

Publishers

- **Kent, N.L.** (2004). *Technology of Cereals*. London: Pergamon Press.

UNIT III

This unit covers the processing of various types of cakes and their sensory and quality evaluation.

- **Dubey, S. C.** (2016). *Basic Baking-Science and Craft*. Delhi: Society of Indian Bakers.
- **Dubey, S. C.** (2009). *Bakery Vighan*. Delhi: Society of Indian Bakers.
- **Matz A.** (2008). *Bakery Technology and Engineering*, 10th Edition, Delhi: CBS Publishers

UNIT IV

This unit covers the processing of various types of cookies and their sensory and quality evaluation.

- **Dubey, S. C.** (2016). *Basic Baking-Science and Craft*. Delhi: Society of Indian Bakers.
- **Dubey, S. C.** (2009). *Bakery Vighan*. Delhi: Society of Indian Bakers.
- **Matz A.** (2008). *Bakery Technology and Engineering*, 10th Edition, Delhi: CBS Publishers

Suggested Readings

- **Cornell, Hugh, J. & Hoveling, Alber. W.** (1998). *Wheat Chemistry and Utilization*, Delhi: CRC Press.
- **Edward, W. P.** (2007). *The Science of Bakery Products*. Cambridge: RSC Publishing.
- **Khanna, K., Gupta, S., Seth, R., Mahana, R., & Rekhi, T.** (2004). *The Art and Science of Cooking*. Delhi: Phoenix Publishing House Private Limited.
- **Raina, U., Kashyap, S., Narula, V., Thomas, S., Suvira, Vir, S., & Chopra, S.** (2005). *Basic Food Preparation – A Complete Manual*. Delhi: Orient Longman.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

Bachelors in Arts with With Community Science Category-V

DISCIPLINE SPECIFIC ELECTIVE COURSE – DSE-FN 7-HSC: NUTRITIONAL BIOCHEMISTRY

CREDIT DISTRIBUTION, ELIGIBILITY, PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the course
		Lecture	Tutorial	Practical		
Nutritional Biochemistry	4	3	0	1	-	-

Learning Objectives

- To focus on the biological roles of key biomolecules including carbohydrates, proteins, lipids, vitamins, minerals and nucleic acids, as essential building blocks sustaining diverse life forms.

- To emphasize on the digestion and absorption of macro-nutrients.
- To understand the major metabolic pathways of macronutrients and associated disorders.
- To understand the physiological significance of micronutrients and their deficiency disorders.

Learning Outcomes

The students would be able to:

- Understand the biochemical role of macro- and micro- nutrients
- Develop an insight of digestion, absorption and metabolism of macronutrients
- Understand the biochemical basis of metabolic disorders including obesity, Type-II Diabetes Mellitus and dyslipidemia

THEORY **(Credits 3: Hours 45)**

UNIT I: Introduction to Nutritional Biochemistry

15 Hours

This unit emphasizes on the biochemical roles and physiological significance of biomolecules in human nutrition and metabolism.

- Scope and importance of Nutritional Biochemistry
- Cellular organization and Biomolecules
- Major characteristics, classification and biological role of carbohydrates, proteins, lipids as Macro-nutrients
- Essential and non-essential fatty acids and amino acids, dietary protein quality
- Major characteristics and biological role of vitamins and minerals as Micronutrients
- Introduction to Enzymes, basic principles of catalysis, enzyme kinetics (K_m and V_{max}) and enzymatic regulation
- Introduction to nucleic acids (DNA and RNA) as information molecules

UNIT II: Digestion and Absorption of Nutrients

10 Hours

This unit highlights the mechanisms involved in the digestion and absorption of carbohydrates, lipids and proteins in humans.

- Digestion and absorption of carbohydrates
- Digestion of proteins and amino acid transport
- Digestion and absorption of lipids including introduction to bile salts, micelles and chylomicrons
- Hormonal regulation of blood glucose levels (insulin and glucagon)
- Glycemic response and glycemic index of foods
- Role of gut microbiota

UNIT III: Metabolism of Macronutrients

15 Hours

This unit introduces the basic concepts of metabolism and the major metabolic pathways of carbohydrates and lipids. It also introduces the major features of metabolic disorders like obesity, Type-II diabetes mellitus, dyslipidemia, protein energy malnutrition, protein toxicity and inborn errors of metabolism.

- Glycolysis, Citric acid cycle, regulation and ATP synthesis
- Glucose homeostasis and biochemical basis of Type-II Diabetes mellitus
- Major lipoproteins including LDL, VLDL and HDL
- Cholesterol synthesis and regulation
- Biochemical basis of obesity and dyslipidemia
- Protein energy malnutrition and protein toxicity
- Inborn errors of metabolism

UNIT IV: Metabolism of Micro-nutrients

5 Hours

This unit focuses on the biochemical importance of vitamins and minerals.

- Biochemical role and deficiency disorders of fat-soluble vitamins (A, D, E and K)
- Physiological role and deficiency disorders of water-soluble vitamins including B-complex and ascorbic acid
- Biochemical role and diseases due to excess or deficiency of minerals including iron, calcium, iodine, selenium and zinc
- Oxidative stress and antioxidants

PRACTICAL (Credits 1; Hours 30)

1. Estimation of blood glucose in serum using GOD-POD method (Glucose oxidase-Peroxidase)
2. Estimation of serum total cholesterol
3. Estimation of lipid profile
4. Estimation of serum urea
5. Five case studies: PEM (Marasmus and Kwashiorkor), Diabetes, Obesity, Vitamin and mineral deficiency.

Essential Readings

UNIT I

This unit focuses on the biochemical significance of biomolecules including carbohydrates, lipids, proteins, vitamins, minerals and nucleic acids

- **Kennelly, P. J., Botham, K. M., McGuinness, O., Rodwell, V. W., Weil, P.A.** (2022). Harper's Illustrated biochemistry (32nd ed.). McGraw-Hill Education. 159
- **Nelson, D. L., Cox, M. M.** (2021). Lehninger Principles of Biochemistry (8th ed.). W. H. Freeman & Co. Ltd.
- **Satyanarayana, U., Chakrapani U.** (2021). Biochemistry (6th ed.). Elsevier.
- **West, E.S., Todd, W.R., Mason, H.S., Bruggen J.T.V.** (2017). Textbook of Biochemistry (4th ed.). Oxford & IBH.

UNIT II

This unit focuses on the mechanisms involved in the digestion and absorption of carbohydrates, lipids and proteins in humans.

- **Kennelly, P. J., Botham, K. M., McGuinness, O., Rodwell, V. W., Weil, P.A.** (2022). Harper's Illustrated biochemistry (32nd ed.). McGraw-Hill Education. 159
- **Nelson, D. L., Cox, M. M.** (2021). Lehninger Principles of Biochemistry (8th ed.). W. H. Freeman & Co. Ltd.

- **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.
- **Gibson, R.** (2005). Principles of Nutritional Assessment. Oxford University Press. ISBN: 978019517169
- **Ramos, S., & Martín, M. Á.** (2021). Impact of diet on gut microbiota. *Current Opinion in Food Science*, 37, 83-90.

UNIT III

This unit introduces the basic concepts of metabolism and the major metabolic pathways of carbohydrates and lipids. It also focuses on major features of metabolic disorders like obesity, Type-II diabetes mellitus, dyslipidemia, PEM and inborn errors of metabolism.

- **Nelson, D. L., Cox, M. M.** (2021). Lehninger Principles of Biochemistry (8th ed.). W. H. Freeman & Co. Ltd.
- **Kennelly, P. J., Botham, K. M., McGuinness, O., Rodwell, V. W., Weil, P.A.** (2022). Harper's Illustrated biochemistry (32nd ed.). McGraw-Hill Education. 159
- **Devlin, T.M.** (2011). Textbook of Biochemistry with Clinical Correlations. 7th ed., John Wiley & Sons, Inc. (New Jersey), ISBN:978-0-470-28173-4.
- **Gropper, S. A. S., Smith, J. L., & Carr, T. P.** (2018). *Advanced Nutrition and Human Metabolism* (7th ed.). Cengage Learning.

UNIT IV

This unit emphasizes on the physiological role and deficiency diseases of vitamins and minerals.

- **Malik, D., Narayanasamy, N., Vavilala, P., Takur, J., Sinha, N.** (2022). Textbook of Nutritional Biochemistry. Springer Singapore
- **Vasudevan, D.M., & Das, K.S.** (2020). Practical textbook of biochemistry for medical students (3rd ed.). Jaypee Brothers Medical
- **Kennelly, P. J., Botham, K. M., McGuinness, O., Rodwell, V. W., Weil, P.A.** (2022). Harper's Illustrated biochemistry (32nd ed.). McGraw-Hill Education. 159
- **Nelson, D. L., Cox, M. M.** (2021). Lehninger Principles of Biochemistry (8th ed.). W. H. Freeman & Co. Ltd.
- **Gropper, S. A. S., Smith, J. L., & Carr, T. P.** (2018). *Advanced Nutrition and Human Metabolism* (7th ed.). Cengage Learning.

Suggested Readings

- **Voet, D., Voet, J.G.** (2012). Principles of Biochemistry (4th ed.). Wiley.
- **Gerald F. Combs Jr.** (2008). The Vitamins: Fundamental Aspects in Nutrition and Health (3rd ed.) Elsevier's Publications.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.