SNDT Women's University, Mumbai

Bachelor of Science
(Nutrition & Dietetics)

B.Sc. (ND)

As per NEP 2020

Semester – III & IV

Syllabus

(w.e.f. Academic Year 2025-26)

Structure with Course Titles

SN	Courses	Type of Course	Credits	Marks	Int	Ext
Semester III						
30130211	Biochemistry (2 Th + 2 Pr)	Major (Core)	4	100	50	50
30130212	Advance Human Physiology (2 Th + 2 Pr)	Major (Core)	4	100	50	50
30130213	Human Nutrition I (Th)	Major (Core)	4	100	50	50
30330211	Institutional Food Service Management (Th)	Minor stream	2	50	0	50
30430221	Nutrition through Lifespan (Pr.)	OEC	2	50	0	50
		AEC	2	50	50	0
31330201	Dietary Surveys in the Community (Pr.)	FP	2	50	50	0
		CC	2	50	50	0
			22	**550**	**300**	**250**

SN	Courses	Type of Course	Credits	Marks	Int	Ext
Semester IV						
40130211	Design Thinking in Nutrition and Dietetics (2 Th+2 Pr)	Major (Core)	4	100	50	50
40130212	Medical Nutrition Therapy I (2 Th+2 Pr.)	Major (Core)	4	100	50	50
40130213	Human Nutrition II (Th)	Major (Core)	4	100	50	50
40430221/ 40430222	Nutrition in Health & Disease (Pr)/ Clinical Pathophysiology (Pr)	OEC	2	50	0	50
40730221	Basic Food Science (Pr)	SEC	2	50	0	50
		AEC	2	50	0	50
41730201	Community Nutrition (Pr)	CEP	2	50	50	0
		CC	2	50	50	0
			22	**550**	**250**	**300**

Exit with UG Diploma with 10 extra credits (44 + 10 credits)

Syllabus Contents

Semester: III

3.1 Major (Core)

Course Title	**Biochemistry (2Th+2Pr)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the basics of biological chemistry, including the structure and function of biomolecules and enzymes, to understand the fundamental metabolic pathways and processes that sustain life. 2. Analyze the integration and significance of various metabolic pathways and evaluate their physiological relevance, processes and pathways. 3. Apply knowledge of metabolic processes to explain their significance in various physiological and pathological conditions. 4. Demonstrate proficiency in the qualitative and quantitative identification of biomolecules by applying appropriate analytical techniques. 5. Evaluate enzyme activity and inhibition by assessing the effects of temperature and pH on enzyme function. 6. Analyze and interpret simulated metabolic disorders through the qualitative and quantitative estimation of normal and abnormal constituents in urine and blood.
Module 1(Credit 1 Th)	**Biomolecules**
Learning Outcomes	After learning the module, learners will be able to
	1. Describe the fundamentals of carbohydrates and explain their importance in biological systems. 2. Explain the significance of lipids and analyze their roles in maintaining biological functions. 3. Describe the chemical structure and properties of proteins and nucleic acids. 4. Identify the role of enzymes in biochemical reactions and evaluate the factors affecting enzyme activity. 5. Analyze the major metabolic pathways of carbohydrates and evaluate their regulatory mechanisms.
Content Outline	1. **Carbohydrate**: Definition, Formula, Classification, structures, Physio -chemical reactions and uses of Monosaccharide, Disaccharide and Polysaccharide.

	2. Lipids: Definition and Introduction, Structural Formula, Difference between Saturated and Unsaturated Fatty acids, Purity of Oils, TAG, Sterols- Structure and Function of Cholesterol, & 7-Dehydro-Cholesterol. **3. Protein:** Classification of Amino-acids with Structure, Structure of proteins (Primary, Secondary, Tertiary and Quaternary Structure), Precipitation, denaturation of proteins **4. Nucleic acid Structures and Enzymes:** Structures of Nucleic acids and Enzymes Definition, Nomenclature, Classification, Specificity, Mechanism of enzyme action, Coenzymes, Co-Factors, Factors effecting Enzyme activity, Enzyme Inhibitors
Module 2(Credit 1 Th) Bioenergetics and Metabolism of Macro molecules	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the utilization of carbohydrates and lipids in the body through their respective metabolic pathways. 2. Recognize the regulatory mechanisms that control the pathways of carbohydrate and lipid utilization. 3. Evaluate the significance of these metabolic pathways in maintaining energy balance and supporting essential functions in the body. 4. Explain the synthesis, regulation, and significance of essential non-nitrogenous compounds derived from amino acids.
Content Outline	**1. Carbohydrate metabolism:** a. Various Biological pathways - site, significance, intermediates with chemical structures, enzymes, coenzymes involved, Regulation and energetics b. Glycolysis, TCA [Kreb's cycle], Pentose phosphate pathway Gluconeogenesis, Glycogenesis, Glycogenolysis. c. Alcohol metabolism and biochemical alterations in alcoholism d. Biological oxidation and Electron transport chain **2. Lipid Metabolism:** a. Oxidation of saturated, unsaturated, even, and odd chain fatty acids (β-Oxidation), regulation, energetics b. Biosynthesis of fatty acids, regulation of synthesis, Elongation and desaturation of fatty acid chains, Ketosis and Ketone bodies metabolism **c.** Triglycerides synthesis **---** Intestinal resynthesis of triglycerides, synthesis in Liver. Introduction of Cholesterol – Parent steroid sources, Cholesterol biosynthesis with structures, mode of utilization, Control of cholesterol metabolism d. Plasma Lipoproteins, Synthesis and significance of Chylomicrons, LDL, HDL and VLDL **3. Protein, Non- proteinous and Nucleic Acid Metabolism**

	a. Trans-amination, Oxidative and non oxidative De-amination with diagrammatic representation, role of pyridoxine, b. Metabolic fate of Ammonia-- Formation of glutamate, Formation of Glutamine and Urea cycle –pathway with structures. c. Metabolism of non protein nitrogenous compounds: Structures of purines, pyrimidines and uric acid, catabolic pathways without structures of the intermediates. Uric acid and gout. Synthesis (without structures) and significance of glutathione. d. Synthesis, catabolism and significance of Creatnine, Transmethylation and one carbon transfer – scheme of inter conversion and disposition of one carbon fragments derived from catabolism of amino acids (without structures) e. Metabolic fate of the carbon skeleton of amino acids – glucogenic, ketogenic and glucogenic and ketogenic amino acids.
Module 3(Credit 1 Pr) Practical Applications in Biomolecule Identification, Enzyme Activity	
Learning Outcomes	After learning the module, learners will be able to 1. Demonstrate proficiency in the qualitative and quantitative identification of biomolecules, including carbohydrates, proteins, and fats, using various analytical techniques and methods. 2. Evaluate enzyme activity and inhibition by studying the effects of temperature and pH on enzyme function.
Content Outline	**1: Identification of Biomolecules** Qualitative analysis of carbohydrates, Glucose, fructose, sucrose, lactose, maltose, starch. Estimation of Glucose/sucrose using Benedict's Quantitative method. Qualitative tests for proteins (colour reactions and precipitation reactions) Qualitative tests for fats. **2: Enzyme Activity and Inhibition** i. Estimation of enzyme activity (e.g. Amylase activity on starch) ii. Effect of temperature and pH on enzyme activity
Module 4(Credit 1 Pr) Practical Applications in Metabolic Disorder Analysis	
Learning Outcomes	After learning the module, learners will be able to

	1. Perform qualitative and quantitative estimations of normal and abnormal constituents in urine, including urea and glucose, to analyze metabolic conditions. 2. Quantify and interpret serum/blood constituents such as urea, uric acid, total protein, and cholesterol to investigate metabolic disorders.
Content Outline	**1. Analysis of Simulated Metabolic Disorders.** 1. Qualitative Estimation of Normal Constituents of Urine. 2. Qualitative Estimation of Abnormal Constituents of Urine. 3. Quantitative Estimation in Urine. a. Urea b. Glucose 4. Quantitative Estimation in Serum / Blood. 1. Urea 2. Uric acid 3. Total protein 4. Cholesterol

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

CCE Components Theory Assignments:

1. Clinical importance of Enzymes
2. Disorders of Nucleic acid metabolism

Practical-Based Assignments/Projects:

1. Alcohol Metabolism Presentation
2. Case Study: Lipid Storage Disorders
3. Oxidation of Odd/Unsaturated Fatty Acids
4. ETC inhibition & lactic acidosis scenario
5. Effects on Enzyme activity

References: -

1. Rastogi, S. C. (2003). *Biochemistry* (2nd ed.). Tata McGraw-Hill Publishing Co. Ltd.
2. Jain, J. L., Jain, S., & Jain, N. (2005). *Fundamentals of biochemistry* (6th ed.). S. Chand Company Ltd.
3. Plummer, D. T. (1971). *An introduction to practical biochemistry* (2nd ed.). McGraw-Hill Publishing Co. Ltd.
4. Apps, D. K., Cohen, B. B., & Steel, C. M. (1992). *Biochemistry: A concise text for medical students*. Bailliere Tindall.
5. Das, D. (1980). *Biochemistry* (2nd ed.). Academic Publishers.
6. Satyanarayana, U., & Chakrapani, U. (2008). *Biochemistry* (3rd ed.). Books & Allied Publishers.
7. Chatterjee, M. N., & Shinde, R. (2012). *Textbook of medical biochemistry* (8th ed.). Jaypee Brothers Medical Publishers.
8. Nelson, D. L., & Cox, M. M. (2017). *Lehninger's principles of biochemistry* (7th ed.). Freeman and Co.
9. Berg, J. M., Tymoczko, J. L., & Stryer, L. (2015). *Biochemistry* (8th ed.). W. H. Freeman.
10. Vasudevan, D. M., & Sreekumari, S. (2007). *Textbook of biochemistry for medical students* (5th ed.). Jaypee Brothers Medical Publishers.
11. Murray, R. K., & Granner, D. K. (2017-18). *Harper's illustrated biochemistry* (31st ed.). Prentice Hall International.
12. Voet, D., & Voet, J. G. (2018). *Biochemistry* (5th ed.). John Wiley & Sons.

3.2 Major (Core)

Course Title	**Advance Human Physiology** (2 Th + 2 Pr)
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the structure and functions of key human physiological systems. 2. Analyze the roles of endocrine and reproductive systems in maintaining health and homeostasis. 3. Identify common disorders related to blood, respiratory, digestive, and reproductive systems. 4. Apply knowledge of human physiology to assess health conditions and preventive care. 5. Design awareness materials and interventions related to reproductive health and hygiene.
Module 1(Credit 1) Th- Blood, Lymphatic, Respiratory & Cardiovascular Systems	
Learning Outcomes	After learning the module, learners will be able to
	1. Define basic physiological terms and classify human tissues. 2. Explain blood composition, functions, and disorders. 3. Describe respiratory and cardiovascular anatomy and mechanisms.
Content Outline	1. **Introduction to General Physiology** i. Key terms: anatomy, physiology, pathophysiology ii. Anatomical position and tissue types iii. Skeleton, cartilage, muscles 2. **Blood and Lymphatic System** i. Blood cells, plasma proteins, coagulation, blood groups ii. Disorders: anaemia, thalassemia, sickle cell anaemia iii. Lymphatic system and immune function 3. **Respiratory System** Respiratory organs, respiration mechanism, diseases: asthma, pneumonia, COPD 4. **Cardiovascular System** i. Heart anatomy, circulations, cardiac cycle ii. Conditions: hypertension, ischemic heart disease (IHD)

Module 2(Credit 1) Th- Digestive, Excretory, Endocrine, Nervous & Reproductive Systems	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the digestive and excretory systems and related disorders. 2. Describe the functions of endocrine glands and hormones. 3. Discuss the nervous and reproductive systems and related health issues. 4. Analyze the importance of reproductive hygiene and antenatal care.
Content Outline	1. **Digestive & Excretory System** i. GI tract anatomy and digestion process ii. Role of digestive organs iii. Kidney functions, Urine formation, body fluid regulation iv. GI and renal disorders: constipation, diarrhea, UTI, stones v. Skin and thermoregulation 2. **Endocrine & Nervous System** i. CNS, PNS, ANS anatomy ii. Brain lobe functions, reflex action iii. Endocrine glands, hormones and their functions. 3. **Reproductive System** i. Male and female anatomy ii. Menstrual cycle, pregnancy, contraception iii. Menstrual hygiene, breastfeeding, antenatal care, STDs
Module 3(Credit 1) Pr- Blood, Lymphatic, Respiratory & Cardiovascular Systems	
Learning Outcomes	After learning the module, learners will be able to

	1. Define blood group compatibility, fluid balance and relate disorders with physiology 2. Analyze clinical cases 3. Evaluate different types of anemia using clinical symptoms and laboratory diagnostic techniques. 4. Calculate Body Mass Index (BMI) and interpret its clinical relevance in nutritional and metabolic assessments. 5. Demonstrate the ability to conduct and interpret basic pulmonary function tests, including lung volumes and capacities, to assess respiratory health. 6. Discuss the clinical implications of respiratory and metabolic dysfunctions in relation to normal physiological processes.
Content Outline	i. Patient case taking- clinical complaints, personal, family and medical history and lifestyle factors. ii. Blood transfusion and blood transfusion reactions. iii. Diagnosis of Anaemia using clinical and laboratory tests v. Body Fluids, regulation of water balance and it's significance v. Calculating BMI and clinical significance vi. Introduction to Pulmonary Function Tests and understanding Lung Volumes and Lung Capacities.
Module 4(Credit 1) Pr- Digestive, Excretory, Endocrine & Reproductive Systems	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain key physiological parameters of pregnancy and analyze their interrelation with psychological changes 2. Apply foundational knowledge to design awareness material and evaluate common reproductive health concerns in diverse populations.
Content Outline	i. Identification of GI tract anatomy using models or diagrams. Case discussion on GI disorders. ii. Kidney structure and functions through diagrams/models. Observation of symptoms and discussion on common renal disorders: UTI, kidney stones, nephritis. iii. Stages of Pregnancy and Pregnancy tests v. Chart preparation on endocrine glands and hormones v. Antenatal care and breastfeeding vi. Awareness poster on menstrual hygiene and STD prevention
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) 1. Case Study on Blood Disorders (Anaemia, Thalassemia) 2. Report on Respiratory Health & Lifestyle Factors (based on practicals) 3. Assignment on Dietary Fiber & Hydration and Digestive Health 4. Group Campaign: Reproductive Health Awareness (posters, skits, leaflets)	

References: -

1. Guyton, A. C., & Hall, J. E. (2011). *Textbook of medical physiology* (12th ed.). Elsevier Saunders.
2. Hall, J. E. (2015). *Guyton and Hall Physiology Review* (3rd ed.). Elsevier.
3. Marieb, E. N., & Hoehn, K. (2018). *Human anatomy & physiology* (11th ed.). Pearson.
4. McArdle, W. D., Katch, F. I., & Katch, V. L. (2014). *Exercise physiology: Nutrition, energy, and human performance* (8th ed.). Lippincott Williams & Wilkins.
5. Sembulingam, K., &Sembulingam, P. (2012). *Essentials of medical physiology* (6th ed.). Jaypee Brothers Medical Publishers.
6. Sherwood, L. (2015). *Human physiology: From cells to systems* (9th ed.). Cengage Learning.
7. Tortora, G. J., & Derrickson, B. (2017). *Principles of anatomy and physiology* (15th ed.). Wiley.
8. Widmaier, E. P., Raff, H., & Strang, K. T. (2018). *Vander's human physiology: The mechanisms of body function* (15th ed.). McGraw-Hill Education.

3.3 Major (Core)

Course Title	**Human Nutrition I (Th)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the physiological processes involved in digestion and nutrient absorption. 2. Describe the functions of essential nutrients and relate them to various physiological roles in the human body. 3. Analyze the impact of nutrient deficiencies and excesses on human health and metabolism. 4. Evaluate the role of water, electrolytes, and fluid balance in maintaining physiological homeostasis. 5. Interpret signs and symptoms of nutritional imbalances and propose dietary adjustments to support health.
Module 1(Credit 1) Foundations of Nutrition Science and Energy Dynamics	
Learning Outcomes	After learning the module, learners will be able to
	1. Know the contributions of various scientists and key developments in nutrition science. 2. Explain the processes of digestion and absorption of macronutrients in the human body. 3. Analyze the inter-relationship between water and electrolytes in maintaining fluid balance. 4. Evaluate the impact of fluid balance changes on physiological functions and overall health.
Content Outline	**History of Nutrients - Eminent Scientists and developments in Nutrition Science** **Basic concepts in Human Nutrition:** i. Digestion, **ii.** Absorption of macronutrients- Transport across cell membrane – active, passive, diffusion **Water, Electrolytes and Acid-Base balance** i. Sources, functions and distribution (Regulation of intra and extra cellular volume), deficiencies of the following: a. Water and Electrolytes- Sodium, Potassium and Chloride **ii.** Mechanisms of water balance, electrolyte balance, osmolality and Acid-Base Balance and Water Intoxication. **ENERGY BALANCE:** i. Forms of energy, its unit ii. measurement of energy, iii. Gross calorific values, Physiological fuel value iv. RQ, SDA, thermogenesis,

	v. Direct and Indirect calorimetry vi. BMR, RMR, estimation of BMR and factors affecting BMR vii. Determination of energy metabolism during work viii. Energy balance ix. Assessment of energy requirement
Module 2(Credit 1) Carbohydrates in Human Health and Disease	
Learning Outcomes	After learning the module, learners will be able to
	Explain the functions, sources, and effects of carbohydrates deficiency and excess on the human body.
Content Outline	**CARBOHYDRATES :** i. Types, sources, dietary requirement, physiological significance and functions. ii. Glycaemic index and glycaemic load iii. Sugar alcohols, iv. Fibre - types, properties, function, role in various diseases. v. EAR-RDA of carbohydrates vi. Effects of excess and deficiency of carbohydrates
Module 3(Credit 1) Protein Metabolism and Nutritional Significance	
Learning Outcomes	After learning the module, learners will be able to
	Explain the concept of protein quality, describe amino acid imbalance, and discuss their implications on health.
Content Outline	**PROTEIN:** i. Classification, sources, requirements, physiological significance, and functions ii. Indispensable and dispensable amino acids iii. Methods of protein quality evaluation- BV, Protein digestibility, NPU, PER, AAS, PDCAAS, DIAAS iv. Amino acid imbalance, nitrogen balance, antagonism and toxicity. v. Factors affecting protein utilization and RDA of protein vi. PEM - clinical and biochemical aspects. vii. Vegetarianism
Module 4(Credit 1) Lipids, Macronutrient Interactions, and Health Implications	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the role of lipids in nutrition and health, and describe their impact on overall well-being. 2. Describe the inter-relationship between macronutrients and explain how they work together to support bodily functions.
Content Outline	**LIPIDS :** i. Types, sources, metabolism, functions, dietary requirements ii. EFA- definition, functions, sources, effects of deficiency

	iii. Transport of lipoproteins and deficiencies of lipids iv. Hydrogenation v. Functions, role of fat in cardio-vascular diseases. vi. RDA vii. Inter relation between carbohydrate, fat and protein in energy metabolism. viii. Starvation, excess of macronutrient.
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) 1. Assignment: Write a report on eminent scientists in nutrition, their discoveries, and their impact on human health. 2. Report: Compare vegetarian and non-vegetarian diets based on protein quality, health benefits, and risks. 3. Assignment on digestion, absorption, energy balance, macronutrient metabolism, and RDA concepts.	

References: -

1. Agarwal, A., & Udipi, S. A. (2013). *Textbook of human nutrition*. Jaypee Brothers Medical Publishers.
2. Bamji, M. S., Rao, N. P., & Reddy, V. (2003). *Textbook of human nutrition*. Oxford & IBH Publishing Co. Pvt. Ltd.
3. Chaney, M. S., & Ross, M. L. (1979). *Nutrition* (9th ed.). Houghton Mifflin.
4. Davidson, S., Passmore, R., & Eastwood, M. A. (1986). *Human nutrition and dietetics* (8th ed.). Churchill Livingstone.
5. Garrow, J. S., & James, W. P. T. (1993). *Human nutrition and dietetics* (9th ed.). Churchill Livingstone.
6. Guthrie, H. A. (1986). *Introductory nutrition*. Times Mirror/Mosby College Publishing.
7. Stephenson, T. J., &Passerrello, C. (2024). *Human nutrition: Science for healthy living* (3rd ed.). McGraw Hill.
8. Swaminathan, M. (1985). *Advanced textbook on food and nutrition* (Vols. I & II). The Bangalore Printing and Publishing Co. Ltd.
9. Willett, W. C., & Skerrett, P. J. (2017). *Eat, drink, and be healthy: The Harvard Medical School guide to healthy eating*. Free Press.
10. Lanham-New, S. A., Hill, T. R., & Gallagher, A. M. (Eds.). (2019). *Introduction to human nutrition* (3rd ed.). Wiley-Blackwell.

3.4 Minor (Stream)

Course Title	**Institutional Food Service Management (Th)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Differentiate between various types of food service institutions and analyze their systems, delivery methods, and menu planning approaches. 2. Apply principles of management and personnel organization to optimize institutional food service operations. 3. Interpret legal regulations and integrate them into institutional food service practices. 4. Evaluate the processes of food standardization, cost control, and quality assurance in food service settings. 5. Develop standardized recipes and cost-effective menus to enhance operational efficiency in food service management.
Module 1(Credit 1) Institutional Food Service Systems and Operational Management	
Learning Outcomes	After learning the module, learners will be able to
	1. Identify different food service systems and explain their applications. 2. Create an institutional menu and apply food cost control methods. 3. Describe and evaluate food service equipment and food management tools. 4. Analyze food service organizations and their management structures.
Content Outline	**1.Types of Food Service Systems and food delivery systems** Institutional food service systems and food delivery methods. **2.Food Management** Characteristics of foods, purchasing of foods, storing of foods, and food costing for institutions. Types of menu. Factors affecting menu planning Basics of bulk cooking and food preparation for institutions. Methods for maintaining quality in large-scale food production. Managing kitchen and store room **3.Food Service Equipment and Management Tools** Understanding kitchen equipment and food management tools.

Module 2(Credit 1) Organizational Structure, Legal Framework, and Quality Assurance in Food Service	
Learning Outcomes	After learning the module, learners will be able to 1. Analyze food market trends and their impact on institutional food service. 2. Explain the laws related to food service institutions.
Content Outline	1. **Principles of Food Service Organization** Basics of management function of management and types of organizations in food services. 2. Laws for Food Service Operations- Regulatory policies governing institutional food services. 3. Personnel management 4. Quality Control and Job Allocation in Food Service
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) 1. Survey on food market trends 2. Presentation on food service laws and regulations 3. Presentation on food equipments	

References: -

1. Lillicrap, D. R., & Cousins, J. A. (2014). *Food and beverage service* (9th ed.). Hodder Education.
2. Kinton, R., &Ceserani, V. (2007). *Theory of catering*. Butterworth-Heinemann.
3. Mohini, S., & Surjeet, M. (1987). *Catering management: An integrated approach*. Wiley Eastern Ltd.
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5. Cousins, J., Foskett, D., & Gillespie, C. (2016). *Food and beverage management* (4th ed.). Routledge.
6. Payne-Palacio, J., & Theis, M. (2015). *Foodservice management: Principles and practices* (13th ed.). Pearson.
7. Spears, M. C., & Gregoire, M. B. (2019). *Foodservice organizations: A managerial and systems approach* (9th ed.). Pearson.
8. Sethi, M. (2011). *Institutional food management*. New Age International.
9. Singh, Y. (2017). *Catering and food service management*. Oxford University Press.
10. Foskett, D., & Paskins, P. (2021). *The theory of hospitality and catering* (14th ed.). Hodder Education.

3.5 OEC

Course Title	**Nutrition through Lifespan (Pr)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the physiological changes and evolving nutritional needs at various stages of the human lifespan. 2. Identify age-specific dietary requirements and relate them to growth, development, and health maintenance. 3. Apply the principles of balanced diet and meal planning to meet nutritional needs across life stages. 4. Analyze the influence of physiological, socio-economic, and cultural factors on food choices and dietary habits. 5. Design age-appropriate meal plans that address nutritional, cultural, and economic considerations.
Module 1(Credit 1) Principles of Balanced Diet and Meal Planning for Adults	
Learning Outcomes	After learning the module, learners will be able to
	1. Apply the fundamental principles of meal planning and its impact on health. 2. Use food guides, pyramids, and food exchange lists to design balanced diets. 3. Identify factors that affect meal planning, including activity levels and personal preferences. 4. Maintain and interpret a dietary record to assess nutritional intake. 5. Create meal plans for individuals with varying activity levels.
Content Outline	1. **Overview of Nutritional Requirements**: i. Basic principles of nutrition. ii. RDA for Macronutrient and micronutrient at various stages of life. 2. **Food Guide/Food Pyramid and its Use**: i. Understanding food groups, food pyramid and servings. ii. Practical application in meal planning. 3. **Balanced Diet**: i. Components of a balanced meal. ii. Adjusting portion sizes for various energy needs. 4. **Factors Affecting Meal Planning** 5. **Food Exchange List**: i. Concept of food exchange list ii. Designing diets using the food exchange system. 6. **Maintaining a Dietary Record**: i. Techniques to calculate nutrients intake from consumed food. 7. **Nutrition in Adulthood**: i. Nutritional needs of adults. ii. Planning meals for sedentary and moderate workers.
Module 2(Credit 1) Nutritional Needs Across Developmental Stages	

Learning Outcomes	After learning the module, learners will be able to 1. Examine the physiological changes during pregnancy and lactation and their impact on nutrient needs. 2. Design meal plans that meet the nutritional requirements during pregnancy and lactation. 3. Describe the nutritional needs of the different developmental stages, from infancy to adolescence. 4. Plan meals for various age groups, considering their specific growth and nutritional needs.
Content Outline	1. **Nutrition during Pregnancy and Lactation**: i. **Pregnancy**: Nutrient needs during each trimester, common complications, and dietary modifications. ii. **Lactation**: Nutritional requirements for breastfeeding mothers, promoting milk production, nutrient-dense foods and galactogogues. 2. **Nutrition during the Lifecycle**: i. **Infancy (0 to 2 years)**: Importance of breast-milk, breastfeeding. Bottle feeding and infant formula. Nutritional requirements and planning complementary feeding. ii. **Childhood (3-6 years, 7-9 years and 10-12 years boys and girls)**: Meal planning for growing children, ensuring proper development and combating common childhood nutritional issues. iii. **Adolescence (13-15 years and 16-18 years)**: Nutritional challenges during puberty, special needs for vitamins, minerals, and energy, and managing eating habits. Eating disorders. Meal planning for adolescents.
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) 1. Assignment on food pyramid 2. Assignment on 24 Hour recall 3. Planning and Cooking– Each plan to be evaluated **4.** Assignments on galactagogues, packed lunches, finger foods **5.**	

References: -

1. Mudambi, S. R., & Rajagopal, M. V. (2022). *Fundamentals of foods, nutrition and diet therapy* (5th ed.). New Age International Pvt. Ltd.
2. Indian Council of Medical Research (ICMR). (2020). *Nutrient requirements and recommended dietary allowances for Indians*. National Institute of Nutrition.
3. National Institute of Nutrition. (2017). *Indian food composition tables (IFCT)*. Indian Council of Medical Research.
4. Guthrie, H. A. (1989). *Introductory nutrition*. Times Mirror/Mosby College Publishing.
5. Guthrie, H. A. (1994). *Human nutrition*. William C. Brown.
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8. Robinson, C. H., & Lawler, M. R. (1990). *Normal and therapeutic nutrition* (17th ed.). Macmillan Publishing Co.
9. Roday, S. (2018). *Food science and nutrition* (3rd ed.). Oxford University Press.
10. Smith, A. M., Collene, A. L., & Spees, C. K. (2024). *Wardlaw's contemporary nutrition* (12th ed.). McGraw Hill.

3.7 Field Projects

Course Title	**Dietary surveys in the community (Pr)**
Course Credits	**2 (Pr)**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the principles and significance of dietary assessment methods. 2. Identify and analyze food consumption patterns across different population groups. 3. Apply appropriate tools and techniques to collect and interpret dietary intake data. 4. Evaluate the accuracy and reliability of dietary assessment data. 5. Develop reports and present dietary findings effectively.
Module 1(Credit 1) Introduction to Dietary Surveys	
Learning Outcomes	After learning the module, learners will be able to
	1. Recognise the importance of dietary surveys 2. Apply different survey methods 3. Plan a diet survey.
Content Outline	Introduction 1. Importance of dietary surveys in assessing nutritional status. 2. Overview of Survey Methods 24 hour recall, Food Frequency Questionnaire (FFQ), Diet Diversity Surveys Planning 1. Selecting the target population 2. Designing of questionnaire 3. Pilot study for validation of questionnaire
Module 2(Credit 1)	**Field Survey**
Learning Outcomes	After learning the module, learners will be able to
	1. Conduct field surveys 2. Analyze and interpret dietary data
Content Outline	Conducting field surveys 1. Collecting dietary intake data 2. Recording food habits, Meal Patterns Data analysis & Interpretation 1. Converting dietary intake data into nutrient intake 2. Comparing results with recommendations 3. Analyzing the data 4. Preparing the report & presentation
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) 1. Designing a questionnaire 2. Field project report writing 3. Presentation on the prepared report	

References: -

1. Gibson, R. S. (2005). *Principles of Nutritional Assessment* (2nd ed.). Oxford University Press.
2. FAO (2013).*Guidelines for Measuring Household and Individual Dietary Diversity.*

Semester: IV

4.1 Major (Core)

Course Title	**Design Thinking in Nutrition and Dietetics (2 Th+2 Pr.)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Identify and define complex nutritional challenges using user-centered research and empathy-based observation. 2. Apply design thinking tools to develop innovative, sustainable solutions in diet planning, food formulation, and nutritional interventions. 3. Prototype, test, and refine dietary programs or nutrition-focused products through iterative feedback loops. 4. Evaluate user needs, scientific feasibility, and healthcare implications to create impactful nutrition solutions. 5. Develop and present entrepreneurial business models in clinical nutrition, public health, or food technology, backed by real world problems and human-centric design principles.
Module 1(Credit 1 Th) Introduction to Design Thinking & Problem Identification in Nutrition	
Learning Outcomes	After learning the module, learners will be able to
	1. Understand the foundational principles of Design Thinking & Innovation (DT&I) in nutrition and dietetics. 2. Conduct user-centered research focusing on individual dietary needs, cultural eating habits, and nutritional gaps. 3. Define real-world dietary and nutrition-related challenges using user-centric data.
Content Outline	1. Overview of Design Thinking in Nutrition and Dietetics 2. Empathy-driven observation in clinical and public health nutrition 3. Identifying dietary patterns in diverse populations 4. Addressing nutrition-related health concerns such as obesity, malnutrition, and metabolic disorders 5. Research methods: ethnographic studies, dietary assessments, contextual inquiry 6. User journey mapping for personalized nutrition solutions
Module 2(Credit 1 Th) Analysis, Ideation, and Concept Development for Nutrition Solutions	
Learning Outcomes	After learning the module, learners will be able to
	1. Visually analyze and structure nutrition-related problems. 2. Apply ideation techniques to generate multiple solutions in meal planning, dietary interventions, and food development.

	3. Evaluate creative nutrition-based concepts, considering scientific feasibility and user acceptability.
Content Outline	1. Nutrition-focused problem analysis tools: food mapping, SWOT, consumer personas 2. Innovative ideation methods: brainstorming, SCAMPER, lateral thinking for diet solutions 3. Meal formulation concepts for specialized populations (e.g., athletes, children, elderly, medical patients) 4. Creativity techniques for diet planning and food innovation 5. Case studies of successful nutrition interventions and public health campaigns
Module 3(Credit 1 Pr) Prototyping and User Testing in Nutrition Innovation	
Learning Outcomes	After learning the module, learners will be able to
	1. Develop low-fidelity and high-fidelity prototypes for nutrition programs, food products, or digital solutions. 2. Conduct testing and gather meaningful user feedback for diet innovations. 3. Refine nutritional interventions or food formulations through iterative feedback cycles.
Content Outline	1. Types of nutrition-based prototypes: meal plans, functional food models, digital applications 2. Human-centered design in nutrition and dietary interventions 3. Prototyping tools and techniques for food and nutrition solutions 4. User testing methodologies: usability trials for diet plans, sensory analysis for food products 5. Ethical considerations in nutrition innovation, including food safety and consumer health
Module 4(Credit 1 Pr) Business Model Development & Market Implementation in Nutrition	
Learning Outcomes	After learning the module, learners will be able to
	1. Apply design thinking principles to develop viable nutrition and dietetics business models. 2. Plan for implementation, scaling, and sustainability of nutrition-based innovations. 3. Pitch a compelling nutrition-focused innovation, backed by research and prototyping.
Content Outline	1. Entrepreneurship in Nutrition and Dietetics 2. Business model development for nutrition startups and wellness programs 3. Market analysis for nutrition-centric products and services 4. Brand positioning and storytelling for food and diet innovations 5. Final project presentations: concept to market impact

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

Suggested Sample Student Projects

1. Digital App for Diet Diversity in Rural India and Dietary recommendations

2.Smart Nutritional Meal Kit for Diabetic Patients

3.Community-Based Nutrition Awareness Program

Reference Books:

1. Brown, T. (2009). *Change by design: How design thinking creates new alternatives for business and society*. Harvard Business Press.
2. Liedtka, J., & Ogilvie, T. (2011). *Designing for growth: A design thinking tool kit for managers*. Columbia University Press.
3. Kelley, T., & Kelley, D. (2013). *Creative confidence: Unleashing the creative potential within us all*. Crown Business.
4. Osterwalder, A., Pigneur, Y., Bernarda, G., & Smith, A. (2014). *Value proposition design: How to create products and services customers want*. Wiley.
5. Martin, R. L. (2009). *The design of business: Why design thinking is the next competitive advantage*. Harvard Business Press.
6. Yadav, S., & Sharma, D. (2016). *Entrepreneurship in the food processing sector*. LAP Lambert Academic Publishing.
7. Francis, F. J., & Smith, R. (2013). *Food product development: From concept to the marketplace*. Springer.
8. Wided Batat, Design Thinking for Food Well-Being, The Art of Designing Innovative Food Experiences, Springer International Publishing (2021)

4.2 Major (Core)

Course Title	**Medical Nutrition Therapy I (2 Th+2 Pr)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Recognize the impact of nutrition on overall health and its role in disease prevention and management. 2. Comprehend the causes and risk factors of various diseases and their nutritional implications. 3. Analyze the metabolic and physiological alterations occurring in different disease conditions. 4.Modify normal diets to meet the nutritional needs of individuals with specific health conditions 5. Apply medical nutrition therapy principles to prevent and manage diseases through dietary interventions. 6.Develop practical meal planning skills
Module 1(Credit 1 Th) Essentials to Therapeutic Diets and Medical Nutrition Therapy	
Learning Outcomes	After learning the module, learners will be able to
	1. Design therapeutic diets. 2. Apply Medical Nutrition Therapy for Anemia. 3. Analyse nutritional needs in infections and fevers. 4. Execute weight management techniques
Content Outline	**Therapeutic Diets** **1. Routine Hospital Diets** a. Clear fluid Diet b. Full fluid Diet c. Soft diet d. Regular normal Diet **2. Special Feeding Methods** a. Enteral Nutrition- Tube feeds b. Parenteral Nutrition **3.Medical Nutrition Therapy in:** **1. Anemia** Etiology Iron Deficiency Anemia Megaloblastic Anemia Dietary Modifications **2. Infections & Fevers** Effects of infection and metabolic changes in fevers Dietary considerations and modifications in Influenza, Typhoid, Tuberculosis **3. Weight Management** **a. Obesity** Etiology, Role of Hormones, Assessment, Types, Dietary considerations & modifications **b.Underweight** Etiology, Dietary considerations & modifications

Module 2(Credit 1 Th)	**Medical Nutrition Therapy in gastro-intestinal disorders**
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the physiology of the gastrointestinal tract and liver 2. Recognize the pathophysiology of liver diseases 3. Apply medical nutrition therapy got GI disorders and liver diseases
Content Outline	1.Review of Gastro intestinal tract physiology 2.Review of pathophysiology of liver diseases 3.Interpretation of laboratory values relevant to disease conditions. **4.Medical Nutrition Therapy in:** **(**Etiology, symptoms, Dietary considerations & modifications for the following) 1. Diarrhea 2. Lactose intolerance 3. Constipation 4. Irritable bowel syndrome 5. Ulcerative colitis 6. Celiac disease 7. Gastritis 8. Peptic ulcer 9. Dumping syndrome 10. Hepatitis 11. Cirrhosis 12. Pancreratitis
Module 3(Credit 1 Pr)	**Basic Therapeutic Modifications**
Learning Outcomes	After learning the module, learners will be able to
	1. Modify the diet for consistency and texture 2. Apply therapeutic diet modifications for specific conditions 3. Integrate nutritional principles to manage weight and anemia 4. Consider practical aspects in therapeutic meal planning
Content Outline	1.Modification of diet for consistency and texture 2.Therapeutics Modification of diet for a. Anemia b. Fevers (Typhoid, Tuberculosis) c. Weight management (Obesity, Underweight) d. Anemia & weight management
Module 4(Credit 1Pr)	**Therapeutic modifications in GI tract ,liver and Pancreatic disorders**
Learning Outcomes	After learning the module, learners will be able to
	1. Modify diets for gastrointestinal and liver disorders 2. Apply nutritional principles for specific conditions 3. Consider practical aspects of therapeutic meal planning 4. Interpret biochemical reports
Content Outline	1. Interpretation of biochemical reports for planning Medical Nutrition Therapy (MNT) for a. Constipation b. Diarrhea c. Peptic ulcer d. Hepatitis e. Cirrhosis

	f. Pancreatitis

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

1. Assignment on pathophysiology, lab reports, interpretation
2. Assignment on special feeding methods
3. Survey on meal replacers in the market
4. Analysis of a sample biochemical report. Provide a case with lab values Interpret the values. Plan dietary modifications based on the findings.

References: -

1. Mahan, L. K., Raymond, J. L., & Escott-Stump, S. (2020). *Krause's food & the nutrition care process* (15th ed.). Elsevier.
2. Nelms, M., Sucher, K. P., Lacey, K., & Roth, S. L. (2022). *Nutrition therapy and pathophysiology* (4th ed.). Cengage Learning.
3. Escott-Stump, S. (2011). *Nutrition and diagnosis-related care* (7th ed.). Wolters Kluwer/Lippincott Williams & Wilkins
4. Williams, S.R. (2016): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby College Publishing.
5. Sharma, A**.** (2017). *Principles of therapeutic nutrition and dietetics.* CBS Publishers
6. Joshi, S. A**.** (2021). *Nutrition and dietetics* (5th ed.). McGraw Hill.
7. Jatana, A**.** (Ed.). (2022). *Apollo clinical nutrition handbook*. Jaypee Brothers Medical Publishers.
8. Indian Dietetic Association**.** (2018). *Clinical dietetics manual* (2018th ed.). Elite Publishing House.

4.3 Major (Core)

Course Title	**Human Nutrition II (Th)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Describe the classification, dietary sources, requirements, and functions of fat-soluble and water-soluble vitamins. 2. Explain the physiological roles, deficiency symptoms, and toxicities of essential vitamins and minerals. 3. Analyze the impact of vitamin and mineral imbalances on human health and metabolic functions. 4. Evaluate the interrelationships among nutrients and their collective influence on health and nutrition. 5. Design evidence-based strategies to improve micronutrient intake in diverse population groups.
Module 1(Credit 1) Fat-Soluble Vitamins – Functions, Sources, and Health Implications	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the classification and functions of fat-soluble vitamins (A, D, E, K). 2. Identify major food sources of fat-soluble vitamins. 3. Explain the effects of deficiencies and toxicities of fat-soluble vitamins.
Content Outline	1. Introduction to Vitamins: History, Classification (Water-soluble & Fat-soluble) 2. Fat-Soluble Vitamins (A, D, E, K): i. Sources, Bioavailability, Metabolism ii. Physiological Functions iii. Deficiency Disorders and Toxicity iv. Dietary Requirements and Factors Affecting Absorption v. Interactions with Other Nutrients and Impact on Health
Module 2(Credit 1) Water-Soluble Vitamins – Nutritional Roles and Requirements	
Learning Outcomes	After learning the module, learners will be able to:
	1. Differentiate between various water-soluble vitamins (Vitamin C, B-complex group) and their metabolic roles. 2. Assess the dietary requirements and sources of water-soluble vitamins. 3. Analyze the consequences of deficiency and excess intake ofwater-soluble vitamins.
Content Outline	**Water Soluble Vitamins** i. Sources, Bioavailability, Metabolism

	ii. Physiological Functions iii. Deficiency Disorders and Toxicity iv. Dietary Requirements and Factors Affecting Absorption Interactions with Other Nutrients and Impact on Health 1. Vitamin C 2. Thiamin 3. Riboflavin 4. Niacin (Tryptophanconversion and Niacin Equivalent) 5. Pyridoxin 6. Cynocobalamin 7. Folic acid
Module 3(Credit 1) Macro Minerals – Metabolism, Functions, and Health Significance	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the roles of macro minerals in the body, dietary sources, RDA, and functions of calcium, phosphorus, sodium, potassium and magnesium in the body. 2. Evaluate the health risks associated with mineral imbalances.
Content Outline	**Macro Minerals :** i. Sources, Bioavailability, Metabolism ii. Physiological Functions iii. Deficiency Disorders and Toxicity iv. Dietary Requirements and Factors Affecting Absorption v. Interactions with Other Nutrients and Impact on Health 1. Calcium 2. Phosphorus 3. Sodium 4. Potassium 5. Magnesium
Module 4(Credit 1) Micro Minerals and Trace Elements – Essentials for Health	
Learning Outcomes	After learning the module, learners will be able to
	1. Recognize the significance in human health. 2. Describe the functions, sources, and recommended intake of iron, iodine, zinc, selenium, copper, and chromium.
Content Outline	**Micro Minerals and Trace Elements** i. Sources, Bioavailability, Metabolism ii. Physiological Functions iii. Deficiency Disorders and Toxicity iv. Dietary Requirements and Factors affecting absorption v. Interactions with Other Nutrients and Impact on Health 1. Iron 2. Iodine 3. Zinc 4. Selenium 5. Copper 6. Chromium

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

1. Assignment on info graphics on Vitamin Deficiencies
2. Presentation on Vitamin Deficiency Disorders
3. Assignment on Mineral Deficiencies and Public Health Impact
4. Assignment on function, sources and deficiencies of nutrients

References: -

1. Whitney, E., & Rolfes, S. R. (2018). *Understanding nutrition* (15th ed.). Cengage Learning.
2. Wardlaw, G. M., Smith, A. M., & Collene, A. L. (2021). *Contemporary nutrition* (12th ed.). McGraw-Hill Education.
3. Sizer, F. S., & Whitney, E. (2020). *Nutrition: Concepts and controversies* (15th ed.). Cengage Learning.
4. Smolin, L. A., & Grosvenor, M. B. (2019). *Nutrition: Science and applications* (4th ed.). Wiley.
5. Guthrie, H. A., & Picciano, M. F. (1995). *Human nutrition* (2nd ed.). Mosby.
6. Bamji, M. S., Krishnaswamy, K., &Brahmam, G. N. V. (2009). *Textbook of human nutrition* (3rd ed.). Oxford & IBH Publishing Co. Pvt. Ltd.
7. Swaminathan, M. (1985). *Advanced textbook on food and nutrition* (Vols. 1 & 2). The Bangalore Printing and Publishing Co. Ltd.
8. Margaret S. Chaney, Mararet L Ross.(2014) Nutrition. Houghton, Mifflin.

4.4 OEC

Course Title	**Nutrition in Health & Disease (Pr)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to:
	1.Describe Nutrient Functions 2. Analyze the impact of nutritional factors on physical and psychological aging. 3. Evaluate dietary modifications for common health concerns at different life stages. 4.Identify Nutrition-Related Diseases 5. Design appropriate meal plans by considering physiological, socio-economic, and cultural factors. 6.Analyze the Relationship Between Nutrition and Disease
Module 1(Credit 1) Nutrition for the Elderly and Common Health Conditions	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the physiological and metabolic changes associated with aging. 2. Identify the nutritional needs and common deficiencies in older adults. 3. Apply dietary modifications for managing diarrhea, constipation, and fever. 4. Evaluate the role of iron in preventing and managing iron deficiency anemia.
Content Outline	1. **Nutritional Considerations for the Elderly:** Understanding age-related changes in digestion, metabolism, and nutrient absorption. Meal planning for elderly. 2. **Dietary Modifications for Common Health Issues:** i. **Diarrhea:** Identifying causes, symptoms, and dietary strategies for management, including hydration and fiber intake. ii. **Constipation:** Importance of fiber, hydration, and specific dietary interventions to promote gut health. iii. **Fever:** Nutritional support for recovery, including hydration, energy-dense foods, and immune-boosting nutrients. 3. **Iron Deficiency Anemia:** Causes, risk factors, symptoms, and dietary strategies to improve iron intake, absorption, and overall management.
Module 2(Credit 1) Nutrition and Metabolic Health	
	After learning the module, learners will be able to

Learning Outcomes	1. Describe the role of diet in weight management and metabolic disorders. 2. Differentiate between underweight, overweight, and obesity in terms of causes, health risks, and nutritional management and dietary modifications. 3. Develop personalized dietary modifications for individuals with hypertension and type 2 diabetes.
Content Outline	1. **Dietary Modifications for Weight Management:** i. **Underweight:** Identifying causes, health risks, and dietary approaches to achieve healthy weight gain through nutrient-dense meals. ii. **Overweight and Obesity:** Understanding contributing factors, health risks, and the role of balanced diets, portion control, and lifestyle modifications. 2. **Dietary Interventions for Metabolic Disorders:** i. **Hypertension:** Role of sodium, potassium, DASH diet principles, and lifestyle interventions in managing high blood pressure. ii. **Type 2 Diabetes:** Importance of glycemic control, carbohydrate management, and meal planning strategies for optimal blood sugar regulation.
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) a. Assessment of Meal Planning b. Interpretation and designing meal plans based on different case study c. Journal writing	

References: -

1. Mudambi, S. R., & Rajagopal, M. V. (2022). *Fundamentals of foods, nutrition and diet therapy* (5th ed.). New Age International Pvt. Ltd.
2. Indian Council of Medical Research (ICMR). (2020). *Nutrient requirements and recommended dietary allowances for Indians*. National Institute of Nutrition.
3. National Institute of Nutrition. (2017). *Indian food composition tables (IFCT)*. Indian Council of Medical Research.
4. Guthrie, H. A. (1989). *Introductory nutrition*. Times Mirror/Mosby College Publishing.
5. Guthrie, H. A. (1994). *Human nutrition*. William C. Brown.
6. Joshi, S. (2021). *Nutrition and dietetics*. McGraw Hill Higher Education.
7. Mudambi, S. R., & Rajagopal, M. V. (2022). *Fundamentals of foods and nutrition* (7th ed.). New Age International Pvt. Ltd.
8. Maharashtra State Board of Secondary and Higher Secondary Education. (2012). *Food science* (1st ed.). Sheth Publications.
9. Robinson, C. H., & Lawler, M. R. (1990). *Normal and therapeutic nutrition* (17th ed.). Macmillan Publishing Co.
10. Roday, S. (2018). *Food science and nutrition* (3rd ed.). Oxford University Press.
11. Smith, A. M., Collene, A. L., & Spees, C. K. (2024). *Wardlaw's contemporary nutrition* (12th ed.). McGraw Hill.

4.4 OEC

Course Title	**Clinical Pathophysiology (Pr)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to 1. Explain the anatomy and physiology of different organ systems. 2. Apply knowledge of normal anatomy and physiology to promote a clear understanding of disease processes 3. Describe the pathogenesis and etiology, of various diseases 4. Identify the clinical manifestations of various diseases. 5. Describe how pathophysiological aberrations of organ systems influence each other's functioning
Module 1 (Credit 1) Pathophysiology of Gastrointestinal, Cardiovascular, Hepatobiliary, and Renal Systems	
Learning Outcomes	1. Explore the pathophysiology of gastrointestinal disorders like reflux disease, ulcers, and inflammatory bowel diseases 2. Examine the pathophysiology of cardiovascular conditions like hypertension, coronary artery disease, and heart failure 3. Explain the pathophysiology of liver, gallbladder, and pancreatic disorders 4. Describe the pathophysiology of excretory system disorders such as chronic kidney disease, nephritis, and renal failure.
Content Outline	1. Disorders of the gastrointestinal systems including GERD, ulcers, and inflammatory bowel diseases. 2. Pathophysiology of cardiovascular disorders including hypertension, coronary artery disease, and heart failure. 3. Disorders of Liver, Gall bladder & Pancreas (e.g., cirrhosis, hepatitis), gallbladder disorders (e.g., cholelithiasis), and pancreatic disorders (e.g., pancreatitis, diabetes). 4. Disorders of the excretory system: chronic kidney disease, nephritis, and renal failure.
Module 2(Credit 1) Pathophysiology of Metabolic, Endocrine, Skeletal, and Respiratory Disorders	
Learning Outcomes	After learning the module, learners will be able to 1. Explore the pathophysiology of malnutrition, and metabolic disorders affecting energy metabolism and weight management. 2. Explain the pathophysiology of common endocrine disorders such as diabetes, thyroid dysfunction, and adrenal diseases. 3. Correlate the mechanisms behind bone diseases and skeletal disorders like osteoporosis, osteoarthritis, and fractures. 4. Describe the pathophysiology of respiratory disorders, including asthma, COPD, and pneumonia.
Content Outline	1. Pathophysiological changes during obesity, malnutrition, and metabolic disorders in energy metabolism and weight management. 2. Disorders of the Endocrine system including diabetes, thyroid dysfunction, and adrenal diseases.

	3. Pathophysiology of Bone Diseases and Skeletal Disorders such as osteoporosis, osteoarthritis, and bone fractures. 4. Disorders of the Respiratory system such as asthma, chronic obstructive pulmonary disease (COPD), and pneumonia.
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) Group assignments on pathophysiology of different organ systems Case Studies/ Report interpretation	

References:

1. Levison, D., Reid, R., Burt, A.D., Harrison, D.J., & Fleming, S. (Eds.). (2008). Muir's Textbook of Pathology (14th ed.). CRC Press.
2. Tortora G. J., Derrickson B. (2009). Principles of Anatomy and Physiology. (12thed.). USA:John Wiley & Sons, Inc.
3. Kumar, V., Abbas A. K., Fausto N. (2008). Robbins &Cotran Pathologic Basis of Disease (7thed.). Pennsylvania: Saunders Elsevier, Inc.
4. Porth C. (2011). Essentials of Pathophysiology: Concepts of Altered Health States. (3rded.).
   Philadelphia: Wolters Kluwer/ Lippincott Williams and Wilkins.
5. Krause's Food & the Nutrition Care Process - E-Book: Krause's Food & the Nutrition Care Process - E-Book A Mahan, L.K. 9780323340762

4.5 SEC

Course Title	**Basic Food Science (Pr)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the role and functions of various food components in cooking and nutrition. 2. Identify physical and chemical changes occurring in foods during different cooking methods. 3. Analyze the effects of cooking techniques on the texture, flavor, and nutritional value of foods. 4. Conduct basic food science experiments to observe food behavior under controlled conditions. 5. Interpret experimental results to demonstrate food science principles.
Module 1(Credit 1) Sugar, Starch, and Fat Cookery	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the stages in sugar syrups and its application 2. Examine the characteristics of starch gels and determine the factors affecting them 3. Describe the role of gluten and factors affecting gluten formation 4. Explain the shortening effect of fat 5. Analyse the factors affecting fat absorption
Content Outline	**1. Sugar and Starch Cookery** i. Preparation of sugar syrups: 1 thread, 2 thread soft ball, crack stage, etc ii. Starch gels and factors affecting gel formation iii. Factors affecting gluten formation i.e. kneading time, types of cereal and flours, effect of amount of fat etc. 2. **Fat Cookery** i. Shortening effect of fat ii. Factors affecting fat absorption
Module 2(Credit 1) Milk and Egg Cookery	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain milk protein coagulation 2. Identify Maillard reaction in milkbased products 3. Explain the effect of heat and acid on egg proteins 4. Elaborate the role of egg as leavening and emulsifying agent

Content Outline	**1. Milk Cookery** i. Coagulation of milk proteins with lactobacilli (Curd formation, Hung curds) ii. Coagulation of milk proteins with acid (Paneer) iii. Non enzymatic browning (Maillard reaction) **2. Egg Cookery-** i. Denaturation & Coagulation of egg proteins due to heat at different temperatures (soft boiled, hard boiled egg) ii. Denaturation & Coagulation of egg proteins due to acid (poached egg) iii. Egg as leavening agent (soft peak, hard peak stage) iv. Egg as emulsifying agent (mayonnaise)
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) 1. Performance of Practical activities in the laboratory. Each practical to be evaluated. 2. Journal writing	

References: -

1. Bennion, M., & Scheule, B. (2009). *Introductory Foods* (13th ed.). Prentice Hall.
2. Manay, S., &Shadaksharaswamy, M. (2010). *Food Facts and Principles* (3rd ed.). New Age International Publishers.
3. Potter, N. N., & Hotchkiss, J. H. (1999). *Food Science* (5th ed.). Springer.
4. Srilakshmi, B. (2023). *Food Science* (8th ed.). New Age International Pvt Ltd Publishers
5. Sharma, A. (2019). *Textbook of food science and technology* (3rd ed.). CBS Publishers & Distributors.
6. Subbulakshmi, G., & Udipi, S. A. (2006). *Food Processing and Preservation*. New Age International Pvt Ltd Publishers**.**

4.7 CE

Course Title	**Community Nutrition (Pr)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Identify and evaluate the dietary habitsof the community. 2. Design and conduct nutrition educationfor the community. 3. Use behavioral change models, culturally appropriate messaging, and interactive methods to engage the community. 4. Assess changes in knowledge, attitudes, and behaviors. 5. Work collaboratively with local organizations, NGOs, and government agencies while upholding ethical standards in community work.
Module 1(Credit 1) Understanding Community Nutrition & Outreach Strategies	
Learning Outcomes	After learning the module, learners will be able to
	1. Conduct a preliminary community nutrition needs assessment. 2. Design educational materials (posters, pamphlets, digital content). 3. Practice communication techniques through role-play and group discussions.
Content Outline	1**.Introduction to Community Nutrition** i. Definition, scope, and importance in public health. **ii.** Common nutritional deficiencies and diet-related diseases**.** 2**.Principles of Community Engagement** i. Understanding community dynamics and cultural considerations. ii. Role of students in promoting nutrition awareness. 3**.Planning & Designing Nutrition Awareness Programs** i. Identifying target groups (children, pregnant women, elderly, etc.). ii. Developing culturally appropriate messages and educational materials. iii. Behavior Change Communication (BCC) techniques for effective outreach.
Module 2(Credit 1) Implementing & Evaluating Community-Based Nutrition Initiatives	
Learning Outcomes	After learning the module, learners will be able to
	1. Implement nutrition awareness activities in real-world community settings. 2. Assess the impact of nutrition education on community behavior. 3. Develop strategies to sustain nutrition awareness efforts in communities.
Content Outline	**1.Executing Community-Based Nutrition Awareness Activities** i. Conducting nutrition education sessions in schools, anganwadis, and community centers.

	ii. Organizing interactive workshops (healthy cooking demonstration, quizzes, storytelling). **2.Monitoring & Evaluating Community-Based Nutrition Interventions** i. Data collection methods ii. Nutrition awareness programs iii. Measuring the effectiveness of awareness activities. **3.Sustaining Community Nutrition Awareness Efforts** i. Encouraging local participation and leadership. ii. Collaborating with NGOs, government bodies, and educational institutions.
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) 1. Conducting dietary survey 2. Planning and conducting nutrition education program in the community	

References: -

1. Boyle, M. A., & Holben, D. H. (2017). *Community nutrition in action: An entrepreneurial approach* (7th ed.). Cengage Learning.
2. Nnakwe, N. (2018). *Community nutrition: Planning health promotion and disease prevention* (3rd ed.). Jones & Bartlett Learning.
3. American Public Health Association. (2020). *Strategic skills for public health practice: Community engagement*. American Public Health Association Press.
4. Pinstrup-Andersen, P., Pelletier, D., & Alderman, H. (Eds.). (1995). *Child growth and nutrition in developing countries: Priorities for action*. Cornell University Press.
5. Khanapurkar, U., &Khanapurkar, A. (2020). *Community nutrition, hygiene and public health*. Amazon Digital Services LLC.
6. Vyas, S. (2021). *Nutrition Education and Program Planning: A Reference Book*. Nitya Publications.
7. Ministry of Women and Child Development. (2017). *Training Manual on Food Safety & Nutrition Awareness Raising*.
8. SPRING. (2016). *India Maternal, Infant, and Young Child Community Nutrition Training Package*.