SNDT Women's University, Mumbai

M.Sc.

(Home Science- Clinical Nutrition & Dietetics)

NEP-2020 Syllabus

w.e.f. Academic Year 2023-24

SNDT Women's University, Mumbai

M.Sc. (Clinical Nutrition and Dietetics)

2023

Programme Degree		M.Sc.
Specialization		(Clinical Nutrition and Dietetics)
Preamble		Nutrition is the science and art of applying the principles of nutrition therapy and food science to attain and maintain human health. Dieticians and Nutritionists are paramedical healthcare professionals, who with their nutritional, food science and human nutrition knowledge help in achieving and maintaining good health. At the end of this Programme, the learners obtain skill sets to work as paramedical health professionals. They will be equipped to work as Dietitians and Clinical Nutritionists in the hospitals or have their own consultancy
Programme Specific Outcomes (POs)		After completing this programme, Learner will be able to:
	1.	Apply the knowledge of Clinical Nutrition and Dietetics, Medical Nutrition Management.
	2.	Develop capacities to become health care professionals for services in various fields of clinical nutrition and medical nutrition management and related areas such as hospitals academics, research, industry, clinical nutrition department, training, extension and community service.
	3.	Develop abilities including analysis, critical reasoning and use their creativity to become professionals in these and related areas to work effectively and efficiently in Academics, research, training, extension and community service.
	4.	Have the necessary capacities and abilities and enable them to Pursue higher education and research in Clinical Nutrition and Dietetics
	5.	Participate effectively as responsible and ethical professionals who can contribute substantially to national Development and quality of life of citizens.
Eligibility Criteria for the Programme		Any student who has passed 12th Standard/HSc/10+2 with Science and successfully completed graduation in Nutrition related subjects with minimum 50%/B Grade is eligible. Students with Commerce/Arts/Pure Science are not eligible. Students who have done B.Sc. Composite Home Science/ BA Home Economics/ Home Science/ BSc. Hospitality/ Institutional/ Food Service Management are not eligible. Students having graduation in Life Science, Bio Chemistry, and

	Physiology are eligible provided they have secured a minimum of 60% or 'A' grade in their Undergraduate degree and have studied minimum eight credits of nutrition/Physiology/bio-chemistry related subjects in their graduation
Intake (For SNDTWU Departments and Conducted Colleges)	40
RM: Research Methodology * OJT: On-Job Training * RP: Research Project	

Postgraduate Programme
2023
M.Sc. Clinical Nutrition & Dietetics

SN	*Courses*	*Type of Course*	*Credits*	*Marks*	*Int*	*Ext*
Semester I						
114411	Physiological Biochemistry (Th)	Major (Core)	4	100	50	50
114412	Human Physiology and Pathophysiology (Th)	Major (Core)	4	100	50	50
114413	Medical Nutrition Therapy - I Th.	Major (Core)	4	100	50	50
114424	Medical Nutrition Therapy - I Pr.	Major (Core)	2	50	0	50
124411/ 124412/ 124413	*Introduction to Entrepreneurship OR Clinical Diagnostics OR Advanced Nutrition I (Macronutrients)	Major (Elective)	4	100	50	50
134411	Research Methodology	Minor Stream (RM)	4	100	50	50
End of Semester I			**22**	**550**	**250**	**300**
Semester II						
214411	Advanced Nutrition II (Micronutrients)	Major (Core)	4	100	50	50
214412	Nutritional Assessment	Major (Core)	4	100	50	50
214413	Medical Nutrition Therapy - II Th.	Major (Core)	4	100	50	50
214424	Medical Nutrition Therapy - II Pr.	Major (Core)	2	50	0	50
224411 224412 2244	Hospital, Personnel and Food Service Management / Food Safety OR Nutrition for Exercise and Fitness	Major (Elective)	4	100	50	50
244441	Internship**	OJT	4	100	50	50
Exit with PG Diploma in Dietetics			**22**	**550**	**250**	**300**

Exit option: (44 credit) (** recommend to undertake 6 months' internship)

Year II

Sr.No.	*Courses*	*Type of Course*	*Credits*	*Marks*	*Int*	*Ext*
Semester III						
314411	Research and Statistical Application	Major (Core)	4	100	50	50
314412	Pediatric Nutrition	Major (Core)	4 (2+2)	100	50	50
314413	Geriatric Nutrition	Major (Core)	4	100	50	50
314414	Nutrition in Critical Care	Major (Core)	2	50	0	50
324421/ 324422	Functional Foods and Nutraceuticals / Drug Nutrient Interaction	Major (Elective)	4	100	50	50
354431	Research Project	RP	4	100	50	50
End of Semester III			**22**	**550**	**250**	**300**
Semester IV						
414411	Nutrigenetics and Nutrigenomics	Major (Core)	4	100	50	50
414412	Nutrition, Diet and Microbiome	Major (Core)	4	100	50	50
414413	Dietetic Techniques and Patient Counseling	Major (Core)	4 (2+2)	100	50	50
424411/ 424412	*Principles of Ayurvedic Dietetics / Public Nutrition and Health	Major (Elective)	4	100	50	50
454431	Dissertation	RP	6	150	100	50
End of Semester IV			**22**	**550**	**300**	**250**

*Elective subjects will be offered only if there are a minimum of 10 students for the respective selected course.

#Nutrition in Diabetes Care / Cardiometabolic Health / Renal Nutrition/ Nutrition in Cancer will be offered as value-added course.

Syllabus Contents
Semester I

1.1 Major Core

Course Title	**Physiological Biochemistry**
Course Credits	4
Course Outcomes	After going through the course, learners will be able to -
	1.Discuss the mechanisms adopted by the human body for regulation of metabolic pathways
	2. Describe biochemical pathways relevant in nutrient metabolism.
	3. Develop an insight into interrelationships between various metabolic pathways.
	4. Discuss the integration of cellular level metabolic events to nutritional disorders and imbalances.
	5. Review biochemical techniques that are relevant for the investigation of nutrient metabolism.
Module 1 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to-
	1. Define and differentiate the structure, composition of Membrane
	2. Illustrate the cell signaling pathways
Content Outline	1. Membrane structure, composition and transport of metabolites across membranes 2. Acid base balance and its regulation 3. Enzymes . Kinetics of monosubstrate and bi substrate catalysed reactions (including inhibition) . Enzyme specificity, regulation of enzyme activity and synthesis . Enzymes in clinical diagnosis. Detoxification in the body- metabolism of xenobiotics (Phase I and Phase II enzymes) 5. Cell Signaling pathways- Overview of extracellular cell signaling, G protein couple receptors and their effectors, enzyme linked receptors and their effectors, second messengers, map kinase pathways 6. Free radicals, ROS and oxidative damage
Module 2 (Credit 1)	

Learning Outcomes	After learning the module, learners will be able to -
	1. Discuss the metabolism of carbohydrates, lipids and protein
Content Outline	1. Carbohydrate Metabolism- a. Intestinal transport of carbohydrates, Transport of glucose across various cells, Cellular metabolism of carbohydrates Glycogen metabolism Regulation of carbohydrate metabolism at substrate level, enzyme level, hormonal level and organ level, b. Disorders of carbohydrate metabolism. c. Definition, classification, structure and properties of glycoproteins and proteoglycans 2. Metabolism of Lipids- a. Metabolism is to be discussed with reference to: Intestinal transport of lipids, Cellular uptake and metabolism of lipids (beta-oxidation, de novo synthesis of fatty acids, synthesis and breakdown of unsaturated fatty acids, cholesterol, phospholipids and triacylglycerol) Lipoprotein metabolism, VLDL and LDL ('Forward' Cholesterol transport) VLDL and LDL (Endogenous TAG transport), HDL ('Reverse' Cholesterol transport), b. Regulation of lipid metabolism at substrate level, enzyme level, hormonal level and organ level, Disorders of lipid metabolism, Dyslipidaemias, Lipid storage diseases 3. Protein Metabolism- a. Metabolism of amino acids- biosynthesis and catabolism - energy, glucose and ketone bodies, protein amino acids, non-protein amino acids (including urea cycle, transamination, one-carbon metabolism), b. Creatine and creatinine, c. Plasma proteins – Nature, properties and functions, d. Biologically active peptides, polypeptides and transport proteins, Inborn errors of amino acid metabolism
Module 3 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	1. Describe the intermediary metabolism of human body.
	2. Define biological oxidation.
Content Outline	1. Intermediary Metabolism- a. Review of regulation of intermediary metabolism- equilibrium and non-equilibrium reactions, committed steps, allosteric modifications, covalent modulation, hormonal induction and repression, crossover theorem, starve-feed cycle, caloric homeostasis and futile cycles, Tricarboxylic acid cycle 2. Biological Oxidation: Electron transport chain and oxidative phosphorylation
Module 4 (Credit 1)	

Learning Outcomes	After learning the module, learners will be able to – 1. Define the metabolism of purine and pyrimidines. 2. Analyze the metabolism of DNA, RNA.
Content Outline	1. Biochemical aspects of purine and pyrimidines- a. Metabolism of purines b. Metabolism of pyrimidines c. Role of purine and pyrimidine nucleotides in metabolism. 2. Biochemistry of Nucleic Acids- a. Metabolism of DNA b. Metabolism of RNA c. DNA replication, mutation, repair and recombination concepts d. Disorders of nucleic acid metabolism 3. Protein Biosynthesis- a. Gene expression and its regulation, transcription, translation, post-translational modification b. Inhibitors of protein biosynthesis c. Gene expression in mitochondria Systems Biology including Metabolomics and Proteomics
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE): ● Illustrate macronutrient metabolism in the form of flow chart ● Library review assignment and reading of research papers ● Creating communication material about metabolism and related topics and making presentation.	

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- Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009): Harpers Biochemistry. Macmillan Worth Publishers.
- Nelson, D.L. and Cox, M.M. (2008): Lehninger's Principles of Biochemistry, Macmillan Worth Publishers.
- Plummer, D.T. (1987). 3rd ed. An Introduction to Practical Biochemistry. McGraw-Hill Book Co.
- Stryer, L. (2002): Biochemistry, WH Freeman and Co.
- Tietz, N.W. (1996) Fundamentals of Clinical Chemistry. WB SaundersCo.
- Voet, D. Voet, J.G. and Pratt, C.W. (2016). Fundamentals of Biochemistry.

1.2 Major(Core)

Course Title	**Human Physiology and Pathophysiology**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the pathophysiological changes in different organs, tissues and systems in different disease conditions across the lifespan.
	2. Discuss the metabolic changes occurring in disease conditions.
	3. Comprehend the implications of functional interrelationships in a diseased body.
	4. Interpret the various diagnostic indicators/parameters
	5. Apply this knowledge for planning nutritional care of individuals.
Module 1 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	1. Analyze the concepts of pathophysiology
Content Outline	● Basic concepts of pathophysiology and metabolism of adaptation a. Altered cellular and tissue biology b. Fluid and electrolyte, acids and bases c. Immunity d. Inflammation e. Hypersensitivity, infection and Immunodeficiency f. Stress and Disease g. Musculoskeletal system-Biochemistry and Pathophysiology, Osteoporosis, Osteomalacia, Osteoarthritis ● Cellular Proliferation and Cancer a. Biology of Cancer b. Tumor spread and treatment c. Clinical manifestations of cancer
Module 2 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Discuss the metabolic derangements leading to diseased condition 2. Interpret the markers

Content Outline	● Endocrine System a. Mechanisms of hormone regulation b. Alteration of hormonal regulation c. Hypo and Hyper functions of Pituitary, Adrenal cortex and medulla, Hypo and Hyperthyroidism d. Type I, Type II and other types of Diabetes ● Markers used and its interpretation
Module 3 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	1. Illustrate the pathophysiology of the digestive system and their functional interrelationship 2.Interpret the markers
Content Outline	● Digestive system: Biochemistry and Pathophysiology a. Manifestations of gastrointestinal dysfunction, b. Acute and chronic gastritis, Ulcers c. Malabsorption syndrome d. Pancreatic insufficiency and Pancreatitis e. Liver dysfunction, Hepatitis, Cirrhosis, Cholelithiasis f. Ulcerative colitis, Crohn's disease ● Renal and Urological Biochemistry and Pathophysiology a. Alteration of renal and urinary tract function b. Urinary tract obstruction, kidney stones, c. Cystic pyelonephritis, glomerulonephritis, nephritic syndrome, renal failure. Markers used and its interpretation
Module 4 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	1. Describe the hematological function and interpret the markers 2. Explain the pathophysiology of cardiovascular system 3. Interpret the markers and the health implications
Content Outline	● Alterations of Hematologic function a) Anemias and clinical manifestations b) Thalasemia, sickle cell anemia ● Cardiovascular, lymphatic and pulmonary system a) Alteration of cardiovascular functions, atherosclerosis, arterioscelerosis, Thrombus, embolus, dysrhythmias Myocardial ischemia, Myocardial infarction, Heart failure stroke b) Hypertension c) Dyslipidemias d) Alterations of pulmonary function- signs and symptoms of pulmonary disease Respiratory distress syndrome in adults and newborn, Obstructive pulmonary diseases Asthma and cystic fibrosis. Markers used and its interpretation

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) :

- List down the diagnostic criteria for types of diabetes.
- Assessment of prevalence of anaemia in specific population.
- Carry out a survey to assess awareness about anaemia in the society.

Bibliography

- Barrett, Barman, Boitano, Brooks. 2010. Ganong's Review of Medical Physiology. 23rd ed. Lange / Tata McGrawHill
- Drake, Vogl, Mitchell. 2009. Dorland's/Gray's Pocket Atlas of Anatomy. Churchill Livingstone
- Guyton and Hall. Textbook of Medical Physiology. 12th ed. Saunders
- Keele, Neil et al. Samson Wright's Applied Physiology. 13th ed. Oxford University Press,Delhi
- Tortora, Derrickson. Principles of Anatomy and Physiology. 12thed

1.3 Major(Core)

Course Title	**Medical Nutrition Therapy - I**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Explain the promotive and therapeutic role of diet and nutritional care With reference to weight management, fevers& infections and diseases of the gastrointestinal tract and hepatobiliary system.
	2. Discuss the etiology, physiologic and metabolic anomalies of acute and chronic diseases and patient needs.
	3. Describe the effect of the various diseases on nutritional status and nutritional and dietary requirements.
	4. Recommend and provide appropriate nutritional care based on pathophysiology, prevention/ and treatment of the various diet-related disorders/ diseases.
	5. Apply different nutritional support systems to nourish the Patient.
Module 1 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Describe the Nutrition Care Process
	2. Apply the nutritional assessment techniques.
Content Outline	● Nutritional (and dietary) Care Process a) in health - Depending on the state of growth & development of the individual - at various activity levels and socioeconomic status. b) in disease - Nutritional screening/ assessment and identification of nutritional problem - Nutritional Intervention and Diet Modification based on interpretation of - Patient data- clinical, biochemical and other relevant data - Nutrition Education and Counseling -Evaluation of Nutritional care ● Delivery of Nutritional Support – Meeting nutritional needs a) Enteral tube feeding Different Enteral feeding access routes Practical Aspects b) Parenteral nutrition
Module 2 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Explain the causes of Obesity
	2. Differentiate between the effect of imbalance in weight on health

Content Outline	● Nutrition for weight management: Disorders of energy balance a) Obesity Components of body weight Adipose tissue- structure, regional distribution and storage Regulation of body weight Types of obesity Assessment of obesity Health risks Causes of obesity: neural, hormonal, and psychological Management of obesity - Dietary Modification: past and present approach - Psychology of weight reduction : psychotherapy and behavior modification Physical activity and exercise - Pharmacological treatment - Surgical treatment (Bariatric surgery) effect on satiety and other factors - Maintenance of Reduced weight b) Underweight/Excessive Leanness/ Undernutrition - Pathophysiology, Causes and assessment including fever and infectious diseases (Tuberculosis, AIDS) - Health risks and effect on nutritional status - Dietary Management - Psychotherapy C) Eating disorders: Anorexia Nervosa and Bulimia Nervosa.
Module 3 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	1. Discuss the nutrition care process in GI disorders 2. Analyze the role of nutrients and therapeutic dietary modifications
Content Outline	● Medical Nutrition therapy for Upper Gastrointestinal tract Diseases/Disorders a) Diagnostic Tests for the G.I. diseases b) Pathophysiology and Nutritional care and diet therapy in i) Diseases of oesophagus; oesophagitis, Hiatus hernia ii) Disorders of stomach: Indigestion, Gastritis, Gastric and duodenal ulcers Management: associated with H. pylori infection, NSAIDS Dietary management: traditional approach and liberal approach c) Gastric Surgery: Nutritional care, dumping syndrome ● Medical Nutrition therapy for Lower gastrointestinal tract Diseases/Disorders a) Common Symptoms of Intestinal dysfunction - Flatulence, constipation, haemorhoids, diarrhoea, steatorrhoea, typhoid Diseases of the large intestine: - Diverticular disease, Irritable

	bowel syndrome, inflammatory bowel disease c) Malabsorption Syndrome/Diseases of Small intestine - Celiac (Gluten –induced) sprue, tropical sprue, intestinal brush border enzyme deficiencies, Lactose intolerance, protein losing enteropathy d) Principles of dietary Care: Fibre, residue Modified fibrediets e) Intestinal surgery: Short bowel syndrome, Ileostomy, Colostomy, Rectal surgery.
Module 4 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to - 1. Plan the MNT in hepato biliary disorders
Content Outline	● Medical Nutrition therapy for Diseases of the Hepato - Biliary Tract a. Nutritional care in liver disease in context with results of specific liver function tests - Dietary care and management in viral hepatitis(different types) , cirrhosis of liver, hepatic encephalopathy, Wilson's disease b. Dietary care and management in diseases of the gall bladder and pancreas i.e. billary dyskinesia, cholelithiasis, cholecystitis, cholecystectomy, pancreatitis, Zollinger Ellison syndrome
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) : ● Carry out Nutrition screening to identify individuals at risk of malnutrition. ● Survey the nutritional supplements recommended in GI and hepato-biliary cases.	

Bibliography:

- Duggan C, Walker, W.A. and Watkins, J.B. (2016): Nutrition in Pediatrics, Boston, Little, Brown &Co.
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- Fauci, S.A. et al (1998): Harrison's Principles of Internal Medicine, 14th Edition, McGraw Hill.
- Guyton, A.C. and Hall, J.E. (2006): Textbook of Medical Physiology, 9th Edition, W.B. Saunders Co.
- Garrow, J.S., James, W.P.T. and Ralph, A. (2003): Human Nutrition and Dietetics, Churchill Livingstone.
- Mahan, L.K. and Escott-Stump, S. (2012): Krause's Food Nutrition and Diet Therapy, 10th Edition, W.B. Saunders Ltd.
- Shils, M.E., Olson, J.A., Shike, M. and Ross, A.C. (2006): Modern Nutrition in Health and Disease, 9th Edition, Williams and Wilkins.
- Srilaksjmi B. (2014). Dietetics. New Age Publishers, New Delhi.
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- Williams, S.R. (2016): Nutrition and Diet Therapy, 7th Edition, Times Mirror/Mosby College Publishing
- World Cancer Research Fund (1997). Food, Nutrition and the Prevention of Cancer- A Global perspective, Washington E.D. WCRF.

Indicative List of Journals and Other Reference Series

1. Nutrition Update Series
2. World Review of Nutrition and Dietetics
3. Journal of the American Dietetic Association
4. American Journal of Clinical Nutrition
5. European Journal of Clinical Nutrition
6. Nutrition Reviews

1.4 Major(Core)

Course Title	**Medical Nutrition Therapy - I (Pr.)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to:
	1.Carry out the Nutritional assessment for the patient
	2.Read the reports and interpret the same
	3.Decide the method of Nutritional support and mode of delivery
	4.Assess the nutritional requirements and plan diets
	5.Educate the patient on the therapeutic modifications
Module 1 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	Conduct the Nutritional assessment
	Apply the exchange list effectively as a tool of meal planning
	Plan diets for patients suffering from energy imbalance and eating disorders
Content Outline	● Nutritional (and dietary) Care Process a) In health. b) In disease - Nutritional screening/ assessment and identification of nutritional problem–

	Delivery of Nutritional Support – Meeting nutritional needs a) Enteral tube feeding Different Enteral feeding access routes Practical aspects b) Parenteral nutrition ● Exchange lists as a tool in planning diets. ● Case studies of weight management: Disorders of energy balance a) Obesity Types of obesity Assessment of obesity Health risks Causes of obesity: neural, hormonal, and psychological Management of obesity - Dietary Modification Psychology of weight reduction: psychotherapy and behavior modification Physical activity and exercise b) Underweight/Excessive Leanness/ Undernutrition - Health risks and effect on nutritional status Dietary Management - Psychotherapy C) Eating disorders: Anorexia Nervosa and Bulimia Nervosa.
Module 2 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	Plan diets for various disorders of the Gastrointestinal tract
Content Outline	● Case studies of Upper Gastrointestinal tract Diseases /Disorders a) Diagnostic Tests for the G.I. diseases b) Pathophysiology and Nutritional care and diet therapy in i) Diseases of oesophagus; oesophagitis, Hiatus hernia ii) Disorders of stomach: Indigestion, Gastritis, Gastric and duodenal ulcers Management: associated with H. pylori infection, NSAIDS Dietary management: traditional approach and liberal approach c) Gastric Surgery: Nutritional care, dumping syndrome ● Case studies of Lower gastrointestinal tract Diseases/Disorders a) Common Symptoms of Intestinal dysfunction - Flatulence, constipation, haemorhoids, diarrhoea, steatorrhoea, typhoid b) Diseases of the large intestine: - Diverticular disease, irritable bowel syndrome, inflammatory bowel disease Malabsorption Syndrome/Diseases of Small intestine -Celiac

	(Gluten –induced) sprue, tropical sprue, intestinal brush border enzyme deficiencies, Lactose intolerance, protein losing enteropathy d) Principles of dietary Care: Fibre, residue Modified fiber diet ● Case studies of the Hepato - Biliary Tract diseases a. Nutritional care in liver disease in context with results of specific liver function tests - Dietary care and management in viral hepatitis(different types) , cirrhosis of liver, hepatic encephalopathy, Wilson's disease b. Dietary care and management in diseases of the gall bladder and pancreas i.e. billary dyskinesia, cholelithiasis, cholecystitis, cholecystectomy, pancreatitis, Zollinger Ellison syndrome.
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) : ● Use nutritional assessment tools like – SGA, MUST, NRS, etc ● Survey of the meal replacers recommended in the management of obesity	

Bibliography:

- Clinical Dietetics Manual (2018), Indian Dietetics Association, Banglore.
- Escott-Stump, S. (2008): Nutrition and Diagnosis Related Care, Sixth Edition, Williams and Wilkins, US.

1.5.1 Major(Elective)

Course Title	**Advanced Nutrition I (Macronutrients & Water)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to -
	Acquire the knowledge of the physiological and metabolic role of macronutrients and their importance in human nutrition.
	Discuss the basis of human nutritional requirements and recommendations through the life cycle and translate the knowledge into practical guidelines for dietary needs.
	Familiarize with the recent advances in nutrition and apply this knowledge in planning for public health programmes.
Module 1 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	1. Define RDA, EAR, etc,
	2. Discuss the components of energy expenditure.
Content Outline	● Human Nutritional Requirements – Development andRecent

	Concepts a. Methods of determining human nutrient needs b. Description of basic terms and concepts in relation to human nutritional requirements. c. Guidelines and Recommendations - Development of International and National Nutritional Requirements - Translation of nutritional requirements into Dietary ● Body Composition a. Significance of body composition and changes through the lifecycle b. Methods for assessing body composition (both classical and recent) and their applications. ● Nutrition in Special Conditions: Space Travel, High Altitudes, Low Temperature, Submarines. ● Energy a. Components of energy requirements: BMR, RMR, the thermic effect of feeding, physical activity. Factors affecting energy requirements, methods of measuring energy expenditure. b. Estimating energy requirements of individuals and groups. c. Regulation of energy metabolism and body weight: Control of food intake – role of leptin and other hormones.
Module 2 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	Define Glycemic index, glycemic load and differentiate between the types of dietary fiber and their mechanism of action.
	Relate carbohydrates with gene expression.
Content Outline	● Carbohydrates a.Review of nutritional significance of carbohydrates and changing trends in dietary intake of different types of carbohydrates and their implications b.Dietary fibre: Types, sources, role and mechanism of action c.Resistant starch, fructo-oligosaccharides, other oligosaccharides: Chemical composition and physiological significance d.Glycemic Index and glycemic load e.Carbohydrates and gene expression
Module 3 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	Understand the role of protein & its metabolism.

Content Outline	● Proteins a.Overview of role of muscle, liver and G.I. tract in protein metabolism b.Amino acid and peptide transporters c.Therapeutic applications of specific amino acids d.Peptides of physiological significance e.Proteins, amino acids and gene expression.
Module 4 (credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	Explain the role and metabolism of lipids.
Course Content	● Lipids a.Nutritional significance of fatty acids – SFA, MUFA, PUFA: functions and deficiency b.Role of n-3 and n-6 fatty acids c.Prostaglandins d.Trans Fatty Acids e.Conjugated linoleic acid f.Nutritional Requirements and dietary guidelines (International & National) for visible and invisible fats in diets. g.Lipids and gene expression.
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE): ● Make a list of foods categorizing in low , moderate and high GI foods. ● Market survey of omega 3 fatty acid supplements.	

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- Bodwell, C.E. and Erdman, J.W. (1988) Nutrient Interactions. Marcel DekkerInc. NewYork
- Gropper, Sarin S.; Smith Jack L.; Carr, Timothy (2021) Advanced Nutrition and Human Metabolism. Wadsworth Publishing co. Inc
- Shils, M.E.; Olson, J.; Shike, M. and Roos, C. (2006): Modern Nutrition in Health and Disease. Williams and Williams. A Beverly Co.London.
- World Reviews of Nutrition and Dietetics

1.6 MinorStream

Course Title	**Research Methodology (Th)**
Course Credits	4
Course Outcomes	After learning the module, learners will be able to -
	1. Develop a scientific approach and know the processes of research
	2. Develop the competence for selecting methods and tools appropriate for research topics
	3. Discuss the concepts of statistical measures of central tendency, dispersion, variability and probability
Module 1 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -

	1. Explain process of research and its relationship to knowledge and science. 2. Identify research process based on actual research conducted. 3. Recognize the process of research problem formulation.
Content Outline	**The Research Process** a. Scientific approach to enquiry in comparison to native, common-sense approach b. Knowledge, theory and research *c*. Role, need and scope of research in the discipline of Home Science **Assignment**: *Differentiate between investigative reporting and research report (with examples to be brought by students as exercise)* **Steps in Research Process and Elements of Research** a. Identifying interest areas and prioritizing Selection of topic and considerations in selection b. Review of related literature and research c.Variables- types of variables including discrete and continuous variables Conceptual definitions and operational definitions d. Concepts, hypotheses and theories e Hypothesis- meaning, attributes of a sound hypothesis, Stating the hypothesis and types of hypothesis Hypothesis testing**-** null hypothesis, sample distribution, level of significance, critical regions, Type I and Type II errors f. Research Design Research questions, objectives and assumptions **Ethics in Research**
Module 2 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	1. Apply different types of researchprocedures. 2. Design research studies by knowing methods ofresearch.
Content Outline	**Types of Research** a. Basic and Applied research, Qualitative and Quantitativeresearch (brief review ofdifferences) b. Historicalresearch c. Descriptive research methods – survey, case study, correlational study, content analysis, causal-comparativeresearch d. Analytic studies- pre-experimental, experimental research,quasi experimentalresearch e. Qualitative research,Ethnography Evaluative research- general characteristics, use of qualitative methods in enquiry Scope and importance in Home Science.
Module 3 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to -
	1. Explain different techniques ofsampling. 2. Apply sampling procedures for specific researchproblems.

Content Outline	**Sampling** a. Rationale, characteristics- meaning, concept of population and sample, andutility b. Types of sampling and generalizability ofresults c. Probability sampling - simple random sample, systematicrandom sample, stratified random sampling etc - random and non-random samples, random numbers anduse d.. Non-probability sampling - purposive samples, incidental samples, quota samples, snowball samples e.. General consideration in determination of sample size
Module 4 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to - 1. Differentiate the tools of datacollection. 2. Design different tools of datacollection.
	Tools for Data Collection a.Primary and secondary methods of data collection b.Different types of questionnaires, rating scales, check lists, schedules, attitude scales, inventories, standardized tests, interviews, observation Development of tools, estimation of reliability and validity oftools Procedure for preparation of the tool, administration of tools for datacollection Procedure for datacollection Planning for data analysis-coding ofresponses

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

- Recognize different Types of variables.
- Hypothesis formations and research questions from Research readings –students identify hypothesis/research questions – Discussion
- Construction of tools for data collection a) types of questions b) Questionnaire c) interview schedule d) observation d) scales
- Differentiate between (a) basic and applied research (Exercise to be based on actual research papers published in accredited journals) (b) qualitative and quantitative research
- Based on Journal contents undertake a critical appraisal of studies/research papers and discuss types of Research with examples.
- For given topic students to frame and discuss the different possibilities of methods and tools.

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- Bhaskaran, V. (2008). Research methods for social work. NewDelhi
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END OF SEMESTER- I

Syllabus Contents

Semester – II

2.1 Major (Core)

Course Title	**Advanced Nutrition II**
Course Credits	4
Course Outcomes	After going through the course, learners will be able to
	1. Recognize the physiological and metabolic role of vitamins and minerals in human nutrition.
	2. Evaluate the pharmacological actions of various vitamins & minerals along with their implications.
Module 1(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Acknowledge the metabolism of fat-soluble vitamins.
	2. Explore the pharmacological & therapeutic role of fat-soluble vitamins.
Content Outline	For each of the vitamins, the following will be discussed: ● Historical background ● Structure and chemistry ● Food sources ● Metabolism (digestion, absorption, transport, storage and elimination), Bioavailability and factors affecting bioavailability. ● Biochemical and physiological functions ● Assessment of status ● Interaction with other nutrients, regulation of gene expression (wherever applicable) ● Pharmacological and therapeutic effects ● Requirements, methods for estimating requirements and recommended daily allowance. ● Deficiency, overload and toxicity. **Fat Soluble Vitamins** Vitamin A and Beta Carotene Vitamin D Vitamin E Vitamin K
Module 2(Credit 1)	
	After learning the module, learners will be able to

Learning Outcomes	1.Acknowledge the metabolism of Water soluble vitamins.
	2.Explore the pharmacological & therapeutic role of water soluble vitamins.
	For each of the vitamins, the following will be discussed: ● Historical background ● Structure and chemistry ● Food sources ● Metabolism (digestion, absorption, transport, storage and elimination), Bioavailability and factors affecting bioavailability. ● Biochemical and physiological functions ● Assessment of status ● Interaction with other nutrients, regulation of gene expression (wherever applicable) ● Pharmacological and therapeutic effects ● Requirements, methods for estimating requirements and recommended daily allowance. ● Deficiency, overload and toxicity. **Water Soluble Vitamins** a. Ascorbic acid b. Thiamin c. Riboflavin d. Niacin e. Pyridoxine f. Folic acid g. Vitamin B_{12} h. Biotin i. Pantothenic acid
Module 3(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Acknowledge the metabolism of macro-minerals
	2. Explore the pharmacological & therapeutic role of macro-minerals

Content Outline	For each of the minerals the following will be discussed: ● Historical background ● Structure and chemistry ● Food sources ● Metabolism (digestion, absorption, transport, storage and elimination), Bioavailability and factors affecting bioavailability. ● Biochemical and physiological functions ● Assessment of status ● Interaction with other nutrients, regulation of gene expression (wherever applicable) ● Pharmacological and therapeutic effects ● Requirements, methods for estimating requirements and recommended daily allowance. ● Deficiency, overload and toxicity. **Macrominerals** a. Calcium and Phosphorus b. Magnesium c. Sodium, Potassium, Chloride
Module 4 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Acknowledge the metabolism of micro-minerals.
	2. Explore the pharmacological & therapeutic role micro-minerals.
	For each of the minerals, the following will be discussed: ● Historical background ● Structure and chemistry ● Food sources ● Metabolism (digestion, absorption, transport, storage and elimination), Bioavailability and factors affecting bioavailability. ● Biochemical and physiological functions ● Assessment of status ● Interaction with other nutrients, regulation of gene expression (wherever applicable) ● Pharmacological and therapeutic effects ● Requirements, methods for estimating requirements and recommended daily allowance. ● Deficiency, overload and toxicity. **Microminerals** a. Iron b. Copper c. Manganese d. Iodine

	e. Fluoride f: Zinc g. Selenium h. Cobalt i. Chromium j. Molybdenum
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) ● Market survey on micronutrient fortification of food ● Importance of micro nutrient supplement ● Antioxidant property of micronutrient ● How to minimize loses of micro nutrient while cooking	

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- WHO Technical Report Series.
- World Reviews of Nutrition and Dietetics.

Journals:

- Nutrition Reviews
- Journal of Nutrition
- American Journal of Clinical Nutrition
- British Journal of Nutrition
- European Journal of Clinical Nutrition
- International Journal of Vitamin and Nutrition Research
- International Journal of Food Science and Nutrition
- Nutrition Research
- Annals of Nutrition & Metabolism
-

2.2 Major (Core)

Course Title	**Nutritional Assessment**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Analyze and various methods for assessment of nutritional status, body composition analysis.
	2. Interpret tests used for lipid profile and glycemic control.
	3. Carry out and interpret the assessment of dietary/nutrient intakes.
	4. Conduct assessment of physical activity and energy expenditure.
Module 1(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Evaluate the different body composition analysis techniques for nutritional assessment
	2. Apply the correct methods for anthropometric measurements.
Content Outline	● Assessment of Nutritional Status a) Reliability b) Validity c) Accuracy d) Precision ● Measurement of weight and height a) Assessment of nutritional status for adults, young and older children b) Calculation of BMI c)Interpretation Use of WHO reference standards Wasting, stunting, underweight, severe and moderate malnutrition d) Calculation of z-scores and use of software Circumference Measurements – chest, head, mid arm. Waist, hip and ratios wherever applicable to children and adults ● Body Composition

	a) Use of skinfold b) Bioelectric impedance c) Dual X-ray Absorptiometry (DEXA) d) Calculation of body fat
Module 2(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Compare the various dietary intake assessment techniques and techniques to assess energy expenditure.
	2. Utilize the techniques for evaluation of nutrient intake and energy expenditure.
Content Outline	● Dietary intake assessment a) Food frequency questionnaire b) A 24 hour diet recall and record - Weighment method ● Assessment of energy expenditure a) Indirect calorimetry - use of ergometer, treadmill, heart rate monitoring b) Recording physical activities c) Factorial estimation of energy expenditure: MET, PAL Study of food labels- calculation of DV
Module 3(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Summarize the use of dietary protein evaluation and serum protein estimation techniques.
	2. Explore the techniques for assessment of protein status.
Content Outline	● Dietary Protein Evaluation and Assessment of Protein Status a) Assessment of protein quality - Chemical Score, PDCAAS, In vitro protein digestibility b) Estimation of serum albumin, globulin and albumin: globulin ratio
Module 4(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Describe the interpretation of blood glucose levels, lipid profiles and other biomarkers.

	2. Select the appropriate biomarkers in assessing the nutritional status.
Content Outline	• Biomarkers of Metabolism - Methods and interpretation of following markers: a) Fasting and Postprandial Blood Glucose estimation, OGTT, Glycosylated Hemoglobin b) Glycemic index and glycemic load, Insulin index c) Serum lipid levels
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) • Assessment and interpretation of anthropometric measurements. • List of foods according to glycemic index and glycemic load.	

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2.3 Major (Core)

Course Title	**Medical Nutrition Therapy - II (Theory)**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Evaluate the promotive and therapeutic role of diet and nutritional care with reference to Endocrine disorders, renal disorders, cardiovascular system, and musculoskeletal system.

	2. State the etiology, physiologic and metabolic anomalies of acute and chronic diseases and patient needs.
	3. Describe the effect of the various diseases on nutritional status and nutritional and dietary requirements.
	4. Plan, recommend and provide appropriate nutritional care based on pathophysiology, prevention/ and treatment of the various diet-related disorders/ diseases.
Module 1(Credit 1)	
Learning Outcomes *(Specific related to the module.. e.g. Define, Differentiate, Carry out, Design, etc. …)*	After learning the module, learners will be able to
	1. Illustrate the etiology as well as the physiological and metabolic alterations in metabolic disorders.
	2. Apply the principles of dietary management to specific conditions.
Content Outline	● Nutrition for Endocrine Disorders Nutrition for Diabetes Mellitus and hypoglycemia a) Aetiology, classification, pathophysiology symptoms and diagnosis b) Management of DM: i) Home blood glucose monitoring ii) Glycosylated hemoglobin iii) Urine testing c) Blood sugar lowering agents: i) Oral hypoglycemic agents ii) Insulin d) Exercise e) Nutritional management: Diet planning for Type1, Type2 ii) For Special conditions a) Pregnancy b) Elderly c) Surgery d) Illness e) Physical activities f) Acute complications – pathophysiology, diagnosis, types, treatment i) Hypoglycemia ii) Ketoacidosis iii) Somogyi effect iv) Dawn phenomenon g) Long term complication - pathophysiology, diagnosis, types, and treatment i). Macrovascular ii). Microvascular ● Nutrition in Diseases of Other Endocrine organs a) Functions of the adrenal cortex, thyroid and parathyroid gland, their insufficiencies, clinical symptoms and metabolic implications.

	b) Dietary treatment as supportive to other form of therapy - Hyper and Hyperthyroidism, goiter, Hypocalcaemia.
Module 2(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Explore the various risk factors for cardiovascular diseases.
	2. Discuss the dietary management in relation to the physiologic and metabolic alterations of the diseases.
Content Outline	● Nutrition in Cardiovascular Diseases a) Review of Normal circulatory system (in brief) b) Blood pressure, i) Regulation, Short-term (sympathetic nervous system) and long-term (kidneys), ii) Hypertension – classification (secondary and essential) iii) Risk Factors for hypertension iv) Dietary management-DASH approach v) Use of various drugs (In brief). ● Hyperlipidemia and Hyperlipoproteinemia a) Classifications b) Dietary management c) Drug management – (in brief) ● Atherosclerosis - Etiology and understanding the pathogenesis a) Coronary Heart Disease - Angina Pectoris and Myocardial Infarction - Clinical manifestation and importance of cardiac enzymes to aid in the detection of CHD - Dietary management b). Congestive Heart Failure - Pathogenesis - Pathogenesis of sodium and water retention Risk factors Clinical manifestation Cardiac Cachexia Treatment - Nutritional Care c) Cerebrovascular Disease and Peripheral Vascular Disease - In brief etiology and dietary care d) Rheumatic and Congenital Heart Disease - Clinical manifestation, pathogenesis and nutritional care.
Module 3(Credit 1)	
	After learning the module, learners will be able to

Learning Outcomes	1. Describe the interrelationship between the renal diseases and nutritional status.
	2. Apply the medical nutrition therapy in the management of renal diseases.
Content Outline	• Nutrition in Renal Diseases Physiology and function of normal kidney A brief review - Classification of kidney diseases a) Glomerular Nephritis Etiology, characteristics Objectives, Principles of dietary treatment and management b) Nephrotic Syndrome Etiology, Objectives, Principles of dietary treatment and management c) Uremic Renal Failure i) History, General importance of protein nutrition in renal failure and uremia ii) Causes and Dietary management in Acute Renal Disease iii) Causes and Dietary management in Chronic Renal Disease iv) Dietary modification in chronic renal disease with complications v) Sodium and Potassium Exchange list d) Types of dialysis and their nutritional care – Haemodialysis, CAPD, Continuous Ambulatory peritoneal dialysis) e) Renal Transplant and its nutritional care f) Nephrolithiasis- etiology, types of stones and nutritional care (acid & alkaline ash diet)
Module 4(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1.Describe the pathophysiology of various pulmonary diseases and musculoskeletal disorders
	2.Apply the principles of dietary management to specific conditions
Content Outline	• Nutritional Management in Pulmonary Disease Review of respiratory system and breathing mechanism. a) Effects of Malnutrition on Respiration b) Chronic Obstructive Pulmonary Disease c) Pneumonia d) Broncho Pulmonary Displasia

	e) Cystic Fibrosis ● MNT for Rheumatic disorders (of the musculoskeletal system) Pathophysiology of inflammation in - a) Rheumatic Diseases b) Osteoarthritis c) Rheumatoid Arthritis, Gout Pharmacologic therapy and Nutritional Care
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) ● Presentations on recent research papers and evidence-based guidelines for management. ● Identification of videos on normal cardiovascular and pulmonary functions. ● Identification of visual presentation on atherosclerosis and cardiac disease.	

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Journals and Other Reference Series

- Nutrition Update Series
- World Review of Nutrition and Dietetics
- Journal of the American Dietetic Association
- American Journal of Clinical Nutrition
- European Journal of Clinical Nutrition
- Nutrition Review

2.4 Major (Core)

Course Title	**Medical Nutrition Therapy - II (Pr.)**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Carry out the nutritional assessment for the patient.
	2. Assess the nutrient requirements as per the specific medical condition
	3. Plan the medical nutrition therapy.
Module 1(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Plan the diets for diabetes mellitus and cardiovascular diseases.
	2. Plan the nutrition prescription for various endocrine disorders.
Content Outline	• **Case studies for Diabetes** a) Diet planning for Type1, Type2 diabetes mellitus b) Diet planning for Special conditions - Pregnancy, Elderly, Surgery, Illness, Physical activities c) Acute complications – nutritional care i) Hypoglycemia ii) Somogyi effect iii) Dawn phenomenon d) Long term complication – prevention and nutritional care i). Macrovascular ii). Microvascular • **Case studies for diseases of other Endocrine organs** a) Dietary treatment as supportive to other form of therapy in diseases of the adrenal cortex, thyroid and parathyroid gland b) Diet planning for Hyper and Hyperthyroidism, goiter, Hypocalcaemia • **Case studies for Cardiovascular Diseases** a) Diet planning of Hypertension-DASH b) Developing low sodium recipes c) Dietary management of Hyperlipidemia and Hyperlipoproteinemia Dietary management i) Coronary

	Heart Disease ii). Congestive Heart Failure iii) Cerebrovascular Disease and Peripheral Vascular Disease
Module 2(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Plan the diets for renal diseases.
	2. Plan nutrition prescription for pulmonary conditions and rheumatic disorders.
Content Outline	• **Case studies for pulmonary Diseases** a) Diet planning for asthma, COPD b) Nutrition care for bronchopulmonarydisplasia and cystic fibrosis • **Case studies for Renal Diseases** a) Sodium and Potassium Exchange list b)Diet planning for GlomeruloNephritis, Nephrotic Syndrome, Acute Renal Disease, Chronic Renal Disease c) Dietary modification in chronic renal disease with complications d) Types of dialysis and their nutritional care – Haemodialysis, Continuous Ambulatory peritoneal dialysis e) Renal Transplant and its nutritional care f) Nephrolithiases- nutritional care (acid & alkaline ash diet) • Nutrition care for Rheumatic disorders of the musculoskeletal system a) Osteoarthritis b) Rheumatoid arthritis c) Gout
Assignments/Activities Market survey of commercial nutritional supplements and nutritional support substrates. • Commonly used tests for diagnosis of various diseases- system-wise. • Interpretation of patient data and diagnostic tests of drawing up of patient diet prescription, using a case study approach.	

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- Srilakshmi B. 7th Edition (2021). Nutrition Science, New Age Publishers
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- Indian Dietetic Association (2018). Clinical Dietetics Manual

Journals and Other Reference Series

- Nutrition Update Series
- World Review of Nutrition and Dietetics
- Journal of the American Dietetic Association
- American Journal of Clinical Nutrition
- European Journal of Clinical Nutrition
- Nutrition Review

2.5.1 Major (Elective)

Course Title	**Hospital, Personnel and Food Service Management**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Relate with the medical food services and hospitals organizations.
	2. Outline the management processes in terms of planning, organizing, leading, evaluating and controlling.
	3. Associate with legislation relating to food service and labour laws.
Module 1(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. State the organizational structure and principles of management in food service sector.
	2.Identify the roles and responsibilities in health care

Content Outline	● Introduction to medical food service a) Goals and objectives. b) Organization – Definitions, types of organization and food service Systems – an overview c) Organization chart, Preparation of chart – activity analysis, decision analysis, relation analysis ● Management principles a) Planning b) Organizing c) Directing d)Controlling e) Management ● Roles and Responsibilities of health care team and dietitians a) Tools of Management b) Professional ethics ● Computer Applications in Food Service
Module 2(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Discuss the decision making and problem solving process.
	2. Apply food related laws and labour laws in health care.
Content Outline	● Recruitment, selection, training of personnel employees, supervision, performance appraisal, motivation and rewards incentives for effective performance, placement and promotion ● Decision-making – Types and approaches to decision making, problem solving tools. ● Time Management ● Labour laws, policies and food related laws, welfare schemes for employees in India.

Module 3(Credit 1)	
Learning Outcomes *(Specific related to the module.. e.g. Define, Differentiate, Carry out, Design, etc. …)*	After learning the module, learners will be able to
	1. Describe the food service systems in health care.
	2. Apply the nutrition knowledge at various stages of food service systems.
Content Outline	● Review of types of catering and food service systems. ● Menu planning a) Menu considerations b) Meal pattern and menu format c) Steps in menu planning d) Modified diet Menu planning e) Cyclic Menus ● Food production and service equipment in Hospitals a) Space allocation b) Equipment selection. c) Safety, care and use of equipments. d) Energy management related to equipment planning. ● Purchasing and Storeroom management a) Purchasing systems b) Specifications, food requisition and inventory systems c) Quality assurance d) Evaluation laws relating to food purchasing
Module 4(Credit 1)	
	After learning the module, learners will be able to

Learning Outcomes *(Specific related to the module.. e.g. Define, Differentiate, Carry out, Design, etc. …)*	1. Explain the financial management and budget system. 2. Reason the hygiene and sanitation at food service system.
Content Outline	● Financial Management a) Cost-Identifying Elements of cost b) Food cost control – cost analysis of dishes c) Portions and menus d) Labour cost control e) Energy cost control ● Budget systems and accounting a) Budget preparation b) Relationship of costs, profits and sales in commercial and non-commercial establishments. ● Sanitation and Hygiene in food storage, preparation and service
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) ● Carry out a survey of the cyclic menu planned at hospitals. ● Observation of preparation of special diets (enteral feeds) for hospitalized patients. ● Kitchen layout of a hospital food service system.	

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2.5.2 Major (Elective)

Course Title	**Food Safety**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Recognize safe receiving, storing and handling of raw material and final product.
	2. Identify the critical control points.
	3. Report food contamination and its prevention.
	4. Describe personal hygiene and sanitation.
Module 1(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Enclist the basics of food safety through food regulations and legislations.
	2. Identify the concerns in food sanitation and safety.
Content Outline	• Introduction to food safety History of food regulations in India. Legislations- Prevention of Food Adulteration act 1954, Food product order (1955), Solvent Extracted Oil, De-oiled Meal and Edible Flour (Control) Order, 1967, Meat Food Products Order (1973),Edible Oils Packaging, 1998, Edible Oils Packaging, 1998, Vegetable Oil Products Order, 1998, Milk & Milk Product Amendment Regulations – 2009. • Food Sanitation and safety:

	Factors contributing to physical, chemical and biological contamination in food chain, prevention and control of food borne hazards, definition and regulation of food sanitation, sources of contamination, personal hygiene-food handlers, cleaning compounds, sanitation methods, waste disposal strategy (solid and liquid waste) and pest control ● **Major food safety concerns –** a) Food adulteration b) Pesticide residues c) Toxic metals d) Misuse of food additives e) Food toxicity – Aflatoxins, Lathyrism ● **Food contamination and spoilage** a) Microbial contamination of foods – Types of microbial contamination, factors responsible for microbial contamination, sources for microbial contamination b) Plant sanitation – Sanitary requirements for equipment, cleaning agents, pest control.
Module 2(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Summarize the standard operational procedures in food processing.
	2. Apply the knowledge of occupational health, safety and personal hygiene.
Content Outline	● Standard Operating Procedures Preparing scope, quality policy and quality objectives of food processing company, Defining Standard operating procedure – purpose- Format - developing and implementing, effective writing. SOP for purchasing raw materials, receiving raw materials, storage, cleaning, holding, cooling, freezing, thawing, reheating, personal hygiene, facility and equipments. Systems in laboratory accreditation ● Pre-requisite Program Good Manufacturing Practices - Personal hygiene – occupational health and safety specification, Food Plant Sanitation Management - Plant facilities construction and maintenance - exterior of the building- interior of the building- equipments. Storage, transportation, traceability, recalling procedures, training.

<table>
<tr><td colspan="2">Module 3(Credit 1)</td></tr>
<tr><td rowspan="3">Learning Outcomes</td><td>After learning the module, learners will be able to</td></tr>
<tr><td>1. Identify the hazard analysis in food processing.</td></tr>
<tr><td>2. Organize various audit control points in hazard analysis.</td></tr>
<tr><td>Content Outline</td><td>● HACCP
Conduct a hazard analysis, CCP identification, establish critical limits for each CCP, establish CCP monitoring procedures, establish corrective actions procedures, and establish procedures for HACCP verification and validation, documenting the HACCP Program.

HACCP for jam, biscuit, bread, dairy, meat, fish and egg industries.

● Audit Check List
Preparation of HACCP based SOP checklist - personal hygiene, food preparation, hot holding, cold holding, refrigerator, freezer and milk cooler, food storage and dry storage, cleaning and sanitizing, utensils and equipments, large equipments, garbage storage and disposal and pest control.</td></tr>
<tr><td colspan="2">Module 4(Credit 1)</td></tr>
<tr><td rowspan="3">Learning Outcomes</td><td>After learning the module, learners will be able to</td></tr>
<tr><td>1. Discuss the food safety practices.</td></tr>
<tr><td>2. Apply food safety practices in food processing.</td></tr>
<tr><td>Content Outline</td><td>● Other Food Safety Practices
Good Agriculture Practices, Good Animal Husbandry Practices and Good Manufacturing Practices Good Retail Practices, Good Transport Practices and Nutrition Labelling, Traceability Studies</td></tr>
<tr><td colspan="2">Assignments/Activities towards Comprehensive Continuous Evaluation (CCE)

● Conduct a survey of street food vendors to observe food safety.
● Undertaking street vendor awareness programme.
● Assessing food safety standards practiced by street vendors through field observation.</td></tr>
</table>

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2.5.3 Major (Elective)

Course Title	**Nutrition for Exercise and Fitness**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Analyze the special nutritional requirements for physical activities related to sports and exercise.
	2. Carry out different techniques to improve the performance of sportspersons.
	3. Acquire the knowledge about nutritional requirements of different sports.
Module 1(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Evaluate the energy needs of various sports.
	2. Discuss the role and effective use of sports drinks.
Content Outline	• Nutritional considerations for sports / exercising person as compare to normal active person. • Energy substrate for activities of different intensity and duration, aerobic and anaerobic activities. • Fluid balance in sports and exercise, importance, symptoms and prevention of dehydration, Sports drink.
Module 2(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Analyze the carbohydrates requirements in difference sports.
	2. Consider and apply carbohydrate loading in different stages of sports.
Content Outline	• Carbohydrates a) Carbohydrate as an energy source for sport and exercise. b) Carbohydrate stores

	c) Fuel for aerobic and anaerobic metabolism d) Glycogen re-synthesis e) Carbohydrates Loading f) Carbohydrate composition for pre exercise, during and recovery period.
Module 3(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Analyze the requirement of fats in various sports and exercises.
	2. Evaluate the use of the different amino acids (protein) for sports and exercises.
Content Outline	● Role of Fat as an energy source for sports and exercise. a) Fat stores, regulation of fat metabolism b) Factors affecting fat oxidation (intensity, duration, training status, CHO feeding) c) Effect of fasting and fat ingestion ● Protein and amino acid requirements a) Factors affecting Protein turnover b) Protein requirement and metabolism during endurance exercise, resistance exercise and recovery process. c) Protein supplement.
Module 4(Credit 1)	
Learning Outcomes	After learning the module, learners will be able to
	1. Identify the role of micronutrients in sports and exercise.
	2.Relate to the various issues of sports personnel – eating disorders, female athletic triad, sports anemia etc.
Content Outline	● Important micronutrients for exercise a) B complex vitamin and specific minerals. b) Exercise induced oxidative stress and role of antioxidants chronic dieting and eating disorder. c) Female athletic triad, sports anemia

	d) Dietary supplements and ergogenic aids (nutritional, pharmacological and physiological).
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) ● Market survey of supplements for various sports and exercises. ● Trends in sports drinks for athletes.	

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2.6 OJT

Course Title	**Internship**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Achieve practical experience of nutritional assessment, education & counseling
	2. Acquire professional skills in various departments / specializations in the hospital set up.
	3. Outline the scope, functions, and job responsibilities in various department of organization.
Learning Outcomes	After learning the module, learners will be able to
	1. Undertake patient management in hospital set up.

	2. Design diet plans and counseling for behavior changes for patients.
Content Outline	● Every candidate shall undergo professional training for one month in a multispecialty hospital with minimum capacity of 150 beds. ● Internal and external evaluation will be carried out to assess the progress of the work during Internship. ● At the end of the internship the student will submit the internship report. During the internship student is expected to complete the following:
Assignments/Activities towards Comprehensive Continuous Evaluation (CCE) : ● Case study presentations. ● Orientation to clinical nutrition / dietetics department in the hospital. ● Observation and documentation of various activities - nutritional assessment, interventions, counseling and follow-ups. ● Internship report along with detailed case studies. ● Presentation of case studies.	

Course Syllabus

Semester III

3.1 Major (Core):

Course Title **Subject Code**	**Research and Statistical Application** **314411**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Identify parametric and non-parametric tests
	2. Apply statistical tests for data analysis for both large and small samples
	3. Interpret the results of statistical analysis of data
	4. Summarize data and present it using tables and graphs
Module 1(Credit 1) - Introduction to Statistics and Data Management	
Learning Outcomes	After learning the module, learners will be able to
	1. Analyze parametric and non-parametric test
	2. Apply the statistical programs for data management
Content Outline	**Introduction to Statistics** Definition, conceptual understanding of statistical measures, popular concepts and misuse of statistics **Normal Distribution and its Properties** a. Normal distribution b. Binomial distribution c. Probability, use of normal probability tables, area under normal distribution curve d. Parametric and non-parametric tests **Data Management** Planning for data analysis – coding of responses, preparation of code book, Coding of data Use of statistical programs - MS Excel – SPSS
Module 2(Credit 1) - Quantitative Data Analysis and Statistical Tests	
Learning Outcomes	After learning the module, learners will be able to

	1. Describe quantitative analysis, descriptive & inferential statistics.
	2. Apply large and small sample tests and interpret the results.
Content Outline	**Data Analysis** a. Quantitative analysis, descriptive statistics, inferential statistics : Uses and limitations, Summation sign and its properties b. Proportions, percentages, ratios c. Measures of central tendency-mean, median, mode-arithmetic mean and its uses, mid – range, geometric mean, weighted mean d. Measures of dispersion /variability- range, variance, standard deviation, standard error, coefficient of variation, Kurtosis, skewness Grouped data-frequency distribution, histogram, frequency polygons, percentiles, quartiles, tertiles, ogive e. Large and Small Sample tests and interpretation -. Z-test for single proportions and difference between proportions -. Large sample test for single mean and difference between means -. Small sample tests- 't'-test, paired 't'-test, 'F' Test
Module 3(Credit 1) - Chi-Square, Correlation, and Experimental Design	
Learning Outcomes	After learning the module, learners will be able to
	1. Interpret chi square test, correlation & regression
	2. Distinguish between experiment designs
Content Outline	**Chi square test and its interpretation** a. General features, goodness of fit b. Independence of Attributes **Correlation and Regression and its interpretation** a. Basic concepts b Linear regression and correlation coefficient Regression and prediction c. Rank correlation, Product-moment method **Analysis of Variance and its interpretation** a. One-factor analysis of variance b. Two-factor analysis of variance **Design of Experiments**

	a. Completely randomized design b. Randomized block design c. Latin square design d. Factorial design
Module 4(Credit 1) - Data Presentation and Research Proposal Preparation	
Learning Outcomes	After learning the module, learners will be able to
	1. Discuss the presentation of Data
	2. Prepare research proposal
Content Outline	**Presentation of Data** a. Tabulation and Organization of data- frequency distributions, cumulative frequency distribution, contingency tables b. Graphical presentation of data- histogram, frequency polygon, ogive, stem and leaf plot, box and whiskers plot, Graphs for nominal and ordinal data- pie diagram, bar graphs of different types, graphs for relation between two variables, line diagram. Use of illustrations Cautions in visual display of data **The Research Report** Basic components of a research report- prefatory material, introduction and Review of Related Literature, Methodology, Results, Discussion, Conclusion, Summary, Abstract, Bibliography and Appendices Students to design a research study on a topic- - specify type of research - sample selection - protocol/operationalization - tools - tests for statistical analysis **Preparation of a Research Proposal**

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE):

- Assignment on a standard normal curve
- Assignment on calculation of descriptive statistics
- Assignment to test the hypothesis
- Assignment on sample size calculation

Bibliography:

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3.2 Major (Core):

Course Title **Subject Code**	**Pediatric Nutrition** **314412**
Course Credits	**4 (2 Th+2Pr)**
Course Outcomes	After going through the course, learners will be able to
	1. Discuss the nutritional requirements at different stages from infancy through adolescence and the recommendations/guidelines of expert groups.
	2. Analyze the importance of nutritional care and nourishment of children with various ailments.
	3. Describe the specific needs of children and the effects of various diseases on nutritional status and nutritional requirements at these stages of the life cycle
	4. Plan appropriate nutritional care based on pathophysiology, prevention/ and treatment of the various diet-related disorders/ diseases
Theory - Module 1(Credit 1) - Infant and Child Nutrition	
Learning Outcomes	After learning the module, learners will be able to
	1. Relate to complementary feeding along with its concerns.
	2. Discuss the growth, development, body composition & nutritional guidelines at different stages.

Content Outline	**Infant and Young Child Feeding Practices Breastfeeding:** Composition of Human Milk, Recommendations, exclusive breastfeeding, prelacteal feeds, duration of breastfeeding, advantages of breastfeeding, contraindications, types of Infant formulas. Complementary feeding, issues and concerns Growth, Development and Nutritional Requirements of Infants/Children/Adolescents Growth, development and body composition from infancy, preschool, childhood, puberty and adolescence Nutritional requirements at different stages of infancy, childhood and adolescence, factors influencing food intake, packed lunch Assessment of nutritional status and growth, growth charts and milestones Preterm/ VLBW infants – Complications, Role of parenteral and enteral nutrition (trophic feeds – gut priming) Undernutrition in childhood – PEM, FTT, SAM, Fe deficiency, Vitamin A deficiency – causes, consequences, management (in brief), Catch-up growth Over-nutrition - causes, consequences, management
Module 2(Credit 1) - Special Pediatric Nutrition	
Learning Outcomes	After learning the module, learners will be able to
	1. Describe the nutritional requirements in management of special conditions
	2. Summarize food allergies
Content Outline	**Nutritional considerations for special conditions –** Nutritional Management of Inborn Errors of Metabolism – PKU, Maple syrup urine disease, Homocystinemia, Tyrosinemia, Galactosemia, Glycogen storage disorder Diarrhea and constipation – causes, consequences, management Epilepsy and dietary approaches – ketogenic diet, Atkins and recent advances Role of diet and nutritional challenges in developmental disabilities- autism spectrum disorders, cerebral palsy, Attention deficit hyperactivity disorder, Type 1 DM – Impact on growth and management Nephrotic syndrome and CKD in children - Impact on growth and management Food Allergies

Practical - Module 3(Credit 1) - Pediatric Nutrition Assessment	
Learning Outcomes	After learning the module, learners will be able to
	1. Carry out pediatric nutritional assessments
	2.Plan dietary guidelines for infants, child and adolescence
Content Outline	**Pediatric Nutritional Assessment**:-. Anthropometric measurements, biochemical parameters, clinical and dietary assessment methods. Measuring, recording and plotting growth on growth charts. Use of growth reference/ standards (Field work) **Normal nutrition for infants** – Guidelines on breastfeeding and complementary feeding. Market survey of infant formulae and complementary foods. Planning complementary feeds as per the guidelines. Preparation of ARF. **Nutrition in childhood and adolescence**: Planning for preschool child, the school-aged child and adolescents
Practical - Module 4(Credit 1) - Nutrition for PEM and Disorders	
Learning Outcomes	After learning the module, learners will be able to
	1. Plan out nutritional guidelines for PEM, SAM cases
	2. Identify the feeding challenges for developmental disabilities
Content Outline	**Nutritional concerns:** - Guidelines for management for PEM, SAM, Fe deficiency and vitamin A deficiency **Nutritional requirements for Inborn Errors of Metabolism** - PKU, Maple syrup urine disease, Homocystinemia, Tyrosinemia, Galactosemia, Glycogen storage disorder **Nutritional Management of diarrhea** **Ketogenic diet, Atkins diet** **Feeding challenges for developmental disabilities, feeding devices** Nutritional requirements and management of - type 1 DM, nephrotic syndrome and CKD

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE):

- Plotting of growth charts activity
- Nutritional assessment of children
- Preparing of ARF
- Preparation of complementary feeds

Bibliography:

- A. Catherine Ross , Benjamin Caballero Professor, Robert J. Cousins, Katherine L. Tucker : Modern Nutrition in Health & Diseases, 11th Edition (2020) Jones and Bartlett Publishers, Inc
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3.3 Major (Core)

Course Title **Subject Code**	**Geriatric Nutrition** **314413**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Discuss the multifaceted aspects of aging and specific needs of elderly
	2. Analyze the effects of various diseases on the nutritional status of the elderly
	3. Describe the nutritional requirements of the elderly and the recommendations/guidelines of expert groups
	4. Plan and recommend appropriate nutritional care based on pathophysiology, prevention/ and treatment of the various diet-related disorders/ diseases
Theory - Module 1(Credit 1) - Physiological Changes in Aging	
Learning Outcomes	After learning the module, learners will be able to
	1. Discuss the physiological and functional changes associated with ageing
	2. Determine the impact of these changes on nutritional status and nutrients requirements of the elderly

Content Outline	**The Ageing Process** a. The Ageing Society- Global and Indian scenario b. Epidemiology c. Life Expectancy vs Life Span d. Usual vs Successful Ageing **Changes associated with Ageing process** a. Cellular aspects of ageing b. Physiological changes: body composition, gastrointestinal, cardiac, respiratory, renal, muscular, skeletal, neural(including brain and spinal cord), endocrine and metabolic, changes and impact on health and nutritional Status c. Functional manifestations of ageing: constipation, impaired fluid and electrolyte balance, altered thermoregulation, sleep disturbances
Module 2(Credit 1) - Aging Theories and Nutritional Needs	
Learning Outcomes	After learning the module, learners will be able to
	1. Discuss the factors that influence the ageing process
	2. Describe the nutritional recommendations for the elderly and factors that influence their nutrient requirements
Content Outline	**Theories of Aging** a. Common molecular theories of ageing and nutritional interventions b. Factors influencing ageing – endogenous and exogenous **Nutritional Requirements and Recommendations** a. Nutritional requirements –influencing factors and nutrient recommendations for senior citizens b. Benefits of calorie restriction and exercise Promoting successful ageing-traditional and modern methods
Module 3(Credit 1) - Age-Related Disorders and Nutrition	
Learning Outcomes	After learning the module, learners will be able to
	1. Describe specific age related disorders and their nutritional care
	2. Summarize Drug-Nutrient Interactions
Content Outline	Nutritional and health status of elderly: Factors influencing food consumption and nutritional status of elderly, Undernutrition in the Elderly – risk factors

	Common diseases in elderly: Etiopathogenesis, manifestations and interventions - Gastrointestinal disturbances, cardiac, renal, respiratory diseases, mental changes including depression, dementia, Parkinson's, Alzheimer's, bone and muscle related abnormalities, Sarcopenia, frailty Role of Nutrition in prevention of age related diseases Nutrient drug interactions
Module 4 (Credit 1) - Geriatric Nutrition Assessment and Care	
Learning Outcomes	After learning the module, learners will be able to
	1. Carry out geriatric nutritional assessment
	2. Plan out nutritional guidelines for elderly in health and sickness
Content Outline	Assessment of geriatric nutritional status – mini nutrition index, assessment of frailty Policies and programmes of the government and NGO sector pertaining to the elderly Promoting fitness and well-being- use of various modern and traditional approaches

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE):

- Nutritional assessment of geriatric population
- Food Product development for elderly
- Measuring appetite/sleep index
- Assessment of fitness of elderly and suggest remedies

Bibliography:

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A Textbook, M/s. ANB Publishers.
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3.4 Major (Elective):

Course Title **Subject Code**	**Nutrition in Critical Care** **314414**
Course Credits	**2**
Course Outcomes	After going through the course, learners will be able to
	1. Discuss the physiology, metabolism and special requirements of the critically ill patients.
	2. Identify the special nutritional support techniques and feeding formulations to meet nutritional needs of critically ill patients
Theory - Module 1(Credit 1) - Nutritional Support in Critical Care	
Learning Outcomes	After learning the module, learners will be able to
	1. Differentiate between different nutritional support systems, indications for use, their administration, and complications
	2. Describe the composition of different formulations used in enteral and parenteral nutrition
Content Outline	**Nutritional support systems and other life – saving measures for the critically ill:** Enteral and parenteral nutrition support. Role of immune enhancers, conditionally essential nutrients, immune suppressants, and special diets in critical care. **Enteral Nutrition :** a. Various sites for Enteral nutrition b. In brief, discussion on Ryle's tube and its care c. Types of feeds, advantages and disadvantage of home-based feeds, Commercial formula feeds d. Incorporation of easily digestible foods e. Requirements of nutrients according to problems eg. Renal, respiratory etc **Total Parental Nutrition**: a. The importance of TPN b. Long term effect of its use c. Site of TPN and its care d. Composition **Diet related ethical issues in the terminally ill**

	Nutritional Support System and Complications including refeeding syndrome and rehabilitation diets.
	Evaluation: Market survey on availability, composition and price of EN and TPN formulations
Module 2(Credit 1) - Critical Illnesses and Nutrition	
Learning Outcomes	After learning the module, learners will be able to
	1. Determine the pathophysiologic, metabolic and clinical aspects of various critical care conditions
	2. Discuss the specific nutritional requirements and management of the conditions
Content Outline	**Patho-physiological, clinical and metabolic aspects, special nutritional requirements, nutritional goals and monitoring the therapy in critical illnesses, nutritional screening and nutritional status assessment of the critically ill, recommendations and guidelines of expert groups, role of immune enhancers, conditionally essential nutrients:** CV complications Stroke Respiratory failure Multi organ failure Hepatic failure Surgery and its complications Sepsis and burns *Evaluation: Review of evidence – based guidelines for the above conditions* *Discussion and presentation on evidence-based guidelines*

Assignments / Activities

- Nutritional assessment of critical care patients.
- Product development for special conditions.
- Preparation of enteral nutrition feeds.
- Market survey of nutrition supplements.

Bibliography:

- Dixit, S., Zirpe, K., Khatib, K., Joshi, A., Kulkarni, S. (2017): Principles in Critical Care Nutrition (ICSSM), 1st edition, Jaypee Brothers Medical Publishers
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3.5.1 Major (Elective):

Course Title **Subject Code**	**Functional Foods and Nutraceuticals** **324421**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to -
	1. Gain knowledge about functional foods and nutraceuticals along with their mode of action
	2. Describe the health effects of various functional foods and nutraceuticals
	3. Apply the principles of functional foods and nutraceuticals into practice
Theory - Module 1(Credit 1) - Basics of Functional Foods and Nutraceuticals	
Learning Outcomes	After learning the module, learners will be able to
	1. Define and classify functional foods / nutraceuticals
	2. Describe the health impact and mode of action of probiotics and prebiotics
Content Outline	**Introduction:** Definition, history, classification – Type of classification (Probiotics, probiotics and synbiotics; Nutrient vs. Non-nutrient; according to target organ; according to source or origin) Metabolism of xenobiotics (review) **Probiotics** a. Taxonomy and important features of probiotic microorganisms b. Health effects of probiotics including mechanism of action. c. Probiotics in various foods: fermented milk products, non-milk products etc. d. Quality Assurance of probiotics and safety

<table>
<tr><td></td><td>Prebiotics

Unit 1. Definition, chemistry, sources, metabolism and bioavailability, effect of processing, physiological effects, effects on human health and potential applications in risk reduction of diseases, perspective for food applications for the following:

a. Non-digestible carbohydrates/oligosaccharides
b. Dietary fibre
c. Resistant starch
d. Gums</td></tr>
<tr><td colspan="2">Module 2(Credit 2) - Health Benefits of Functional Foods</td></tr>
<tr><td rowspan="3">Learning Outcomes</td><td>After learning the module, learners will be able to</td></tr>
<tr><td>1. Discuss the active biodynamic principles and physiological action of several classes of functional foods</td></tr>
<tr><td>2. Describe their role in health promotion and disease risk reduction</td></tr>
<tr><td>Content Outline</td><td>Potential health benefits of the following functional foods: Definition, chemistry, sources, metabolism and bioavailability,effect of processing, physiological effects, effects on human health and potential applications in risk reduction of diseases, perspective for food applications for:

a. Polyphenols: Flavonoids, catechins, isoflavones, tannins Curcumin, Resveratrol
b. Phytoesterogens/ Isoflavones
c. Phytosterols
d. Glucosinolates
e. Pigments : Lycopene, Carotenoids
f. Organosulphur compounds
Other components – Phytates, Protease inhibitors, saponins, Amylase inhibitors, haemagglutinins</td></tr>
<tr><td colspan="2">Module 3(Credit 1) - Effects of Nutrients and Spices on Health</td></tr>
<tr><td rowspan="3">Learning Outcomes</td><td>After learning the module, learners will be able to</td></tr>
<tr><td>1. Identify non- nutrient effects of specific nutrients</td></tr>
<tr><td>2. Describe the active biodynamic principles and health effects of various spices and condiments</td></tr>
<tr><td>Content Outline</td><td>Non- nutrient effect of specific nutrients:

Proteins, Peptides and nucleotides, Conjugated linoleic acid and n3 fatty acids, Vitamins and Minerals

Active biodynamic principles in spices, condiments and other plant materials and their evidence based effects</td></tr>
</table>

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE):

- Market survey of Indian nutraceuticals.
- Write review paper on spices and condiments used as nutraceuticals.
- Assignment on medicinal herbs and their functional properties.

Bibliography:

- A. Catherine Ross , Benjamin Caballero Professor, Robert J. Cousins, Katherine L. Tucker : Modern Nutrition in Health & Diseases, 11th Edition (2020) Jones and Bartlett Publishers, Inc
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3.5.2 Major (Elective):

Course Title **Subject Code**	**Drug Nutrient Interaction** **324422**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to -
	1. Define medication interactions with nutrients and Drug reaction and disposition
	2. Elucidate how medications affect nutritional status and how food
	3. Understand the drug and nutrient interactions at different stages of life
	4. Understand the drug and nutrient interactions in different disease conditions or treatment
Module 1 (Credit 1) - Drug-Nutrient Interaction Basics	
Learning Outcomes	After learning the module, learners will be able to -
	1. Classify the drugs and drug-nutrients
	2. Understand drug-nutrient interactions
Content Outline	**Introduction to Drug-Nutrition Interactions and the Impact of Nutritional status on drug disposal and its outcome** a. Introduction and Classification of Drug-Nutrient Interactions b. Drug Reaction and Disposition c. Drug Transporters d. Drug-Metabolizing Enzymes e. Nutrient Disposition and Response
Module 2 (Credit 1) - Food Impact on Drug Metabolism	
Learning Outcomes	After learning the module, learners will be able to -
	1.Comprehend drug metabolism
	2.Understand the influence of food and dietary components on drugs
	3.Associate the effects of drugs on food intakes

Content Outline	**Food Nutrients or Supplements' Impact on Drug Disposal and Impact** a. Drug Absorption with Food b. Effects of Specific Foods and Dietary Components on Drug Metabolism c. Food's Effect on Drug Absorption, Drug Transport, Drug Metabolism,Drug Utilization,Drug Excretion d. Drug Effects on Food Intake e. Positive Drug-Nutrient Interactions f. Drug-Induced Changes to Nutritional Status g. Influence of Protein-Calorie Malnutrition on Medication h. Influence of Overweight and Obesity on Medication i. Interaction of Natural Products with Medication and Nutrients
Module 3 (Credit 1) - Life Stage Drug-Nutrient Interactions	
Learning Outcomes	After learning the module, learners will be able to -
	1. Understand the drug nutrient interactions in different stages of life.
Content Outline	**Drug Nutrient Interaction in Different Life Stages** a. Drug–Nutrient Interactions in Infancy and Childhood b. Drug–Nutrient Interaction Considerations in Pregnancy and Lactation c. Drug–Nutrient Interactions in the Elderly
Module 4 (credit 1) - Drug-Nutrient Interactions in Diseases	
Learning Outcomes	After learning the module, learners will be able to -
	1.Understand the drug nutrient interactions in specific medical conditions
Course Content	**Drug Nutrient Interaction In Specific Conditions** Drug–Nutrient Interactions in a. Patients Receiving Enteral Nutrition b. Patients Receiving Parenteral Nutrition c. Immune Function d. Cancer e. Transplantation f. Chronic Infections

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

1. Methods to lower the Risk of Drug-Nutrient Interactions
2. Drug Nutrient Interaction in Neuro-psychological conditions
3. Drug classification and mechanism of action
4. Contraindications of Ayurvedic,Allopathic and Homeopathic medications

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3.5 Research Project

Course Title **Subject Code**	**Research Project** **354431**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Demonstrate mastery of parametric and non-parametric statistical tests through application in data analysis.
	2. Evaluate and critique quantitative analysis methods, demonstrating proficiency in interpreting large and small sample tests for inferential statistics.
	3. Synthesize advanced statistical techniques such as chi-square tests, correlation, and regression to analyze complex datasets and draw meaningful conclusions.
	4. Construct comprehensive research proposals, integrating data presentation techniques and discussing experimental designs with clarity and precision
Module 1(Credit 1) - Formulation of problem	
Learning Outcomes	After learning the module, learners will be able to
	1. Recognize and undertake research problems.
Content Outline	● Identifying research gaps and formulating research questions. ● Sources of research problems (literature, real-world issues, academic curiosity). ● Techniques for developing research questions. ● Writing clear and measurable research objectives.
Module 2(Credit 2) - Review of Literature	
Learning Outcomes	After learning the module, learners will be able to
	1. Review the existing literature
Content Outline	● Conducting comprehensive literature searches using databases and other resources. ● Evaluating and selecting relevant literature. ● Organizing literature into themes and developing a theoretical framework. ● Writing a coherent and critical literature review.
Module 3(Credit 1) - Designing Research proposal	
Learning Outcomes	After learning the module, learners will be able to
	1. Apply critical thinking to the problem selected for research

Content Outline	• Components of a research proposal (title, abstract, introduction, etc.). • Selecting appropriate research design (exploratory, descriptive, experimental). • Methodology: data collection methods and sampling techniques. • Writing and structuring the research proposal.
Module 4 (Credit 1) - Planning tools & techniques for data collection	
Learning Outcomes	After learning the module, learners will be able to
	1. Able to design the research work and plan the execution.
Content Outline	• Use Gantt charts, timelines, and milestones for project planning and resource allocation. • Address ethical considerations, including obtaining informed consent. • Conduct data collection through surveys, interviews, and observations, ensuring ethical guidelines.

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE):

- **Module 1:** Continuous assessment involves monitoring students' ability to identify research gaps, formulate clear research questions, and articulate measurable research objectives.
- **Module 2:** Assess students' proficiency in conducting comprehensive literature searches, evaluating and synthesizing relevant literature, and developing a coherent theoretical framework for their research.
- **Module 3:** Evaluate students' application of critical thinking in selecting appropriate research designs, developing methodologies for data collection, and structuring a research proposal effectively.
- **Module 4:** Assess students' competence in using planning tools like Gantt charts for project management, addressing ethical considerations in data collection, and applying qualitative and quantitative analysis methods to interpret research findings.

Semester IV

Syllabus Contents

4.1 Major (Core)

Course Title **Subject Code**	**Nutrigenetics And Nutrigenomics** **414411**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Analyze the genetic components involved in human nutrition
	2. Correlate nutrition with genetics.
	3. Tailor the dietetic advice to patients based on nutrigenetics and counsel the patient.
Module 1 (Credit 1) - Introduction to Human Genetics	
Learning Outcomes	After learning the module, learners will be able to
	1. Describe the basics of genetics and the normal physiology of DNA 2. Identify diseases with genetic inheritance patterns
Content Outline	**Introduction to Human Genetics** ▪ Definition of gene, genome, DNA, allele, chromosome. Mitosis and Meiosis. ▪ Mendelian Principles- Chromosome Theory of Heredity (Sutton-Boveri), Inheritance patterns, the phenomenon of Dominance, Recessive, and Co-dominance. ▪ Inheritance patterns in Humans (Sex-linked, Autosomal, Mitochondrial, Unifactorial, Multi-factorial). ▪ Molecular effects of genetic variation- polymorphism, genetic linkage- linkage disequilibrium, haplotype, copy number variants, and mutations. Hardy-Weinberg equilibrium. Gene nomenclature
Module 2 (Credit 1) - Introduction to Nutrigenetics and Nutrigenomics	
Learning Outcomes	After learning the module, learners will be able to
	1. Describe the history of genetics in nutrition 2. Analyze the relationship between nutrition, environment and genomics 3. Discuss the interactions of epigenetic changes and nutrient components

Content Outline	**Introduction to Nutrigenetic and Nutrigenomics** ● Introduction to Epigenomics, Molecular mechanisms of Epigenomics, Epigenomics and Nutrition (Molecular bases of gene-gene and gene-environment interaction), Epigenomics and disease, ● What is Nutrigenetics and Nutrigenomics? How are they different from each other? Nutrigenomic interactions [direct and indirect method]. ● History of Nutrigenetics- Phenylketonuria, MTHFR genes, Where Nutrigenetics differences comes from- Nutritional Relativism, Nutrigenetics and the early life origins of health and diseases.
Module 3 (Credit 1) - Nutrigenetics and Nutrigenomics of Metabolic Health	
Learning Outcomes	After learning the module, learners will be able to
	1. Examine the genetics of obesity and metabolic health 2. Evaluate the influence of genes on response to dietary interventions
Content Outline	**Nutrigenetics and Nutrigenomics of Metabolic Health** ● Brief Overview of lipid metabolism ● Genetic disorders of lipid metabolism ● SNPs associated with Lipid profile – ABCG8, CELSR, LDLR, ABCA1, CETP, APOA1, APOA5, GCKR gene. ● Genomics of eating behaviour and appetite regulation (HPA, serotonin) ● Genetics of body composition; from obesity to extreme leanness, Genetic implication of energy homeostasis, Genetic variation with influence on the individualized response to weight loss diet: FTO Gene as evident, Genetics variation with influence on the individualized body fat percentage: ADRB3, BDNF, FTO, MC4R, SH1B2, TMEM18. ● Nutrient-gene interaction studies, lifestyle intervention studies
Module 4 (Credit 1) - Effective Health Coaching and Nutrigenetic Counseling	
Learning Outcomes	After learning the module, learners will be able to
	1. Counsel patients effectively based on the principles of nutrigenetics
Content Outline	**Effective Health Coaching and Nutrigenetic Counselling** ● Conducting health history questionnaires, health goals, identifying physiological parameters that are essential for the ideal diet planning ● Purpose of Effective Counselling, explain Nutrigenetic recommendations and diet plan, Planning the grocery list.

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE):

1. Review current ICMR/NIN guidelines for diet in adults
2. Report on factors affecting genetic changes and epigenetics
3. Formation of a health assessment questionnaire focusing on nutrigenetics.
4. Role play of effective nutrigenetic counselling

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4.2 Major (Core)

Course Title **Subject Code**	**NUTRITION, DIET AND MICROBIOME** **414412**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Elaborate on the field of human microbiome in health
	2. Discuss the role of human microbiome in health and disease.
	3. Apply the concepts of microbiology in dietetic practice
Module 1(Credit 1) - Introduction to Human Microbiome	
Learning Outcomes	After learning the module, learners will be able to
	1. Elaborate on the importance of human microbiome 2. Illustrate the stages of microbiome development
Content Outline	**Introduction to Human Microbiome** ● Various microbes in human body ● Importance of microbiome in human health ● Microbiota development in all organ systems (microbiota in different niches like respiratory tract, gut microbiota, vaginal and reproductive tract etc.) ● Life changing events and personal microbiota development.
Module 2 (Credit 1) - Human Microbiome Across the Lifespan	
Learning Outcomes	After learning the module, learners will be able to
	1. Illustrate the relationship between microbiome and immunity 2. Justify the role of microbiome in healthy ageing
Content Outline	**Human Microbiome Across the Lifespan** ● Microbiota development in all epochs of life ● Role of microbiota in aging including healthy aging and role in longevity and ageing related diseases ● Role of microbiota in infancy and childhood immunity
Module 3 (Credit 1) - Microbiota in Diet and Disease	
Learning Outcomes	After learning the module, learners will be able to
	1. Review the significance of microbiome in specific diseases 2. Design therapies for healthy microbiome
Content Outline	**Microbiota in Diet and Disease** ● Obesity ● Malabsorption syndrome ● SIBO ● GI Cancers ● IBD/IBS ● GI Surgery **Microbial therapies and diagnostics and personalized therapies**

Module 4 (Credit 1) - Applicability and Societal Impact	
Learning Outcomes	After learning the module, learners will be able to
	1. Associate microbiome with medical therapy 2. Practice the use of metagenome and other genome data sets
Content Outline	**Applicability and Societal Impact** ● Role and applicability of microbiome in pharmacy and medical therapy ● Approaches to study the Microbiome in healthy and diseased states using data sets like metagenome transcriptome genome and other omics approaches.

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE):

1. Enlist the significant microbes in heath and disease
2. Conduct a market survey of nutraceuticals containing microbes
3. Design audio visual aids to illustrate microbiome development.

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4.3 Major (Core)

Course Title **Subject Code**	**DIETETIC TECHNIQUES AND PATIENT COUNSELLING** **414413**
Course Credits	**4 (2 credits theory + 2 credits practical)**
Course Outcomes	After going through the course, learners will be able to
	1. Elaborate the principles and procedures of nutriti on counseling and the role of the counselor.
	2. Discuss (a) lifestyles influence health and well-being; (b) acute and chronic disease affects the emotional and psychological state and the behavior of the individuals.
	3. Counsel patients using various techniques.
	4. Apply various types and techniques of counseling to motivate patients to achieve well-being.
Module 1 (Credit 1) (Theory) - Introduction to Counseling	
Learning Outcomes	After learning the module, learners will be able to
	1. Elaborate on effective counselling and the role of counsellor 2. Practice patient evaluation and realistic goal setting
Content Outline	**Introduction to Counselling** Counselling – Definition, Expectations, goals, scope and limits. Counsellor – Characteristics of an effective counselor The Client – Characteristics, expectations The Counselling Process: Techniques for obtaining relevant information ● Clinical Information ● Medical History and General Profile ● Dietary Diagnosis ● Assessing food and nutrient intakes ● Lifestyles, physical activity, stress ● Nutritional Status ● Correlating relevant information and identifying areas of need Stage I: Problem exploration and clarification Stage II: Developing new perspectives and setting goals ● Stage III: Implementation follow up and evaluation
Module 2 (Credit 1) (Theory) - Counseling Techniques	
Learning Outcomes	After learning the module, learners will be able to
	3. Apply the various counselling techniques 4. Conduct individual and group counselling

Content Outline	• **Counselling Theories and Approaches: Key Concepts and Techniques** Counselling techniques, strategies and communication skills Rapport building and opening techniques Questioning, listening, reflecting, acceptance, silence, leading reassurance, non-verbal behaviour, terminating skills. • **Group Counselling**
Module 3 (Credit 1) (Practical) - Education Resource Development	
Learning Outcomes	After learning the module, learners will be able to
	1. Design auditory and visual resources for nutrition education
Content Outline	**Developing resources and aids for education and counseling**
Module 4 (Credit 1) (Practical) - Patient Counseling in Clinical Settings	
Learning Outcomes	After learning the module, learners will be able to
	1. Counsel hospitalized patients for nutrition therapy
Content Outline	• **Working with:** 1. Hospitalised patients (adults, pediatric, elderly, handicapped), adjusting and adopting to individual needs Outpatients (adults, pediatric, elderly, handicapped), patients' education, techniques and modes **Follow up Monitoring and Evaluation of outcome: Home visits.**

Activities towards Comprehensive Continuous Evaluation (CCE):

1. Role play between dietitian and client/patient in an OPD/clinic setting
2. Plan creative resources for nutritional education
3. Visit to hospital.

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4.4.1 Major (Elective)

Course Title **Subject Code**	**PRINCIPLES OF AYURVEDIC DIETETICS (TH.)** **424411**
Credits	**4**
Course Outcomes	After going through the course, learners will be able to:
	1. Discuss the Ayurvedic concepts of food and nutrition 2. Acquire skills to correlate the interrelationships of food science, human nutrition and Ayurvedic principles for public health. 3. Develop better diet planning skills for various stages of life and diseases integrating Ayurvedic knowledge with Modern Dietetics/Medical Nutrition Therapy 4. Contribute towards healthy human society.
Module 1 (Credit 1) - Ayurvedic Perspectives of Health	
Learning Outcomes	After learning the module, learners will be able to:
	1. Explore the philosophy about Health in both traditions and modern systems of medicine, identify areas for integration and the lessons that can be learned and integrated into modern dietetic practices 2. Discuss Prakriti and its implications for dietetic practice and dietary recommendations 3. Assess Prakriti using validated tools
Content outline	**Ayurvedic Perspectives of Health** ● Health in Traditional Health Care System and Modern Sciences ● Ayurvedic Perspective of Health to Diseases Continuum ● Ayurvedic Fundamentals: *Tridosh Siddhant* and *Samanya Vishesh Siddhant* ● Constitution of Body and its Constituents: Ayurvedic and Current Perspective of Physiology and Metabolism ● Prakriti and its Determinants ● Prakriti in Health and Disease: Ayurvedic Perspective
Module 2 (Credit 1) - Concept of Agni and Digestion	
Learning Outcomes	After learning this module, learners will be able to:
	1. Elaborate the concept of Agni, digestion and correlate these with modern concepts including gut microbiome, its role in health and disease 2. Incorporate the Ayurvedic principles for daily diet and seasonal (***Ritu***) regimes and in dietetic practice for health and well-being

Content Outline	**Concept of *Agni* and *Mahasrotas*** ● Agni in Ayurveda and its relation to Health and Diseases ● Concordance between Ayurvedic Concepts of Agni and Molecular Nutrition ● *Concept of Ojas* ● Microbiome and its Role in Health ● Concepts of Digestion in Ayurveda ● Ahar vidhi Visheshayatana ● Daily Diet and Seasonal Regimes
Module 3 (Credit 1) - Ayurvedic Food Classification	
Learning Outcomes	After learning this module, learners will be able to:
	1. Classify foods as per the Ayurvedic principles 2. Integrate the Ayurvedic principles of *Pathya Apathya* and *ViruddhaAnna* in dietetic practice for health and well-being Incorporate the concepts of *Langhan and rasayana* into dietetic prescriptions for patient health and well-being
Content Outline	**Poshan and Ahar: Compatibility and Langhan** ● Classification of food material as per Classical Ayurvedic Texts ● Ayurvedic Properties of food material ● *Pathyapathya* ● *Viruddha Anna* ● Concept of Fasting and its applications in Ayurveda ● Caloric Restrictions and Types of Diet Healthy Ageing & Rasayana
Module 4 (Credit 1) - Ayurvedic Food Properties and Sensory Evaluation	
Learning Outcomes	After learning this module, learners will be able to:
	1. State the terminologies used to describe the properties Ayurvedic classification of foods and the properties ascribed to them 2. Describe the Ayurvedic concept of taste, their functions and relevance to health 3. Elaborate the concordance with modern food science and sensory evaluation science and know the differences 4. Apply the knowledge about *Sanskar (Ayurvedic perspective)* and modern understanding of Food Processing and Food Science and their effects on foods and their properties and use the knowledge in dietary prescriptions
Content Outline	**Poshan and Ahar: Dravyaguna Aspect** ● Terminology used in Ayurveda to describe properties of food material: *Dravya, Guna, Karma, Rasa, Veerya, Vipak, Prabhav*

	• Concept of Taste, functions and relation to health • Taste Receptors and Food Science • Sanskar vis a vis Food Processing • Modern Nutrition & Dietetics Ayurvedic Properties of Food Material: *Dravyaguna*

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE):

1. Conduct *prakriti* assessment using standard tools
2. Develop recipes based on Ayurvedic principles of food

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4.4.2 PUBLIC HEALTH AND NUTRITION

Course Title **Subject Code**	**PUBLIC HEALTH AND NUTRITION** **424412**
Course Credits	**4**
Course Outcomes	After going through the course, learners will be able to
	1. Develop a holistic knowledge base and understanding of the nature of important nutritional problems and their prevention and control for the disadvantaged and upper socio-economic strata in society
	2. Discuss the causes /determinants and consequences of nutritional problems in society
	3. Identify the various approaches to nutrition and health interventions, programmes and policies.
Module 1 (Credit 1) - Introduction to Public Health Nutrition	
Learning Outcomes	After learning the module, learners will be able to
	1. Explore the domain of public health nutrition 2. Discuss food and nutrition security in India
Content Outline	• **Concept of public nutrition** a. Relationship between health and nutrition b. Role of public nutritionists in the health care delivery • **Sectors and Public Policies relevant to nutrition and health.** • **Primary Health Care of the Community** a. National Health Care Delivery System b. Determinants of Health Status c. Indicators of Health • **Population Dynamics** a. Demographic transition b. Population structure c. Fertility behavior d. Population policy e. Fertility f. Interrelationship between Nutrition and Quality of Life • **Food and Nutrition Security** a. Food production i. Access ii. Distribution iii. Availability iv. Losses v. Consumption b. Food Security c. Socio-cultural aspects and Dietary Patterns: Their implications for Nutrition and Health
Module 2 (Credit 1) - Nutritional Status and Problems	

Learning Outcomes	After learning the module, learners will be able to
	1. Analyze the determinants of nutritional status 2. Discuss the occurrence and therapies of nutritional problems
Content Outline	a. **Nutritional Status** b. Determinants of nutritional status of individual and populations c. Nutrition and Non-nutritional indicators i. Socio-cultural ii. Biologic iii. Environmental iv. Economic c: Assessment of nutritional status of individuals of different ages- MUAC, Weight for age, Height for age, Weight for height, Ponderal index, BMI Applications and limitations in different field situations- choice of an indicator • **Major Nutritional Problems** – etiology, prevalence, clinical manifestations, preventive and therapeutic measures for: a. Macro and micro nutrient deficiencies b. Other nutritional problems like lathyrism, dropsy, aflatoxicosis, alcoholism and fluorosis. Overweight, obesity and chronic degenerative diseases
Module 3 (Credit 2) - Strategies and Health Economics	
Learning Outcomes	After learning the module, learners will be able to
	1. Develop strategies for improvement of nutritional status 2. Correlate public nutritional concerns with health economics
Content Outline	**Approaches and Strategies for improving nutritional status and health:** a. National Food, Nutrition and Health Policies - Plan of action and programmes b. Programmatic options- their advantages and demerits. i. Feasibility ii. Political support iii. Available resources (human, financial, infrastructural) c. Case studies of selected strategies and programmes: their rationale and context, how to select interventions from a range of possible options: d. Health-based interventions, Food-based interventions including fortification and genetic improvement of foods, supplementary feeding, Nutrition education for behaviour change. • **Health economics and economics of malnutrition** a. Its impact on productivity and national development b. Cost-Benefit i. Cost effectiveness Cost efficiency

Assignments / Activities towards Comprehensive Continuous Evaluation (CCE):

1. Assessment of nutritional status of adults in community
2. Develop cost effective recipes for micronutrient deficiencies
3. Plan an outreach programme for nutritional awareness

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4.5 DISSERTATION

Course Title **Subject Code**	**Dissertation** **454431**	
Course Credits	**6**	
Sr. No.	**Modules and Outcomes**	**Course Contents**
Course Outcomes:	At the end of this course Learners will be able to – - Demonstrate mastery of parametric and non-parametric statistical tests through application in data analysis. - Evaluate and critique quantitative analysis methods, demonstrating proficiency in interpreting large and small sample tests for inferential statistics. - Synthesize advanced statistical techniques such as chi-square tests, correlation, and regression to analyze complex datasets and draw meaningful conclusions. - Construct an argument based on their prior research proposal, integrating data analysis and presentation techniques and drawing summary and conclusion with clarity and precision.	
	Data collection/ analysis ● Gather and finalize any remaining data required for the dissertation. ● Ensure all data is complete, validated, and ready for analysis. ● Conduct final data analysis using appropriate statistical methods. ● Validate findings and ensure they align with research objectives and hypotheses.	
	Finalization of chapters of Introduction & Methodology ● Review and finalize the introduction chapter, providing a clear rationale and background for the study. ● Refine the methodology chapter, detailing the research design, sampling methods, and data collection procedures. ● Ensure all methodological aspects are well-documented and align with the research questions. ● Incorporate any feedback or suggestions to enhance the clarity and coherence of these chapters.	
	Finalization of Results and Discussion ● Analyse and interpret the final results obtained from the data analysis. ● Present findings in a clear and structured manner, using tables, graphs, and figures as needed. ● Discuss the implications of the results in relation to the research questions and existing literature. ● Address any unexpected findings or limitations and provide possible explanations.	
	● Craft a well-rounded conclusion that reflects on the overall research journey and its implications.	

	Approval of final draft of the dissertation and research article ● Submit the final draft of the dissertation to the academic advisor or committee for review and approval. ● Address any feedback or revisions requested by the advisor or committee to ensure the dissertation meets academic standards. ● Simultaneously, students will prepare a research article based on their dissertation findings for submission to an international journal of high repute. The article should be structured according to the journal's guidelines, emphasizing the novelty, significance, and implications of the research
	Submission of dissertation and Viva voce ● Submit the approved dissertation to the academic institution by the specified deadline. ● Ensure the dissertation adheres to all formatting and documentation requirements for final submission. ● Concurrently, students will finalize the research article based on their dissertation findings for submission to the international journal. ● Prepare for the viva voce (oral defense) examination, which includes defending both the dissertation and the research article before a panel of examiners. ● Demonstrate in-depth knowledge, critical thinking, and the ability to articulate and defend research findings during the viva voce.

Dissertation Assessment Template:

<table>
<tr><td rowspan="8"></td><td rowspan="3">INTERNAL ASSESSMENT (25)</td><td colspan="2"></td><td>TOTAL Marks Obtained</td></tr>
<tr><td>Proposal (15)</td><td></td><td rowspan="2"></td></tr>
<tr><td>Understanding of concept & Execution
(10)</td><td></td></tr>
<tr><td colspan="3">TOTAL Marks
out of 25</td><td></td></tr>
<tr><td rowspan="5">INTERNAL ASSESSMENT (25)</td><td>(A) General</td><td></td><td rowspan="5"></td></tr>
<tr><td>Punctuality, Sincerity, Perseverance, Commitment, Attitude</td><td></td></tr>
<tr><td>TOTAL</td><td>Out of 15</td></tr>
<tr><td>(B) Skills</td><td></td></tr>
<tr><td>Use of Resources, Literature, Use of Technology, Communication, Any
other</td><td></td></tr>
<tr><td></td><td colspan="2">TOTAL</td><td>Out of 10</td><td></td></tr>
<tr><td></td><td colspan="3">TOTAL Marks (by the internal supervisor)
out of 50</td><td></td></tr>
<tr><td colspan="2"></td><td colspan="2">INTERNAL EXAMINER</td><td>EXTERNAL EXAMINER</td></tr>
<tr><td rowspan="4">JOINT ASSESSMENT (100)</td><td>Dissertation (50)</td><td></td><td></td></tr>
<tr><td>Viva Voce (50)</td><td></td><td></td></tr>
<tr><td>TOTAL</td><td></td><td></td></tr>
<tr><td>TOTAL (Average of the two)</td><td colspan="2"></td></tr>
<tr><td colspan="4">OVERALL TOTAL (OUT OF 150)</td><td></td></tr>
</table>