

**Shree Manibhai Virani and Smt. Navalben Virani Science College, Rajkot
(Autonomous)
Affiliated to Saurashtra University, Rajkot**

B.Sc. BIOCHEMISTRY

**Discipline Specific Elective Cluster II
Semester IV**

Discipline Specific Elective For the students admitted from A.Y. 2021-2022 & onwards		
Offering Department: Biochemistry	Offered to: Other Departments	
Semester – IV		
Course Code	Course Title (Ad)	Course Credit and Hours
21UBCDE406	Nutritional Biochemistry	3 Credits -3 hrs/wk

Course Description:

This course provides introduction to biochemistry of macro- and micronutrients with a limited focus on medical aspects of nutrient deficiencies and metabolism. Students will be introduced to biochemical mechanisms of energy expenditure and storage, including metabolic adaptation to periods of fasting or food intake.

Course Purpose:

This course introduces students to nutrition principles necessary to promote a healthy lifestyle through assessment and application. Students will be better prepared to evaluate nutrition-related issues presented in the media and to make informed choices about their diet in order to promote health throughout their lives. Information about nutrients (proteins, carbohydrates, fat, vitamins, water, and minerals) and the physiological processes used to digest, absorb, and utilize them is presented and related to such topics as maintenance of ideal body weight, improvement in physical performance, and the role of nutrients in various disease states such as heart disease, diabetes, cancer, and osteoporosis

Course Outcomes: Upon completion of this course, the learner will be able to

CO No.	CO Statement	Blooms taxonomy Level (K₁ to K₆)

CO ₁	Discuss calorogenic action of food, SDA and energy requirements of humans. Explain BMR and enumerate the factors affecting it.	K1 , K2
CO ₂	Describe the digestion, absorption and functions of carbohydrates, proteins and lipids in body.	K2 , K3
CO ₃	Elaborate the role of proteins in body with reference to quality of proteins, digestibility coefficient, biological value and amino acid score of proteins.	K2, K3 and K4
CO ₄	Explain the physiological roles of fat and water soluble vitamins and their deficiency disorders.	K2, K3 and K4
CO ₅	Describe physiological role of various major and trace elements in body. Explain disorders related to nutrition	K2, K3 and K4

Course Content	Hours
Unit 1: Introduction to Nutrition and Energy Metabolism	8 hrs
<ul style="list-style-type: none"> Defining Food, Nutrition and role of macro and micro nutrients in human body. Concept of RDA, Food tables and their use Units of energy: calorie, Kcal or Cal (kilo calorie) Joule. Physical v/s biological energy value of foods, Measurement of energy content of foods using bomb calorimeter, Measurement of energy expenditure. Direct and Indirect Calorimetry, Physical activity, Overview of calories burned during different types of physical activities, Factors affecting energy input - hunger, appetite, Energy balance- Positive and negative energy balance and factors responsible for it. 	
Unit-II: Nutritionally Important Carbohydrates and Lipids	9 hrs
<ul style="list-style-type: none"> Overview of functions of carbohydrates. Sources, Digestion, absorption, utilization and storage of carbohydrates, Glycemic Index (GI) and low GI foods. Dietary fibers: different classes, examples, dietary sources and their importance in human health. Overview of classification, sources, functions, digestion, absorption, utilization and storage of Lipids. Types of Fatty acids- Saturated fatty acids, Mono and Poly unsaturated fatty acids. Essential Fatty Acids (EFA); Functions of EFA and their deficiency. Omega 3 and Omega 6 fatty acids and their importance in diet. Different lipoproteins and their importance in health and diseases 	

Unit-III : Nutritional importance of Proteins.	9 hrs
<ul style="list-style-type: none"> • Review of functions of amino acids, peptides and proteins in the body. RDA of Proteins for different age groups. • Different food sources of proteins, digestion and absorption of proteins. • Essential, Semi essential and Non-essential amino acids with examples and nutritional classification of proteins: Complete proteins, Partially complete proteins and Incomplete proteins. • Concept of Protein quality and different chemical and biological methods to evaluate quality of dietary proteins. Limiting amino acids in foods, different ways and means of improving protein quality in human diet: Fortification and Blending with suitable examples. • Protein calorie malnutrition; Definition, etiology, clinical symptoms, , treatment of Nutritional Marasmus and Kwashiorkor. Causes of Protein deficiency in Adults. 	
Unit-IV : Fat and Water Soluble Vitamins	9 hrs
<ul style="list-style-type: none"> • Vitamin A, D, E and, K: Dietary sources, RDA, Absorption, Distribution, and their biochemical functions. • Nutritional diseases of Vitamin A and Vitamin D deficiency. Hypervitaminosis and toxicity of vitamin A and D. • Vitamins of B complex and Vitamin C: Dietary sources, RDA, Absorption, Distribution, and their biochemical functions. • Clinical symptoms, diagnosis, prevention and treatment of vitamin deficiency diseases such as Beriberi, Pellagra, Vitamin deficiency Anemia. 	
Unit- V: Nutritionally Important Minerals	9 hrs
<ul style="list-style-type: none"> • Calcium, Phosphorus and Iron - Distribution in the body, absorption, Utilization and biochemical functions. • Transport, Excretion, Balance, Deficiency, Toxicity, Sources, RDA of Calcium, Phosphorus and Iron. • Role of iron in prevention of anemia. • Trace elements: Iodine, Fluoride, Mg, Cu, Zn, - Dietary sources, RDA, Distribution in the human body, Major Biochemical functions, and deficiency. 	

Text books (2 textbooks):

1. Passmore, R., & Eastwood, M. A. (1996). *Davidson and Passmore Human Nutrition and Dietetics*: (ed. 8th). Churchill Livingstone
2. Satyanarayan U., Chakrapani U. ,(2011). *Biochemistry*. (ed. 3rd)Books and allied (P) ltd.

Reference books (2 or 3 reference books):

1. Williams, M. H., Rawson, E. S., & Branch, J. D. (2017). *Nutrition for Health, Fitness, and Sport*. McGraw Hill international edition.
2. Mahan, L. K., & Raymond, J. L. (2016). *Krause's Food & the Nutrition Care Process- E-Book*. Elsevier Health Sciences.
3. Devlin T. M. (2011). *Textbook of Biochemistry with Clinical Correlations*. John Wiley & Sons, Inc. (New York)

Pedagogic tools:

- Chalk and Board
- Power point presentation
- Seminar
- Videos

Methods of Assessment& Tools:

Components of CIE: 40 marks (Example as below)

Sr. No.	Component	Content	Duration (if any)	Marks	Sub Total
A	Test 1	1 st 2 units	1 ^{1/2} hours	5 (Set for 30)	20
	Test 2	All 5 units	3 hours	15 (Set for 70)	
B	Assignment			5	10
C	Class activity			5	
Grand Total					30
Assignment		<ul style="list-style-type: none"> • Abstract and executive summary • Case study writing • Concept mapping • Student generated handbook • Essay writing etc. 			
Class activity		<ul style="list-style-type: none"> • Reaction paper • Quiz • One-minute paper • Situation based question • Application card etc. 			

Note : Any other assessment tools or methods can be adopted as per requirement of the course.