:**<br>**Meat:** Processing and storage; Factors influencing meat quality; Ageing and<br>Tenderization of meat. **Poultry and Fish;** Processing, storage and preservation methods. | 12 |

| | | |
|---|---|---|
| 5 | **Introduction of post- harvest technology:** Introduction to post-Harvest technology of agricultural produce; Status of Production, Losses, Need, Scope and Importance. | 12 |

| **CO** | **Course Outcomes** |
|---|---|
| CO1 | Understand the concepts and principles of food processing |
| CO2 | Identify the various processed food products from plant and animal sources. |
| CO3 | Plan the by-products utilization from food processing. |
| CO4 | Make use of the systematic knowledge of basic and applied aspects in food processing and technology. |
| CO5 | Apply the various post-harvest technologies for different food products |

| **Text books:** | |
|---|---|
| 1 | Shakuntala Manay N Shadak Chera swamy M. (2004) Food Facts and Principles. New age publisher. 2 nd edition. |
| 2 | Roady S. (2011).Food Science. Oxford publication.1stedition |
| 3 | B Srilakshmi (2015) Food science. New Age Publishers. 6thedition. Fellows P. (2000). Food Processing Technology, 2nd Edition. |
| 4 | Wood head Publishing Limited and CRC Press LLC.1stedition |
| 5 | Avantina Sharma. (2017). Text book of food science and Technology. CBS Publisher and distribute ltd.3rdedition. |
| **Reference Books:** | |
| 1 | Raocg. (2006). Essentials of food process engineering. PHI learning private ltd. |
| 2 | Janet D Ward and Larry Ward. (2006). Principles of Food Science. Stem Publishers. 4thedition. |
| 3 | Srivastava R, Pand Kumar S. (2006) Fruits and Vegetables Preservation Principles and Practices. International Book Distributing Co.3rd edition |
| 4 | WB Cruses. (2004). Commercial Unit and Vegetable Products. W.V. Special Indian Edit ion, Pub Agro bios India.2nd edition. |
| 5 | Eskein . (2012). Biochemistry of Food. Elsevier publications.1st edition |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PSO1** | **PSO2** | **PSO3** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO4** | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **Total** | 14 | 14 | 13 | 14 | 14 | 12 | 14 | 13 | 15 | 15 | 15 |
| **Average** | 2.8 | 2.8 | 2.6 | 2.8 | 2.8 | 2.4 | 2.8 | 2.6 | 3 | 3 | 3 |

**3 – Strong, 2- Medium, 1- Low**

## 1ST YEAR: FIRST SEMESTER

| Course Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| **24PNDA101** | **AECC1-HOME-SCALE PRESERVATION OF FRUITS AND VEGETABLES** | AECC-1 | **1** | **1** | 0 | 0 | 2 | 2 | 25 | 75 | 100 |

| **Learning Objectives** | |
|---|---|
| LO1 | Gain understanding of the principles and importance of Food Preservation. |
| LO2 | Learn about various home scale preservatives method of fruits and vegetables |
| LO3 | Understand the importance of food safety in home food preservation. |
| LO4 | To understand the historical and modern role of Chemical and salt in food preservation. |
| LO5 | Learning about the stages of fermentation, the influence of yeast strains on flavor profiles, and the chemical processes. |

| Unit | Content | Hours |
|---|---|---|
| 1 | **Introduction to Food Preservation**- Basic Principles of Food Preservation, Types of Spoilage, Importance of Food Preservation Different Methods of Food Preservation. | 6 |
| 2 | **Preservation by using Sugar-** Sugar concentrates, Preparation of Jam, Jelly, Marmalades, Candied, Glazed, Crystallized Fruits, FPO Specification, Problems Encountered, Spoilages | 6 |
| 3 | **Preservation by Removal of Moisture -** Sun drying, Drying, Dehydration, Method of Drying, Preparation of Vegetable , Vathals – Ladies Finger, Brinjal, Beans, Cluster Beans, Preparation of Vadams– Rice Vadam, Sago Vadam, Rice Flakes Vadam, Tomato Vadam | 6 |
| 4 | **Preservation by using Chemicals and Salts:** Chemical Preservatives– Definition, Types of Preservatives, Preparation and Preservation of Fruit Juices<br>**Salt preservatives**: Pickles, sauerkraut. | 6 |
| 5 | **Fermentation:** Definition, Types of Fermentation, Common Fermented Foods–Cheese Making, Dokhla, Wine and fermented sausages. | 6 |

| CO | Course Outcomes |
|---|---|
| CO1 | Knowledge on the principles of food preservation, importance and methods of food preservation and food spoilage. |
| CO2 | Gain expertise to preserve fruits using sugars |
| CO3 | Gain expertise to prepare and preserve dehydrated foods at home scale level |
| CO4 | Expertise to preserve fruits and vegetables using chemicals and salts. |
| CO5 | Students will gain knowledge about various fermented foods, their production processes, and their cultural significance. |

| **Text books:** | |
|---|---|
| 1 | Adams, M. R. and Moss, M.O. (2005) Food Microbiology, New Age International (P) Ltd., New Delhi. |
| 2 | Usha Chandrasekhar, (2002) Food Science and Applications in Indian Cookery, Phoenix Publishing House Pvt. Ltd., New Delhi. |
| 3 | Srilakshmi, B. (2013) Food Science, New Age International (P) Ltd., New Delhi. |
| 4 | Serpil Sahin and Servet Gulum Sumnu. (2006). Physical properties of Foods. Springer publications |
| 5 | Norman N. Potter (2007). Food Science |
| **Reference Books:** | |
| 1 | Fellows, P. (2000) Food Processing Technology, Principles and Practice, 2nd Edition, CRC Press, Woodland Publishing Ltd., Cambridge, England, |
| 2 | Sommers, C.H. and X Veteng Fan, (2006) Food Irradiation Research and Technology, Blackwell Publishing, 2006. |
| 3 | Swaminathan, M. Food Science, Chemistry and Experimental Foods, Beppo Publishers 2013. |
| 4 | Eskein. (2012). Biochemistry of Food. Elsevier Publications |
| 5 | Lyn Obrien Nabors. (2001). Alternative Sweeteners. Taylor and Francis Publications. |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 |
| **CO3** | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **Total** | 14 | 13 | 14 | 15 | 15 | 13 | 11 | 14 | 14 | 15 | 15 |
| **Average** | 2.8 | 2.6 | 2.8 | 3 | 3 | 2.6 | 2.2 | 2.8 | 2.8 | 3 | 3 |

**3 – Strong, 2- Medium, 1- Low**

## 1ST YEAR: SECOND SEMESTER

| Course Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| 24PNDC21 | MICRO NUTRIENTS | Core | 3 | 1 | 2 | 0 | 4 | 6 | 25 | 75 | 100 |

| Learning Objectives | |
|---|---|
| LO1 | To enables the students to learn the functions, deficiency symptoms, food sources and requirements of the different micronutrients |
| LO2 | To Gain knowledge of nutrients requirement and management of micronutrients during various stages of life and disease |
| LO3 | To gain in sight about recent concept and findings in field of nutrition and application of the same to prevent disease |
| LO4 | To Identify between water-soluble vitamins and their functions. |
| LO5 | To gain the knowledge different types of immune nutrients and antioxidants and Nutraceuticals promoting health and preventing disease. |

| Unit | Content | Hours |
|---|---|---|
| 1 | **UNIT-I**<br>**Macro Minerals**<br>Distribution in the body, functions, effects of deficiency, food sources, requirement and Recent research of macro minerals Calcium, Phosphorous, Magnesium, Potassium, Sodium and Chloride. | 14 |
| 2 | **UNIT –II**<br>**Micro Minerals**<br>Distribution in the body, functions, food sources, requirement deficiency, toxicity and recent research of micro minerals and trace minerals. Micro minerals-lron, Zinc, Fluoride, Copper, Iodine and Manganese. Trace Minerals Selenium, Cobalt, Chromium, Silicon, Boron and Nickel Selenium and Vitamin E relationship, Chromium and glucose tolerance factor. | 14 |
| 3 | **UNIT-III**<br>**Fat Soluble vitamins**<br>Distribution in the body, functions, food sources, requirement deficiency, toxicity and recent research of Fat Soluble Vitamins A, D, E and K. | 14 |
| 4 | **UNIT-IV**<br>**Water soluble vitamins**<br>Distribution in the body, functions, food sources, requirement deficiency, toxicity and recent research of Water soluble vitamins– Water soluble vitamins: VitaminC, Thiamine, Riboflavin, Niacin, Pantothenic Acid, Biotin, Folic Acid, Vitamin B 12, Vitamin B6. | 14 |
| 5 | **UNIT-V**<br>**Recent Concepts in Nutrition:**<br>Immuno-nutrients and Antioxidants. Definition, classification and function of functional food and Nutraceuticals. Anti nutrients present in various food groups – Cereals, legumes and nuts and oilseeds Food and drug interaction. Prebiotics and probiotics | 14 |

| CO | Course Outcomes |
|---|---|
| CO1 | Evaluate the specific role of functional foods and Nutraceuticals in prevention of degenerative disease |
| CO2 | Understand the importance of micronutrients in growth and development of humans |
| CO3 | Analyze the importance of diet in maintaining human health to combat nutrient deficiency in the community |
| CO4 | Gain in-depth knowledge of the physiological and metabolic functions of vitamins and minerals and their implications |
| CO5 | Analysetherecentadvancesinthefieldofmicronutrientandresearchforthe welfare of the community |


| **Text books:** | |
|---|---|
| 1 | Guthrie, H.A. (2001) "Introductory Nutrition" Tenth edition, C.V .Mos by Company, St. Louis. |
| 2 | Bogert, J.G.V., Briggs, D.H, Calloway, (2000). "Nutrition and physical fitness",11th edition W.B. Saunders Co., Philadelphia, London, Toronto. |
| 3 | Ward law, G.M and Kessel, M, (2002) "PerspectiveinNutrition",5th edition, McG raw Hill, New York, New Delhi. |
| 4 | Willium, S.R. (2000). "Nutrition and Diet Therapy", Mos by Co., St . Louis. |
| 5 | Sizer, F.S and Whitney E.R. (2003). "Nutrition, Concepts and Controversies"9th edition, Thomas Wadsworth, Australia. |
| 6 | Robinson Ch., M.B. Lawlea, W.L., Chenoweth, and A.E., Carwick. (1990). Basic Nutrition and Diet therapy, MacMillan Publishing Company |
| **Reference Books:** | |
| 1 | Brown, J.E. (2002). "Nutrition Now", 3rd edition, Wadsworth Thomson Learning New York. |
| 2 | Maurice, E. Shils, James A. Obson, Moshe Shike, (2000). "Modern Nutrition in Health and Disease", 8th Edition, Vol I and II, Lea & Febiger Philadelphia, A Waverly Company |
| 3 | Mahan L.K. and Stamp, S.E (2000). "Krause's Food Nutrition and Diet Therapy",11th edition, W.B. Saunder's Company, Philadelphia |
| 4 | Tadeja, G.S and Singh P (2004). "Micronutrient Profile of Indian Population", ICMR Publication, New Delhi. |
| 5 | D. M. Swaminathan (2002). "Principles of Nutrition and Dietetics", BAPPCO, 88, Mysore Road Bangalore– 560 018. |


**Mapping with Programme Outcomes and Programme Specific Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| **Total** | 15 | 15 | 13 | 15 | 14 | 13 | 14 | 13 | 15 | 15 | 15 |
| **Average** | 3 | 3 | 2.6 | 3 | 2.8 | 2.6 | 2.8 | 2.6 | 3 | 3 | 3 |

**3–Strong, 2-Medium, 1-Low**

## 1ST YEAR: SECOND SEMESTER

| Course Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| 24PNDC22 | CLINICAL BIOCHEMISTRY | Core | 3 | 1 | 2 | 0 | 4 | 6 | 25 | 75 | 100 |

| Learning Objectives | |
|---|---|
| LO1 | To acquire fundamental knowledge blood glucose regulation and diabetes mellitus |
| LO2 | To know about the genetic diseases and fatty liver |
| LO3 | To obtain a knowledge of liver function tests and its interpretation with pathological diseases |
| LO4 | To gain insights renal function tests and importance of non-protein nitrogenous Compounds |
| LO5 | To understand the importance marker enzymes in diseases and gastric function. |

| Unit | Content | Hours |
|---|---|---|
| 1 | **Blood glucose homeostasis:** Renal threshold value, regulation of blood glucose - hormonal action. Diabetes Mellitus and its metabolic complications. Oral GTT in normal and diabetic condition, renal glycosuria, Fructosuria & Galactosemia. | 14 |
| 2 | **Disease related to amino acid metabolism:** Clinical manifestation of Phenylketonuria, Cystinuria, Albinism, Fanconi syndrome, Tyrosinemia and alkaptonuria. Types of Lipoproteins - Dyslipoproteinemias, atherosclerosis, obesity & Fatty liver. | 14 |
| 3 | **Liver function tests**: Metabolism of bilirubin - Jaundice, types, causes and differential diagnosis. Liver function test -Icteric index, Vandenberg test, plasma protein changes, Prothrombin Test. Liver disorders - Acute and Chronic Hepatitis, Cirrhosis | 14 |
| 4 | **Renal function tests:** Clearance test - urea, creatinine, insulin, PAH test, concentration and dilution test. Diabetes Insipidus, Nephrotic syndrome, renal failure and UTI. | 14 |
| 5 | **Gastric function test**: collection of gastric contents, examination of gastric residue, FTM stimulation test, tubeless gastric analysis. Gastric disorders. Enzyme patterns in acute pancreatitis, Myocardial infarction and bone disorder. | 14 |

| CO | Course Outcomes |
|---|---|
| CO1 | To understand the relationship between the enzymes and their activity |
| CO2 | Understand the metabolism of carbohydrates |
| CO3 | Explain the classification of Proteins and their metabolism in human body |
| CO4 | Identify and understand the biomolecules and functions of lipids in maintaining health and various diseases |
| CO5 | Analyze the structure and function of Nucleic acid |


| **Text books:** | |
|---|---|
| 1 | Jain, J.L, Jain ,S.,& Jain ,N.(2005).Fundamentals of Biochemistry. S. Chand &Company Ltd. Ramnagar, New Delhi-110055.6th revised edition |
| 2 | Bettelheim, F.A., Brown, W.H., Campbell, M.K., & Farrell, S.O.(2009). *General, Organic & Biochemistry*. Brooks/Cole Cengage Learning |
| 3 | Champe,P.C.,Harvey,R.A.,&Ferrier,D.R.(2005).*Biochemistry*.LippincottWilliams&Wilkins,6th edition, Wolters Kluwer, London |
| 4 | Talwar, G.P. ,& Srivastava. N,L.M. (2002).*Text book of biochemistry and human biology* .PHI Learning Pvt. Ltd |
| 5 | Murray, R.K., Granner, D. K., Mayes, P.A. and Rod well, V.W.(2000):25th edition. Harpers Biochemistry Macmill and Worth Publishers |
| **Reference Books:** | |
| 1 | Beck, W.S. (1971) Human Design. Har court Brace Jovanovich Inc., New York. |
| 2 | Best, C.H. and Taylor, N.B. (1980) Living Body.4th ed. BIP, Bombay |
| 3 | Creager, J.G. (1992) Human Anatomy and Physiology .2nd ed. WMC Brown Publishers, England |
| 4 | Guyton, A. C. (1979) Physiology of the Human Body. 5thed. Saunders College of Publishing Philadelphia. |
| 5 | Subraniam, S. and Madhavan Kutty, K. (1971). The Text Book of Physiology. Orient Longman Ltd., Madras. |


**Mapping with Programme Outcomes and Programme Specific Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| **Total** | 15 | 14 | 13 | 15 | 14 | 13 | 14 | 13 | 15 | 15 | 15 |
| **Average** | 3 | 2.8 | 2.6 | 3 | 2.8 | 2.6 | 2.8 | 2.6 | 3 | 3 | 3 |

**3 – Strong, 2- Medium, 1- Low**

## 1ST YEAR: SECOND SEMESTER

| Course Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| **24PNDC23P** | **TECHNIQUES IN FOOD ANALYSIS PRACTICAL** | Core | **0** | **0** | 4 | 0 | 3 | 4 | 25 | 75 | 100 |

| | **Learning Objectives** |
|---|---|
| LO1 | Learn the techniques of estimating the quantity of different nutrients present in food |
| LO2 | To enable the students to get practical experience in the laboratory and develop the skills to undertake research work |
| LO3 | To understand the significance of Ash content which represents the total mineral content in food samples. |
| LO4 | To understand the principles and techniques for determining moisture content in food. |
| LO5 | To understand the purpose and applications of different experimental methods for food analysis. |

| **Unit** | **Content** | **Hours** |
|---|---|---|
| 1 | **UNIT-I**<br>**Introduction to Laboratory Practices**<br>1. Instrumental Techniques<br>Autoclave, Hot Air Oven, pH Meter, Electronic Weighing Balance, Centrifuges, Hot Plate, Spectrophotometer, Water Bath, Muffle Furnace, Viscometer, IR Moisture, Analyzer Colorimeter. | 12 |
| 2 | **UNIT –II**<br>Preparation and Standardizations of Solution | 12 |
| 3 | **UNIT –III**<br>Ashing of Food (Thermo gravimetric Method) and Preparation of Ash Solution | 12 |
| 4 | **UNIT-IV**<br>Food Analysis Experiments– Estimation of Moisture Content–Air Oven Method, Iodine Number of oils–Wij's Method, Acid Number of oils- Titrimetric Method, Peroxide Value of oils-Titrimetric Method, Ascorbic Acid–2,6-Dichloroindophenols, Titrimetric Method, Calcium-Precipitation Titrimetric Method, Iron–Wong's Method, Phosphorus–Colorimetric Method. | 12 |
| 5 | **UNIT- V**<br>**Demonstration Experiments**<br>Estimation of protein content in food by Kjeldahl method, Estimation of fat content in food by Soxhlet method. Pigment Analysis by Paper Chromatography Techniques | 12 |

| CO | Course Outcomes |
|---|---|
| CO1 | Understand safety rules for the laboratory and demonstrate various instruments used for food analysis. |
| CO2 | Acquire skills to prepare and standardize various solutions to conduct experiments for food analysis. |
| CO3 | Acquire skills in ashing of foods and prepare ash solution to analyse mineral contents in food. |
| CO4 | Demonstrate quantitative analysis of various nutrients in foods i.e. crude fibre, moisture,<br>Vitamin C, calcium, phosphorus, iron, etc. |
| CO5 | Demonstrate experiments to check estimation of protein, fat content and pigment analysis |

| **Textbooks:** | |
|---|---|
| 1 | S. Suzanne Nielsen (2017). Food Analysis Laboratory Manual. Springer International Publishing. Third Edition. |
| 2 | S. Suzanne Nielsen (2017). Food Analysis. Springer International Publishing. Fifth Edition. |
| 3 | Otles, S. (2005). "Methods of Analysis of Food Components and Additives" CRC Press, USA |
| 4 | Ranganna, S. (2001). "Hand book of Analysis and Quality Control for Fruit and Vegetable Products". Tata- McGraw-Hill, India. 2 nd edition |
| 5 | Sadasivam, S and Manickam, A (1997). "Biochemical Methods". New Age International Publishers, New Delhi.2ndEdition. |
| 6 | Jayaram, I, (1996), "Laboratory Manual in Biochemistry", New Age International Publishers, New Delhi. Fifth ed |
| 7 | Raghuramulu,N, Nair K.M & Kalayana Sundaram, S.A,(1983),"Manual of Laboratory Techniques", National Institute of Nutrition, ICMR. |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| **Total** | 15 | 14 | 13 | 15 | 14 | 13 | 14 | 13 | 15 | 15 | 15 |
| **Average** | 3 | 2.8 | 2.6 | 3 | 2.8 | 2.6 | 2.8 | 2.6 | 3 | 3 | 3 |

**3 – Strong, 2- Medium, 1- Low**

## 1ST YEAR: SECOND SEMESTER

| Course Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| **24PNDC24** | **Research Methods in Nutrition** | Core | **2** | **1** | 1 | 0 | 3 | 4 | 25 | 75 | 100 |

| **Learning Objectives** | |
|---|---|
| LO1 | To provide students understanding about the basic concepts, approaches and methods in conducting research |
| LO2 | Enabling the appreciate and critique the designing are search study as well the ethical dimensions of conducting researches. |
| LO3 | To explain the importance of research in food science and nutrition. |
| LO4 | To make students understand the research problem and develop skills |
| LO5 | Outline of research work and construct common data collection tools. |

| Unit | Content | Hours |
|---|---|---|
| 1 | **Nutrition Research**<br>Research - Meaning, Objectives and Classification of Research Designs. Exploratory, Des criptive– Longitudinal and Cross sectional, Observation. Need of Research in Food Science and Nutrition. Research Process- Selection and Formulation of Research Problem. Hypothesis – Definition, importance, types and errors I and II. | 12 |
| 2 | **Sampling Design**- Sampling Process and Characteristics of good Sampling. Classification of Sampling Techniques- Probability and Non- Probability Sampling. Preparation of Laboratory Food Samples. Measurement and Scaling Fundamental and Comparative Scales– Meaning and types Nominal Scale Ordinal Scale Interval Scale Ratio Scale. | 12 |
| 3 | **Data Collection and Preparation**<br>Data Collection–Tools–Primary Data- Interviews-structured and unstructured, Case studies, Questionnaire, Surveys–Pilot, Laboratory Experiments. Secondary Data- Published Sources, Unpublished Sources.<br>Data Preparation Process, Editing, Coding, Classification, Tabulation. | 12 |
| 4 | **Statistical Methods**<br>Parametric and Non- Parametric tests–Difference and Applications Data Analysis Process- Descriptive Analysis-Graphical and Diagrammatic Presentations Central Tendency–Mean, Median & Mode. Dispersion- Standard Deviation Statistical Inference–Tests of Hypothesis. | 12 |
| 5 | **Reporting the finding & computer applications**<br>Report Writing–Importance, Types, Mechanics, Guidelines and Precautions. End Notes-Bibliography, Appendices, Footnotes and Glossary of terms Computer applications in nutrition research- Importance and Uses Applicable Statistical Analysis Software- Literature Searching- PubMed Data Analysis-Micro Soft Excel, SPSS. Plagiarism Checker– Turnitin, Scribbr. | 12 |

| CO | Course Outcomes |
|---|---|
| CO1 | Demonstrate knowledge of the scientific method, purpose and approaches to research and become a qualified researcher. |
| CO2 | Identify and select research sampling and scales of measurement. |
| CO3 | Understand the types of tools applicable to research problem to develop skills of preparing outline of research work and construct common data collection tools |
| CO4 | Assess the numerical data for providing statistical evidences to Support the research results and interpretation of data with the use of tables and pictorial representations |
| CO5 | Present research data in a scientific manner and understand the key elements of a research report and various applications of computer in nutrition research. |


| **Text books** | |
|---|---|
| 1 | Kothari CR (2004). Research Methodology–Methods & Methodology. Delhi, New Age International PvtLtd.2nd edition |
| 2 | Ranjit Kumar (2011). Research Methodology a step-by-step guide for beginners SAGE Publications.3rd edition |
| 3 | Chawla, Deepak and Neena Sondhi. (2018): Research Methodology-Concepts and Cases. Noida, Vikas Publishing V House Pvt Ltd.2nd edition |
| 4 | Da Danial, Wayne Wand Chad Cross (2017): Biostatistics–Basic Concepts and Methodology For the Health Sciences–International Student Version. New Delhi, Aram International,10th edition. |
| **Reference Books:** | |
| 1 | Ker linger, Foundation of Educational Research Ingle P.O. Scientific Report Writing. Nagpur Sarla P. Ingle |
| 2 | Anderson, David Randet.al. (2013). Statistics for Business and Economics. Delhi |
| 3 | Bandarkar, P. L. and Wilkinson T.S. (2000). Methodology and Techniques of Social Research |
| 4 | Bell, Judith (2005): Dingy our Research Project–A guide for first time researchers in education |


**Mapping with Programme Outcomes and Programme Specific Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| **Total** | 15 | 14 | 13 | 15 | 14 | 13 | 14 | 13 | 15 | 15 | 15 |
| **Average** | 3 | 3 | 2.8 | 3 | 2.8 | 3 | 2.8 | 2.6 | 3 | 3 | 3 |

**3 – Strong, 2- Medium, 1- Low**

## 1ST YEAR: SECOND SEMESTER

| Course Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| **24PNDE21** | **EC 3 –Food Preservation** | Core | **2** | **1** | 1 | 0 | 3 | 4 | 25 | 75 | 100 |

| Learning Objectives | |
|---|---|
| LO1 | Learn the basic concepts and importance of Food Preservation |
| LO2 | Understand the different methods of Food Preservation |
| LO3 | Choose appropriate food handling and storage techniques |
| LO4 | Understand about the different methods of Preservation |
| LO5 | Learn about how each preservation method works to inhibit spoilage and extend shelf life. |

| Unit | Content | Hours |
|---|---|---|
| 1 | **Introduction to Food Preservation**<br>Concept, importance of food preservation. Common terms used in food preservation. Different methods and Principles of preservation. Food Additives. | 12 |
| 2 | **Preservation by Low Temperature**<br>Use of Cold and Refrigerated Storage. Use of Freezing temperatures: Slow and fast freezing of foods and Cryogenic freezing of foods, dehydro freezing, Frozen storage of foods. | 12 |
| 3 | **Preservation by High Temperature**<br>Preservation of foods by high temperatures. Blanching, Pasteurization and Sterilization of foods. General process of caning of foods. | 12 |
| 4 | **Preservation by Drying**<br>Principles and application of drying and dehydration of foods. Different types of drying and dryers | 12 |
| 5 | **Preservation using Chemicals and Irradiation**<br>Preservation using Chemical Preservatives-Squashes, Ketchup and Marmalade Preservation by Irradiation: Gamma rays, X-rays and Electron Beam Preservation by high osmotic pressure: High Concentration of Sugar-jams and Jellies, High Concentration of Salt. Pickling and curing of meat. | 12 |

| CO | Course Outcomes |
|---|---|
| CO1 | Describe the basic concepts and principles of Food Preservation |
| CO2 | Identify the best methods of storage of different foods based on their shelf life. Recommend appropriate post-harvest technology procedures that increase shelf life of food |
| CO3 | Analyze the use of low and high temperature to preserve food and identify the appropriate method to preserve different foods |
| CO4 | Discuss the use and effects of different preservatives on the quality of foods |
| CO5 | Appreciate the use of modern technology in food preservation and managing Food wastage |

| **Textbooks:** | |
|---|---|
| 1 | "Food Preservation and Processing" by Shirley J. VanGarde and Margy Woodburn |
| 2 | "Handbook of Food Preservation" edited by M. Shafiur Rahman |
| 3 | "Food Processing Technology: Principles and Practice" by P.J. Fellows |
| 4 | "Fermentation for Beginners: The Step-by-Step Guide to Fermentation and Probiotic Foods" by Drakes Press |
| 5 | "Modern Food Microbiology" by James M. Jay |
| **Reference Books:** | |
| 1 | Prakash Triveni (2010). Food Preservation ,Aadi ,Delhi. |
| 2 | M. Shafiur Rahman (2007): Hand Book of Food Preservation, Marcel Dekker Inc, New York. |
| 3 | Mc Willims and Paine (2009): Modern Food Preservation, Surjeet Publications |
| 4 | Karnal, Marcus and D.B. Lund (2003). "Physical Principles of Food Preservation" |
| 5 | Rutledge. V and Garde, S.J. and Wood burn. M (2001) "Food Preservation and Safety Principles and Practice". Surbhi Publications. |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 2 | 3 | 3 | 33 | 2 | 2 | 2 | 2 |
| **Total** | **15** | **15** | **11** | **11** | **15** | **15** | **12** | **15** | **14** | **14** | **14** |
| **Average** | **3** | **3** | **2.2** | **2.2** | **3** | **3** | **2.4** | **3** | **2.8** | **2.8** | **2.8** |

**3 – Strong, 2- Medium, 1- Low**

## 1ST YEAR: SECOND SEMESTER

| Subject Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| **24PNDE23** | **Elective IV – Perspectives of Home Science** | **Core** | **2** | **1** | **1** | **0** | **3** | **4** | 25 | 75 | 100 |

| **Learning Objectives** | |
|---|---|
| **LO1** | Understand and define the concept of Extension Education, |
| **LO2** | Explore the interrelationship between maturation and learning, and how they influence each other in human development. |
| **LO3** | Aim to build foundational knowledge in textile science and fabric production. |
| **LO4** | Provide essential skills for managing family resources and improving household decision-making and interior designs |
| **LO5** | To grasp the fundamentals of guidance and counselling, and its role in education and personal growth. |

| Unit | Content | Hours |
|---|---|---|
| 1 | **Extension Education**<br>a. Meaning, definition, objectives, characteristics, principles<br>b. Extension teaching methods-types and methods<br>c. Qualities of a good extension worker<br>d. Role of Extension Education in Promoting Lifelong Learning | 12 |
| 2 | **Human Development**<br>a. Growth, Development, Maturation and Learning.<br>b. Principles and Developmental stages and task<br>c. Parental Disciplinary Techniques–merits and demerits.<br>d. Nutrition and Its Role in Human Development across the Lifespan | 12 |
| 3 | **Textiles and Clothing**<br>a. Classification and general properties of textile fibers.<br>b. Processing and manufacture of Cotton, Silk, Wool, progenies. Classification of Yarn<br>c. Textile Dyeing and Printing Techniques, Textile Testing and Quality control<br>d. Fabric construction-woven, non-woven and knitted fabric. | 12 |
| 4 | **Family Resource Management**<br>a. Home Management–Meaning, objectives and process. b. Time, Money and Energy management<br>C. Decision making-Steps and Methods of resolving conflicts.<br>d. Principles and Elements of Interior design, Various colors and color schemes. | 12 |
| 5 | **Guidance and counselling**<br>a. Meaning, nature, types and scope of Guidance and counselling.<br>b. Various steps and techniques of Guidance and counselling.<br>c. Need and importance of educational guidance. | 12 |

| CO | Course Outcomes |
|---|---|
| CO1 | Understand the concept of Extension Education and its importance. |
| CO2 | Comprehend the key aspects of human growth and development. |
| CO3 | Understand the basic concepts of Textiles and Clothing. |
| CO4 | Understand the meaning of Guidance and Counselling and Career. |
| CO5 | Understand the meaning of Guidance and Career in Home science |

| | |
|---|---|
| **Textbooks:** | |
| 1 | Jha,J.K. (2002). Encyclopaedia of Teaching of Home Science, Vol. I, II and III. New Delhi: Anmol Publications. |
| 2 | Suriakanthi. A. (2002). Child Development- An Introduction Gandhi gram: Kavitha Publications. |
| 3 | Srilakshmi. B. (2015). Food Science. New Delhi. New Age Age International Pvt. Ltd. |
| 4 | Premlata Mullick (2016),4th edition, Kalyani Publishers. |
| **Reference Books:** | |
| 1 | Serene and Ahlawat Santos Shekhar (2013). Textbook of Home Science Extension Education. |
| 2 | Tami James Moore and Sylvia M. Asay (2008). Family Resource Management, Sage Publications. |
| 3 | Diane E. Papalia (2004). 9th edition, Human Development, McGraw Hill India. |
| 4 | Rani K. Sudha and Srivastava Sushila, Textbook of Human Development: A Lifespan Development Approach, S. Chand & Co Ltd. |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 2 | 3 | 3 | 33 | 2 | 2 | 2 | 2 |
| **Total** | **15** | **15** | **11** | **11** | **15** | **15** | **12** | **15** | **14** | **14** | **14** |
| **Average** | **3** | **3** | **2.2** | **2.2** | **3** | **3** | **2.4** | **3** | **2.8** | **2.8** | **2.8** |

**3 – Strong, 2- Medium, 1- Low**

## 1ST YEAR: SECOND SEMESTER

| Course Code | Course Name | Category | L | T | P | S | Credits | Hours | Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CIA | External | Total |
| **24PNDS21** | **BASIC IN FOOD SCIENCE** | Core | **1** | **1** | 0 | 0 | 2 | 2 | 25 | 75 | 100 |

| **Learning Objectives** | |
|---|---|
| LO1 | Obtain knowledge of different food groups and their nutritive value, Understand the scientific principles underlying food preparation |
| LO2 | To help them study the different methods of cooking and their advantages and Disadvantages. |
| LO3 | To gain experience in the preparation of foods with attention to the preservation of their nutritive value oriented to Indian cooking. |
| LO4 | To help them understand the scientific principles governing the acceptability of food preparations. |
| LO5 | To Provide a comprehensive understanding of fats, sugars, spices, and beverages. |

| Unit | Content | Hours |
|---|---|---|
| 1 | **Introduction to Food and Cooking Methods**<br>**Definition** - Food, food science, nutrients, balanced diet, food pyramid.<br>**Cooking** - cooking methods- Moist and Dry heat methods of cooking. | 12 |
| 2 | **Cereals, Millets, Pulses, Legumes and Nuts:**<br>**Cereal and Millets –** Nutritive value of cereals.<br>**Pulses and legumes** - methods of cooking<br>**Nuts** - Role of nuts in cookery<br>**Oilseeds** - Uses and shelf life | 12 |
| 3 | **Vegetables, Fruits and Milk:**<br>**Vegetables** - Classification and selection of vegetables.<br>**Fruits** - Enzymatic browning and its prevention.<br>**Milk** - Composition and Nutritive value, Types of milk. | 12 |
| 4 | **Flesh foods and Egg**<br>**Meats** – Selection of meat.<br>**Fish** - classification, Nutritive value and selection of fish<br>**Eggs**- Structure, Selection, use in cookery. | 12 |
| 5 | **Fats and Oils -** Types, Rancidity, Smoking point.<br>**Sugar** - stages of sugar cookery, crystallization.<br>**Spices and Condiments** – Classification, uses in Indian cookery<br>**Beverages** – Classification of Beverages and nutritive value | 12 |

| CO | Course Outcomes |
|---|---|
| CO1 | To gain knowledge on food groups and its function, their nutritive value and role in the day's diet. |
| CO2 | To understand different methods of cooking |
| CO3 | To relate skill and techniques in Food preparation with conservation of nutrients, understand the cookery concepts involved in cereals, pulses and vegetables |
| CO4 | To comprehend the composition, nutritive value and develop skills in the preparation of milk and fleshy products. |
| CO5 | To recognize the smoking point of any cooking oil, apply knowledge on preparation of beverages. |

| **Text books:** | |
|---|---|
| 1 | Srilakshmi. B; Food Science, 6th edition, New Age International (P) Limited Publishers, 2015. |
| 2 | Shakunthala Manay. N; Shadakshara Swamy.M; Foods Facts and Principles, 3rd edition, New Age International (P) Limited Publishers, 2014. |
| 3 | Lillian Hoagland Meyer, Food chemistry, CBS Publishers and Distributors, 2004. |
| 4 | Arindam Ramaswamy, Elements of Food Science, Oxford Book Company, 2010. |
| 5 | Siva Sankar. B; Food Processing and Preservation, PHI Learning Private Limited, 2011. |
| **Reference Books:** | |
| 1 | Hughes, O and Bennion, M. 1970 Introductory Foods, 5th ed., The Macmillan Co., New York. |
| 2 | Griswold, R.M. 1962. Experimental Study of Foods, Houghton Mifflin company, Boston. |
| 3 | Ghose, R.L.M., Ghate, M.B. and Subramaniam, V. 1960. Rice in India. ICMR, New Delhi. |
| 4 | Eckles, G.H., Combs, W.S. and Macy, H. 1951. Milk and Milk Products, RMB Publishing Co., Ltd., New Delhi. |
| 5 | Fisher, P. and Bender, A. 1971. The Value of Foods. Oxford University Press, London. |

**Mapping with Programme Outcomes and Programme Specific Outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 2 | 3 | 3 | 33 | 2 | 2 | 2 | 2 |
| **Total** | **15** | **15** | **11** | **11** | **15** | **15** | **12** | **15** | **14** | **14** | **14** |
| **Average** | **3** | **3** | **2.2** | **2.2** | **3** | **3** | **2.4** | **3** | **2.8** | **2.8** | **2.8** |

**3 – Strong, 2- Medium, 1- Low**