Semester: 6	
Course: Major 4	
Paper Title: METABOLISM AND INTEGRATIVE PHYSIOLOGY	
Paper Code: C3BT230641T	**Credits: 4**
Hours/week: 4	
Category: Core/MDC/SEC/VAC: Core	
Theory / Practical / Composite: Theory	
No of Modules: 2	

COURSE OVERVIEW:

The course aims to:

1. Impart a fundamental understanding of metabolic processes, emphasizing regulatory networks, with specific examples of metabolic diseases
2. Understand the physiological processes involved in protein digestion, absorption, and intracellular protein turnover
3. Explore the diverse roles of amino acids as precursors
4. Outline the pathways of nucleotide biosynthesis
5. Impart a basic understanding of cross-system interactions and dynamic integration of physiological systems in health and disease
6. Emphasize on the basic principles of medical diagnostics and disease diagnostics
7. Provide fundamental concepts of biochemical toxicology with specific emphasis on various pharmacological aspects.

COURSE OUTCOME:

Module A
1. Identify key metabolic pathways involved in amino acid, lipid, and nucleotide metabolism.
2. Explain biosynthetic and degradative pathways for amino acids, lipids, and nucleotides and their regulation.
3. Apply knowledge of metabolic precursors and conversions, linking amino acids to biomolecules, fatty acids via acetyl CoA, and nucleotides to pathological conditions.
4. Analyse degradation processes like amino acid catabolism and urea cycle, lipid beta-oxidation of saturated/unsaturated chains, and nucleotide-related disorders.
5. Evaluate therapeutic implications, including anti-cancer drugs targeting thymidylate synthesis, alongside regulatory disruptions in amino acid and lipid metabolisms.
6. Integrate interconnections between amino acid, lipid, and nucleotide pathways to formulate comprehensive metabolic models under normal and diseased states.
Module B
1. Recognise core concepts of metabolism and physiology including metabolic integration, disease diagnostics, xenobiotics, and basic pharmacological principles.
2. Understand the relationships among metabolic disorders via clinical case studies, dynamic system integrations under stress and chronobiology, drug toxicity effects, and nanotechnology applications in diagnostics and forensics.
3. Apply metabolic and physiological principles to interpret clinical examples in health, disease and diagnostics.
4. Analyze metabolic integrations in disease states, chronobiological disruptions, biomarker roles in haematology, drug and toxicological actions, and nanotechnology
5. Evaluate the impact of metabolic perturbations on human health and disease progression and assess drug actions, toxicity profiles, and diagnostic findings.

6. Develop a comprehensive overview of the principles of metabolism and integrative physiology emphasising diagnostics, toxicology and pharmacology.				
Prerequisites: Basic knowledge about physiology and biochemistry				
SYLLABUS:				
UNIT/Module	**CONTENT**	**HOURS or NUMBER OF**	**CO Mapping**	**COGNITIVE LEVEL**
Module A	**Unit-I: Amino acid metabolism:** Amino acid biosynthesis; biosynthetic families of amino acids; regulation of amino acid biosynthesis; amino acids as precursors of biomolecules; amino acid degradation; urea cycle; **Unit-II: Lipid metabolism**: beta-oxidation of fatty acids; degradation of unsaturated fatty acids; synthesis; synthesis of unsaturated fatty acids; role of acetyl CoA in fatty acid metabolism. **Unit-III: Nucleotide metabolism**: de novo synthesis; salvage pathway; regulation of nucleotide biosynthesis; DHFR, thymidylate synthesis and anti-cancer drugs; nucleotide metabolism and related pathological conditions.	1.5 classes per week	CO1-CO6	K1-K6
Module B	**Unit-IV: Metabolic disorders:** (i) Metabolic integration in health and disease (clinical case studies) (ii) Inborn errors of metabolism. **Unit-V: Integrative physiology and diagnostics:** (i) Concept of Integrative physiology, role of feedback loops (ii) Dynamic integration of physiological systems in health and disease (Clinical case studies) (iii) Stress physiology (iv) Chronobiology (v) Histopathological and haematological examination, concept of	2.5 classes per week	CO1-CO6	K1-K6

	biomarkers (vi) Postmortem examination and forensics. **Unit-VI: Pharmacology and toxicology**: (i) Concept of xenobiotics (ii) Basic mechanism of drug action (iii) Drug toxicity and drug abuse (iv) Nanotechnology in medicine.			

TEXT BOOKS & SUGGESTED READINGS:

1. Lehninger Principles of Biochemistry - Cox & Nelson
2. Biochemistry - Voet and Voet
3. Biochemistry – Berg, Tymoczko & Stryer
4. J.E. Hall. Guyton and Hall Textbook of Medical Physiology.
5. K. Barrett, S. Barman et al. Ganong's Review of Medical Physiology.
6. Harper's Illustrated Biochemistry
7. Hodgson, E. A Textbook of Modern Toxicology, 4th ed. Wiley.
8. Robbins & Kumar Basic Pathology
9. Timbrell, J. Introduction to Toxicology, 5th ed. CRC Press.
10. Burchiel, S.W. & Luster, M.I.. Molecular Mechanisms in Toxicology. Academic Press.
11. C.C. Chatterjee. Human Physiology
12. Casarett & Doull's Toxicology: The Basic Science of Poisons
13. Relevant scientific literature

EVALUATION:

CIA- 20 marks; Assignment -5 marks, Attendance- 5 marks; End Semester Exam: 70 marks

PAPER STRUCTURE FOR THEORY SEMESTER EXAM MODULE:

Module A (25 marks)

Any 5 out of 7 questions: Each of 5 marks with subparts [No sub-part will be less than 1 marks and more than 5 marks]

Module B (45 marks)

Any 5 out of 7 questions: Each of 9 marks with subparts [No sub-part will be less than 2 marks and more than 8 marks]

COURSE outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
	Module A	
CO1	Identify key metabolic pathways involved in amino acid, lipid, and nucleotide metabolism.	K1
CO2	Explain biosynthetic and degradative pathways for amino acids, lipids, and nucleotides and their regulation.	K2
CO3	Apply knowledge of metabolic precursors and conversions, linking amino acids to biomolecules, fatty acids via acetyl CoA, and nucleotides to pathological conditions.	K3
CO4	Analyse degradation processes like amino acid catabolism and urea cycle, lipid beta-oxidation of saturated/unsaturated chains, and nucleotide-related disorders.	K4

CO5	Evaluate therapeutic implications, including anti-cancer drugs targeting thymidylate synthesis, alongside regulatory disruptions in amino acid and lipid metabolisms.	K5
CO6	Integrate interconnections between amino acid, lipid, and nucleotide pathways to formulate comprehensive metabolic models under normal and diseased states.	K6
	Module B	
CO1	Recognise core concepts of metabolism and physiology including metabolic integration, disease diagnostics, xenobiotics, and basic pharmacological principles.	K1
CO2	Understand the relationships among metabolic disorders via clinical case studies, dynamic system integrations under stress and chronobiology, drug toxicity effects, and nanotechnology applications in diagnostics and forensics.	K2
CO3	Apply metabolic and physiological principles to interpret clinical examples in health, disease and diagnostics.	K3
CO4	Analyze metabolic integrations in disease states, chronobiological disruptions, biomarker roles in haematology, drug and toxicological actions, and nanotechnology	K4
CO5	Evaluate the impact of metabolic perturbations on human health and disease progression and assess drug actions, toxicity profiles, and diagnostic findings.	K5
CO6	Develop a comprehensive overview of the principles of metabolism and integrative physiology emphasising diagnostics, toxicology and pharmacology.	K6