DISCIPLINE SPECIFIC ELECTIVE COURSE –DSE-5 :

Course title& Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Human Nutrition and Biochemistry (BS-DSE-5)	**4**	**2**		**2**	Class XII pass with Biology and chemistry	**NA**

Learning Objectives:

This course provides students with knowledge and understanding of the characteristics, function, metabolism and deficiency of macro and micronutrients in the human body. It involves integrated learning between the areas of Biochemistry and Nutrition.

Learning Outcomes:

On successful completion of the course, a student will:

- Critically analyze and evaluate concepts in nutritional biochemistry that are important for an understanding of human nutrition.
- Appreciate the biochemical underpinning of human nutrition in maintaining health.
- Demonstrate understanding of the biochemical basis of essentiality of macro and micronutrients and their nutritional deficiencies.
- Be aware of techniques used in the assessment of nutritional status and nutritional disorders.

Understand drug nutrient interactions

SYLLABUS FOR DSE-5

Course Contents -Theory

UNIT 1: Introduction to Nutrition and Energy Metabolism **No. of hours: 4**

Defining nutrition, role of nutrients. Unit of energy, Food energy, Specific Dynamic Action. Energy expenditure and its components, Energy Balance, Recommended Nutrient Intakes (RNI) and Daily Recommended Intakes for different age groups.

UNIT 2: Macronutrients **No. of hours: 10**

Food sources of carbohydrates, functions of carbohydrates, RDA, Factors affecting bioavailability, Glycemic index and glycemic load. Dietary fiber and the role of fiber in health. Role of Gut microbiome in maintaining health. Role of prebiotics and probiotics in nutritive health.
Essential Fatty Acids; Functions of EFA, AI, excess and deficiency of EFA, factors affecting bioavailability. Dietary implications of ratios of n6 and n3, MUFA, PUFA, SFA and Cholesterol in the body.
Functions of proteins in the body. RDA for different age groups. Essential and Nonessential amino acids. Complete and incomplete protein, Amino Acid Interactions: Antagonism, Toxicity, Imbalance, Amino acid complementation and Supplementation in foods. Protein quality determinants: Net protein utilization (NPU), Biological Value, Protein digestibility-corrected amino acid score (PDCAAS), Nitrogen balance. PEM: Marasmus and Kwashiorkor.

UNIT 3: Fat- and water-soluble Vitamins **No. of hours: 9**

Vitamin A, D, E, K and their dietary sources, RDA, Role of Vitamin A in Visual cycle and overview of other functions. Role of Vitamin K in Gamma carboxylation (blood clotting). Role of Vitamin E as an antioxidant. Role of Vitamin D in maintenance of bone physiology and overview of other functions. Vitamin C- Dietary sources, RDA, role in collagen synthesis. The B Complex vitamins- Dietary sources, RDA.Functions and role in metabolism, Role of Vitamin B12 and Folate in Hematopoiesis and Neurology Biochemical basis for deficiency symptoms, Hypervitaminosis.

UNIT 3: Minerals **No. of hours: 7**

Minerals: Dietary Sources, RDA. Sodium, Potassium, Calcium, Iron, Chloride, Copper and Phosphorus-Function, metabolism, Excretion, Deficiency and Toxicity.
Function, Metabolism, deficiency, Toxicity and Sources of Trace Elements: Iodine, Fluoride, Mg, Zn, Se,Chromium, Molybdenum.

PRACTICAL

CREDITS: 2 **TOTAL HOURS: 60**

1. Anthropometric identifications for nutrition related diseases –Body mass index (BMI), percentage body fat
2. Calculation of Basal Metabolic Rate (BMR) and Total daily Energy Expenditure (TDEE)
3. Determination of oxidative stress: Thiobarbaturic acid reactive substances (TBARS) in serum.
4. Assay of antioxidant enzymes in hemolysate/plant sources.
5. Estimation of vitamin A/E in serum.
6. Estimation of minerals in drugs/food/serum.
7. Determination of nutritive value of foods through Kjeldal's method, Soxhlet method
8. Understanding fortification and supplementation
9. Presentation and discussion on Food as medicine.
10. Group discussion on Nutrient-nutrient and drug-nutrient interactions
11. Case studies on nutritional disorders.

Essential Readings

1. Coombs Jr. G. F., (2008). *The vitamins, Fundamental aspects in Nutrition and Health.* Elsevier's Publications. ISBN-13- 978-0-12- 183493-7.
2. Mahan, L.K., Strings, S. E., Raymond, J. (2012) *Krause's Food and Nutrition Care process.* Elsevier's Publications. ISBN: 978-1-4377-2233-8.
3. Rosalind Gibson (2005). *Principles of Nutritional Assessment.* Oxford University Press. ISBN: 9780195171693
4. Tom Brody (1999). *Nutritional Biochemistry* (2nd Ed). Harcourt Braces. ISBN:9814033251, 978981403325
5. Malik, D., Narayanasamy, N., Vavilala, P., Takur, J., Sinha, N., (2022). Textbook of Nutritional Biochemistry. Springer Singapore, ISBN978-981-19-4149-8.

Suggested Reading

1. Devlin, T. M., (2011). *Textbook of Biochemistry with Clinical Correlations.* John Wiley & Sons, Inc. (New York), ISBN: 978-0-4710-28173-4.