



ST THOMAS COLLEGE PALAI
AUTONOMOUS | ESTD. 1950 | REACCREDITED BY NAAC WITH A++ GRADE

UNDERGRADUATE PROGRAMMES (HONOURS) **SYLLABUS**

STCP-UGP (HONOURS)
(2024 ADMISSION ONWARDS)



FACULTY : SCIENCE

PROGRAMME : Biochemistry MINOR, MDC & VAC

ST THOMAS COLLEGE PALAI AUTONOMOUS
ARUNAPURAM P.O., PALA, KOTTAYAM - 686 574
KERALA, INDIA

**ST THOMAS COLLEGE PALAI
AUTONOMOUS UNDER GRADUATE
PROGRAMMES (HONOURS) SYLLABUS**

STTCP-UGP (Honours)

(2024 Admission Onwards)



FACULTY: SCIENCE BOS: Biochemistry

PROGRAMME: MINOR, MDC & VAC

St Thomas College Palai Autonomous

Arunapuram, Kottayam-686574,

Kerala, India.

Preface

Biochemistry is a multidisciplinary science that investigates the chemistry of living organisms and the molecular mechanisms underlying changes in living cells. It is the most comprehensive of the basic sciences, encompassing various sub-specialties such as neurochemistry, bio-organic chemistry, clinical biochemistry, physical biochemistry, molecular genetics, biochemical pharmacology, and immunochemistry. Recent advancements in these areas have forged connections between technology, chemical engineering, and biochemistry. By employing methods from chemistry, physics, molecular biology, and immunology, biochemistry examines the structure and behavior of complex molecules in biological material, studying how these molecules interact and communicate within and between cells and organs. Biochemists aim to understand the functions of specific molecules like proteins, nucleic acids, lipids, vitamins, and hormones in biological processes.

Biochemistry has provided insights into the causes of many diseases in humans, animals, and plants, often suggesting methods for treatment or cure. It also delves into the intricate chemical reactions in various life forms, laying the groundwork for practical advances in medicine, veterinary medicine, agriculture, and biotechnology. Biochemistry encompasses and underpins emerging fields like molecular genetics and bioengineering.

The new curriculum for the Undergraduate Programme in Biochemistry (B.Sc. Biochemistry Honours) offers a focused, outcome-based syllabus at the Honours level, providing structured teaching and learning experiences tailored to student needs. The curriculum includes Foundation courses, Discipline-Specific Courses, and Discipline-Specific Capstone courses. Foundation courses comprise Ability Enhancement Courses, Skill Enhancement Courses, Value Addition Courses, and Multi-disciplinary Courses.

The approved curricular framework by the Higher Education Department, Government of Kerala, and Kerala State Higher Education Council in accordance with the UGC guidelines 2023, aims to provide students with a comprehensive understanding of the fundamentals, practical training, and application of subject knowledge in various areas of Biochemistry, equipping them with the necessary knowledge, skills, and personality traits.

St. Thomas College Palai Autonomous was conferred autonomous status by the UGC on 19 January 2024 and subsequently Mahatma Gandhi University, Kottayam after due procedure, notified it only on May 7, 2024, which resulted in the delay of the constitution of various statutory bodies (Governing Body, Academic Council and Board of Studies) of our College. Therefore, the first Academic Council of St Thomas College Palai Autonomous held on 10 June 2024 decided to adopt the syllabus of Mahatma Gandhi University for the UG programmes of our college for the academic year 2024–25.

St Thomas College Palai Autonomous

Programme Outcomes

The outcomes described in qualification descriptors are attained by students through learning acquired on completion of a programme of study. The term 'programme' refers to the entire scheme of study followed by learners leading to a qualification. Individual programmes of study will have defined learning outcomes which must be attained for the award of a specific certificate/ diploma/ degree.

PO 1 : Critical thinking and Analytical reasoning

Capability to analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories to develop knowledge and understanding; critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.

PO 2 : Scientific reasoning and Problem solving

Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective; capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

PO 3: Multidisciplinary/ interdisciplinary/ transdisciplinary Approach

Acquire interdisciplinary/ multidisciplinary/ transdisciplinary knowledge base as a consequence of the learning they engage with their programme of study; develop a collaborative-multidisciplinary/ interdisciplinary/ transdisciplinary- approach for formulate constructive arguments and rational analysis for achieving common goals and objectives.

PO 4: Communication Skills

Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

PO 5: Leadership Skills

Ability to work effectively and lead respectfully with diverse teams; setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.

PO 6: Social Consciousness and Responsibility

Ability to contemplate of the impact of research findings on conventional practices, and a clear understanding of responsibility towards societal needs and reaching the targets for attaining inclusive and sustainable development.

PO 7: Equity, Inclusiveness and Sustainability

Appreciate equity, inclusiveness and sustainability and diversity; acquire ethical and moral reasoning and values of unity, secularism and national integration to enable to act as dignified citizens; able to understand and appreciate diversity (caste, ethnicity, gender and marginalization), managing diversity and use of an inclusive approach to the extent possible.

PO 8: Moral and Ethical Reasoning

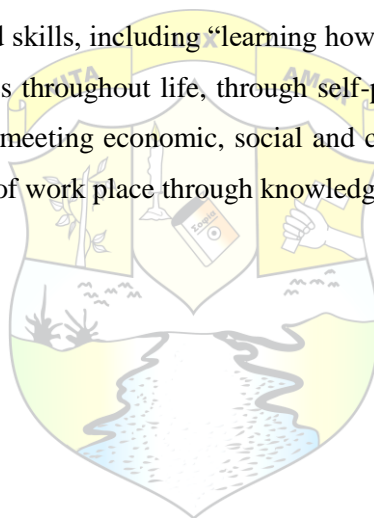
Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behavior.

PO 9: Networking and Collaboration

Acquire skills to be able to collaborate and network with educational institutions, research organisations and industrial units in India and abroad.

PO 10: Lifelong Learning

Ability to acquire knowledge and skills, including “learning how to learn”, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.



Syllabus Index

Semester 1

Course Code	Title of the Course	Type of the Course DSC, MDC, SEC etc.	Credit	Hours /week	Hour Distribution /week			
					L	T	P	O
24U1BCHDSC100	Biochemistry- The Science of Life	DSC A	4	5	3	-	2	-
24U1BCHMDC100	Sports Biochemistry: The Science of Exercise and Human Performance	MDC	3	4	2	-	2	-

L—Lecture, T—Tutorial, P—Practical/Practicum, O—Others

Semester 2

Course Code	Title of the Course	Type of the Course DSC, MDC, SEC etc.	Credit	Hours /week	Hour Distribution /week			
					L	T	P	O
24U2BCHDSC100	Essentials of Biochemistry: Vitamins, Hormones, Enzymes and Neurotransmitters	DSC A	4	5	3	-	2	-
24U2BCHMDC100	Biochemistry in Entrepreneurship	MDC	3	4	2	-	2	-

Semester 3

Course Code	Title of the Course	Type of the Course DSC, MDC, SEC etc.	Credit	Hours /week	Hour Distribution /week			
					L	T	P	O
24U3BCHDSC202	Techniques in Biochemistry and Forensic Science	DSC B	4	5	3	-	2	-
24U3BCHMDC200	Food as Medicine	MDC	3	3	3	-	0	-
24U3BCHVAC200	Microplastics and Environment	VAC	3	3	3	-	0	-

Semester 4

Course Code	Title of the Course	Type of the Course DSC, MDC, SEC etc.	Credit	Hours /week	Hour Distribution /week			
					L	T	P	O
24U4BCHDSC202	Metabolism of Carbohydrates, Proteins and Lipids	DSC C	4	5	3	-	2	-
24U4BCHSEC200	Biochemical Tests in Disease Diagnosis	MDC	3	3	3	-	0	-
24U4BCHVAC200	Narcotic Drugs and Psychotropic Substances (NDPS)	VAC	3	3	3	-	0	-





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Programme	Biochemistry Minor					
Course Name	Biochemistry-The Science of Life					
Type of Course	DSC B					
Course Code	24U1BCHDSC100					
Course Level	100-199					
Course Summary	The primary objective of this course is to establish a strong foundation in biochemistry for students, with a focus on essential molecular components. Additionally, the course covers fundamental procedures within a biochemistry laboratory and the qualitative analysis of biomolecules.					
Semester	I	Credits			4	Total Hours
Course Details	Learning Approach	Lecture 3	Tutorial 0	Practical 1	Others 0	
Pre-requisites, if any	Nil					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1.	Acquire an understanding of the nature of cells, water, buffers and the scope of Biochemistry	K, U, I	2, 3, 4, 6, 10
2.	Demonstrate the structure and functions of carbohydrates	K, U, E	1, 2, 3, 4
3.	Describe the general structure of amino acids and structural organisation of proteins	K,U, E	1,2,3,4
4.	Evaluate the chemical nature of lipids and nucleic acids.	U, E, An	1, 2, 3, 4
5.	Demonstrate laboratory safety practices and preparation of solutions.	An, E, Ap	2, 5, 8,10
6.	Employ appropriate biochemical tests to identify unknown biomolecules	U, A, C, S	2, 8,10

***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)**

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1. Introduction to Biochemistry	1.1	History of Biochemistry.	2	1
	1.2	Cells - the basis of living organisms- prokaryotic and eukaryotic cells.	2	1
	1.3	Importance of water in biological systems - interactions in aqueous systems.	3	1
	1.4	Dissociation of water, ionic product of water, concepts of pH and pOH, acids and bases, pHscale, Buffers.	3	1
	1.5	Buffers, biological buffers- bicarbonate buffer, phosphate buffer, hemoglobin buffer.	2	1
	1.6	Different types of biomolecules and their functional groups.	2	1
	1.7	Scope of Biochemistry.	1	1
2. Carbohydrates and Proteins	2.1	Classification of carbohydrates	1	2
	2.2	Monosaccharides and their importance (glucose, galactose, mannose and fructose with structures), Isomerism of carbohydrates - D and L forms, epimers, anomers. Disaccharides - sucrose, maltose, lactose	3	2
	2.3	Haworth perspective formula and functions of disaccharides - sucrose, maltose, lactose.	2	2
	2.4	Structure and important properties of the homopolysaccharides — starch, cellulose and glycogen. (without structure) heteropolysaccharide - hyaluronate (without structure)	3	2
	2.5	Name (with one letter and three letter code) of the 20 standard amino acids, general structure of amino acid. Zwitter ions.	3	3
	2.6	Elementary study of primary, secondary, tertiary and quaternary structural levels in proteins.	3	3
3. Lipids and Nucleic Acids	3.1	Classification and functions of lipids, Fatty acids - structures of stearic acid, oleic acid and linoleic acid.	2	4
	3.2	Structure and significance of triacylglycerol phosphatidic acid, lecithin and cholesterol.	3	4
	3.3	Chemical nature of nucleic acids- purines and pyrimidines, deoxyribose, ribose, nucleosides, nucleotides. Phosphodiester linkage.	4	4
	3.4	Watson-Crick model of DNA, Chargaff rule, Different forms of DNA-A, B and Z DNA. Introduction to types of RNA (mRNA, rRNA and tRNA). Central Dogma	6	4

4. Practical	4.1	Laboratory Safety Practices, Preparation of normal, molar, percentage solution and dilution of stock solutions. Determination of pH using a pH meter.	6	5
	4.2	Systematic analysis of carbohydrates and aminoacids in the given unknown samples.	10	6
	4.3	Qualitative analysis of lipids and nucleic acids	9	6
	4.4	Industry/ Laboratory visit	5	6
5. Teacher specific content	5.1	Awareness of Blood routine analysis (ESR, Hb, RBC, WBC), Lipid profile (LDL, HDL, TG), Diabetes mellitus (PPBS, FBS, HbA1c), Liver function test (SGOT, SGPT, ALP), Kidney function test (creatinine, urea, uric acid)		

Teaching and Learning Approach	<p>Classroom Procedure (Mode of transaction)</p> <p>The course content will be transacted through Lectures, E-learning, Seminars, presentations, Group activity, Interactive sessions and Laboratory sessions</p>
Assessment Types	<p>MODE OF ASSESSMENT</p> <p>A. Continuous Comprehensive Assessment (CCA) (Theory 25 Marks)</p> <ol style="list-style-type: none"> 1. Internal Assessment Test (10 marks) 2. Assignments (5 Marks) <p>Faculty component:</p> <ol style="list-style-type: none"> 3. Viva Voce (2 marks) 4. In Class Discussion (1 mark) 5. Open book test (2 marks) 6. Oral presentation (1 mark) 7. Individual project report (4 marks) <p>Practical 15 marks*</p> <ol style="list-style-type: none"> 1. Viva (5 marks) 2. Record (5 marks) 3. Laboratory involvement (5 marks) <p>*This mark to be converted to 7.5 marks</p>
	<p>B. End Semester Examination (ESE)</p> <p>Written examination for one and a half hours (50 marks)</p> <p>Practical examination (35 marks)*</p> <p>*This mark to be converted to 17.5 marks</p>

References

1. Nelson D. L., Cox M. M. (2021) Lehninger Principles of Biochemistry, (8th ed.) W.H. Freeman & Co Ltd.
2. Berg J.M., Gatto G.J., Hines J, Tymoczko J.L., Stryer L. (2023) Biochemistry (10th ed.) W.H. Freeman & Co Ltd.
3. West E.S., Todd W.R., Mason H.S., Van Bruggen J.T., (2017) Text Book of Biochemistry (4th ed.)
4. Voet D., Voet J., Pratt C.W., (2018) Voet's Principles of Biochemistry (5th ed.)
5. Rastogi V. B., Aneja K.R., (2020) Zubay's Principles of Biochemistry (5th ed.)

Suggested Readings

1. Das D., (2015) Biochemistry (14th ed.) Academic publishers



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Programme	Biochemistry Minor					
Course Name	Sports Biochemistry: The Science of Exercise and Human Performance					
Type of Course	MDC					
Course Code	24U1BCHMDC100					
Course Level	100-199					
Course Summary	The course on sports biochemistry delves into the complex interplay among sports, exercise, and biochemistry. The students will acquire an understanding of the biochemical mechanisms during physical activity, the impact of exercise on the body's systems, and the ways in which biochemistry shapes both athletic performance and overall well-being.					
Semester	1	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
Pre-requisites, if any	Nil					
		2	0	1	0	60

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Attain a thorough comprehension of the biochemical processes that form the foundation of exercise and sports performance.	K, U, A	1,2,3,4,6
2	Demonstrate the ability to apply biochemistry principles to design personalized training and nutrition plans.	U, A, C, S	1,2,3,4,8
3	Conduct a critical analysis of how hormones, metabolism, and nutrition significantly influence athletic performance.	U, An, E	2,3,4,
4	Develop an understanding of the ethical considerations surrounding sports nutrition and supplementation.	K, U, Ap	1,2,3,4, 6,8
5	Acquire an understanding of fundamental concepts related to sports injuries, recovery, and cellular adaptations.	U, E, A	1,2,3,4
6	Develop practical skills in assessing and optimizing biochemical factors influencing sports and exercise.	A, S, I	1,2,3,4, 7,9,10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill(S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1. Fundamentals of Sports Biochemistry	1.1	Introduction Definition and scope of sports biochemistry. Importance in the field of sports science and medicine.	2	1
	1.2	Fuel utilization and Importance of hormones in Sports Fuel utilization in different sports. Role of hormones in Exercise: Adrenaline and noradrenaline, Insulin and glucagon, Cortisol, Growth hormones	4	3
	1.3	Muscle Biochemistry & Adaptations Overview of muscle tissue types (skeletal, smooth, cardiac) with focus on skeletal muscle in the context of sports biochemistry. Role of muscle in energy production during exercise. Overview of Cellular adaptations, Metabolic adaptation, Enzyme and Hormonal Adaptations, Strength and Power Adaptations, Neural adaptations, Endurance Adaptations.	3	3
	1.4	Sports Nutrition Macronutrients and Micronutrients. Hydration: Significance of maintaining proper fluid balance during exercise. Pre-Exercise Nutrition: Timing and composition of pre-exercise meals for optimizing performance. During-Exercise Nutrition: Importance of maintaining energy and hydration during prolonged exercise. Use of sports drinks, gels, and other supplements during activities. Post-Exercise Nutrition: Nutrient timing and composition for post-exercise recovery. Protein intake to support muscle repair and glycogen replenishment.	3	2
	1.5	Ergogenic Aids Definition and Types Legal and Illegal Substances Caffeine: Effects of caffeine on performance and endurance. Recommended dosage and timing for optimal benefits. Creatine: Role of creatine in enhancing strength, power, and muscle recovery. Safe and effective usage guidelines. Nitric Oxide Precursors: Substances that enhance nitric oxide production for improved blood flow and oxygen delivery. Beta-Alanine: Buffering capacity and its role in reducing muscle fatigue.	3	4
2. Diseases, Recovery, Practical Applications	2.1	Sports Injuries Types of Sports Injuries: sprains, strains, fractures, and overuse injuries Biochemical Markers of Injury: Identifying and monitoring Specific biochemical markers (e.g., creatine kinase, cytokines) associated with tissue damage. Using biomarkers to assess the severity and progression of injuries.	3	5

	2.2	<p>Recovery strategies</p> <p>Repair and Regeneration: Overview of the biochemical mechanisms involved in tissue repair and regeneration</p> <p>Recovery strategies</p> <p>Rest and Periodization: Understanding the importance of rest and recovery in preventing overtraining and reducing the risk of injuries. Incorporating periodization in training programmes to allow for adequate recovery.</p> <p>Nutrition for Recovery: Adequate protein intake for muscle repair, carbohydrate replenishment for glycogen stores, and hydration.</p> <p>Cryotherapy and Thermotherapy: Using cold and heat applications to manage inflammation and promote recovery. Understanding the biochemical effects of cryotherapy and thermotherapy</p> <p>Sleep and Circadian Rhythms: Importance of quality sleep in promoting recovery and optimizing performance.</p> <p>Psychological Strategies: Incorporating psychological techniques (e.g., mindfulness, visualization) for stress reduction and mental recovery.</p>	7	5
	2.3	<p>Practical applications and safety in sports:</p> <p>Individualized Training Programs: Designing training programs tailored to an athlete's specific needs, goals, and physical condition.</p> <p>Biomechanical Analysis: Conducting biomechanical assessments to identify and correct movement patterns that may contribute to injuries.</p> <p>Nutrition and Hydration Strategies: Developing personalized nutrition plans to meet the energy demands of training and competition. Emphasizing hydration protocols to prevent dehydration and maintain optimal performance. Monitoring and Recovery Protocols: Implementing monitoring tools (e.g., heart rate variability, sleep tracking) to assess an athlete's physiological responses to training.</p>	5	4
3. Practical	3.1	Measurement of Lung Capacity	3	6
	3.2	Heart Rate Variability (HRV) Assessment	3	6
	3.3	Respiratory Quotient (RQ) Calculation	3	6
	3.4	Hydration Status Assessment	3	6
	3.5	First Aid And Preventive Measures	3	6
	3.6	Field/Industrial Visit	15	6
4. Teacher specific content	4.1	<p>Glucose to ATP- a small journey of energy production: How glucose is utilized in the body?</p> <p>Glycolysis, Pyruvate oxidation, Citric acid cycle</p>		

Teaching and Learning Approach	<p>Classroom Procedure (Mode of transaction)</p> <p>Direct Instruction: Brainstorming lecture, E-learning</p> <p>Interactive Session: Seminar, Group Assignments, Library work and Group discussion, Presentation by individual student</p> <p>Practical: Hands on learning, real world application, problem solving</p>
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Assessment Types	<p>MODE OF ASSESSMENT</p> <p>A. Continuous Comprehensive Assessment (CCA) (Theory 15 marks)</p> <p>1. Internal Assessment test (5 marks)</p> <p>2. Assignments (5 marks)</p> <p>Faculty component:</p> <p>3. Viva Voce (1 mark)</p> <p>4. Open Book test (2 marks)</p> <p>5. Oral presentation (2 marks)</p> <p>Practical 15 marks*</p> <p>1. Viva (5 marks)</p> <p>2. Record (5 marks)</p> <p>3. Laboratory involvement (5 marks)</p> <p>*This mark to be converted to 7.5 marks</p>
	<p>B. End Semester Examination</p> <p>Written examination for one hour (35 marks)</p> <p>Practical examination (35 marks)*</p> <p>*This mark to be converted to 17.5 marks</p>

References

1. Anshel, M. H., et al. (1991). Dictionary of the Sport and Exercise Sciences, Human Kinetics, USA
2. Beashel, P., & Taylor, N. (1996). Advanced Studies in Physical Education and Sport. Thomas Nelson & Sons Ltd. U.K.
3. Blakey, P. (1998). The Muscle Book (2nd ed.). Stafford: Bibliotek Books.
4. Davis, B., Bull, R., Roscoe, J., & Roscoe, D. (2000). Physical Education and the Study of Sport (5th ed.). London: Harcourt.
5. Honeybourne, J., Hill, M., & Moors, H. (2006). Advanced Physical Education & Sport for A Level (3rd ed.). Cheltenham: Nelson Thornes.
6. MacLaren, D., & Morton, J. (2012). Biochemistry for Sport and Exercise Metabolism, John Wiley & Sons, Ltd. UK.
7. McArdle, D., Katch, V., & Katch, F. (2011). Essentials of Exercise Physiology (4th ed.). Lippincott: Williams & Wilkins, Baltimore
8. Schmidt, R., & Wrisberg, C. (2000). Motor Learning and Performance: A Problem-Based Learning Approach (2nd ed.). Human Kinetics, USA
9. Sharp, B. (1992). Acquiring Skill in Sport. Sports Dynamics, UK
10. Webster, S. (1996). Sport Psychology: An A Level Guide for Teachers and Students. Widnes: Roscoe Publications.

Suggested Readings

1. Bubbs, M. (2019). Peak: The New Science of Athletic Performance That is Revolutionizing Sports. Chelsea Green publishing Company



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Programme	Biochemistry Minor					
Course Name	Essentials of Biochemistry: Vitamins, Hormones, Enzymes and Neurotransmitters					
Type of Course	DSC B					
Course Code	24U2BCHDSC100					
Course Level	100-199					
Course Summary	This comprehensive course delves into the fundamental biochemical aspects of vitamins, hormones, enzymes, and neurotransmitters, exploring their roles in maintaining physiological balance and supporting essential cellular functions.					
Semester	2	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
Pre-requisites, if any	Nil					75

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Discuss the fundamentals of vitamins	K,U	1,2,3,4
2	Describe the general features of hormones and their receptors.	U, E	2,3,4
3	Describe the classification, functions, mechanism of action and deficiency disorders of hormones	U, E, A	1,2,3,4
4	Evaluate neurotransmitter and its mechanism of action	A, E	1,2,3,4
5	Analyse the mechanism of enzyme catalysis, kinetics and specificity	U, An, E	1,2,3,4
6	Demonstrate proficiency in enzyme and vitamin extraction and quantification from various sources	U, A, S, Ap	1,2,3,4,10
7	Demonstrate the mechanism of action of hormones/neurotransmitters through presentations	A,S,C, I	2,3,4,6,10

**Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)*

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1. Vitamins	1.1	Vitamins- General introduction	3	1
	1.2	Classification and nomenclature of vitamins	4	1
	1.3	Fat soluble vitamins (types, biochemical and physiological functions, deficiency diseases) Vitamins as coenzymes	3	1
	1.4	Water soluble vitamins (types, biochemical and physiological functions, deficiency diseases)	5	1
2. Hormones & Neurotransmitters	2.1	History of endocrinology	1	2
	2.2	Concept on target gland, negative and positive feedback, characteristics and transport of hormones	3	2
	2.3	Hormone receptors and its classification	3	2
	2.4	Outline study of hypothalamic, pituitary, thyroid, parathyroid, adrenal, pancreatic and gastro intestinal hormones (types of hormones, physiological and biochemical role, deficiency diseases)	3	3
	2.5	Mechanism of action of peptide and steroid hormones	3	3
	2.6	Neurotransmitters-definition, classification, types of receptors, role in synaptic transmission	3	4
	2.7	Molecular mechanisms of action - Acetylcholine, biogenic amines, catecholamines, serotonin, amino acids. Neuroactive peptides as transmitters.	4	4
3. Enzymes	3.1	Classification of enzymes- six major classes of enzymes with one example each.	2	5
	3.2	Cofactors and coenzymes	1	5
	3.3	Elementary study of the factors affecting velocity of enzyme catalysed reactions- effect of substrate concentration, enzyme concentration, temperature and pH	2	5
	3.4	Michaelis-Menten equation (without derivation). K_m and its significance, Lineweaver Burk plot.	2	5
	3.5	Enzyme specificity- an example each for group specificity, optical specificity, geometrical specificity and cofactor specificity of enzymes.	3	5

4. Practical	4.1	Extraction and assay of enzymes - Acid phosphatase from Fresh Potato (<i>Solanum tuberosum</i>)	5	6
	4.2	Extraction and assay of enzymes - β - amylase from sweetpotato (<i>Ipomoea batatas</i>)	5	6
	4.3	Extraction and assay of enzymes -Catalase from bovine /porcine liver	5	6
	4.4	Extraction and assay of enzymes -Urease from Jackbean (<i>Canavalia ensiformis</i>)	5	6
	4.5	Estimation of ascorbic acid from lemon guice	5	6
	4.6	Demonstration of the mechanism of action of hormones/neurotransmitters through posters, models, and digital presentations	5	7
5. Teacher specific content	5.1	An overview of endocrine glands of human body Hypothalamus, Pituitary gland, Thyroid gland, Parathyroid gland, Adrenal gland, Pancreas, Gonads, Pineal gland		

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) The course content will be transacted through seminars, power point presentations, Group activity, Interactive sessions and Laboratory sessions.
Assessment Types	<p>MODE OF ASSESSMENT</p> <p>A. Continuous Comprehensive Assessment (CCA) (Theory 25 Marks)</p> <ol style="list-style-type: none"> 1. Internal Assessment Test (10 marks) 2. Assignments (5 Marks) <p>Faculty component:</p> <ol style="list-style-type: none"> 3. Viva Voce (2 marks) 4. In Class Discussion (1 mark) 5. Open book test (2 marks) 6. Oral presentation (1 mark) 7. Individual project report (4 marks) <p>Practical 15 marks*</p> <ol style="list-style-type: none"> 1. Viva (5 marks) 2. Record (5 marks) 3. Laboratory involvement (5 marks) <p>*This mark to be converted to 7.5 marks</p>
	<p>B. End Semester Examination (ESE)</p> <p>Written examination for one and a half hours (50 marks)</p> <p>Practical examination (35 marks)*</p> <p>*This mark to be converted to 17.5 marks</p>

References

1. Botham K, McGuinness O., Weil P.A., Kennelly P., Rodwell V. (2022) Harper's Illustrated Biochemistry (32nd ed.) Mc Graw Hill Education
2. Kandel E., Schwartz J, Jessell T., Siegelbaum S., Hudspeth A. (2013) Principles of Neuroscience (5th ed.) Mc Graw Hill Education
3. Nelson D. L., Cox M. M. (2021) Lehninger Principles of Biochemistry, (8th ed.) W.H. Freeman & Co Ltd.
4. Berg J.M., Gatto G.J., Hines J, Tymoczko J.L., Stryer L. (2023) Biochemistry (10th ed.) W.H.

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5. West E.S., Todd W.R., Mason H.S., Van Bruggen J.T., (2017) Text Book of Biochemistry (4th ed.)
6. Voet D., Voet J., Pratt C.W., (2018) Voet's Principles of Biochemistry (5th ed.)
7. Experimental Biochemistry: A Student Companion, Beedu Sasidhar Rao & Vijay Deshpande (ed), I.K International Pvt. LTD, New Delhi
8. Introductory Practical biochemistry, S. K. Sawhney & Randhir Singh (eds) Narosa Publishing House, New Delhi
9. Standard Methods of Biochemical Analysis, S. K. Thimmaiah (ed), Kalyani Publishers, Ludhiana

Suggested Readings

1. Banerjee P.K. (2020) Introduction to Biophysics (Revised Edition) AB Book.
2. Das D. (2015) Biochemistry (14th ed.) Academic publishers





ST THOMAS COLLEGE PALAI

AUTONOMOUS ESTD. 1959 RE-ACCREDITED WITH A** GRADE BY NAAC

Programme	Biochemistry Minor					
Course Name	Biochemistry in Entrepreneurship					
Type of course	MDC					
Course code	24U2BCHMDC100					
Course level	100-199					
Course summary	The "Biochemistry in Entrepreneurship" course is designed to equip students with a multifaceted understanding of the intersection between biochemistry and business. The course then transitions to the practical aspects of the nutraceutical industry, covering business strategies, regulatory frameworks, and essential marketing principles.					
Semester	2	Credits			3	Total hours
Course details	Learning approach	Lecture 2	Tutorial 0	Practical 1	Others 0	
Pre-requisites, if any	Nil					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains*	PO No
1	Acquire a comprehensive understanding of nutrition and herbal food supplements, emphasizing their benefits for daily nutrition and preventive care.	K, U, A	2,3, 6,10
2	Attain an understanding of the nutraceutical business landscape, encompassing dietary supplements, functional foods, and phytochemicals.	U, A, An	2,3,4, 6
3	Develop expertise in the regulatory aspects of nutraceuticals, including NPD activities, GMP requirements, and quality management systems	U, An, E	2,3,4, 5,8
4	Examine marketing terminology in the nutraceutical industry, emphasizing food safety standard labelling, claims, expiration dates, and gluten-free labelling, in order to make well-informed decisions.	K, U, E, Ap	2,3,6, 8,10
5	Explain the foundational concepts of biochemical entrepreneurship, exploring the transformative power of technological innovations.	U, A, E, I	1,2,3, 6,10
6	Develop an understanding of target audiences, market needs, and trends, fostering strategic product development.	A,C, S, Ap	2,3,5, 9,10

***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)**

COURSE CONTENT

Content for Classroom transaction (Sub-units)

Module	Unit	Course description	Hrs	CO. No.
1. Foundations of holistic wellness: Exploring nutrition, Nutraceuticals, and herbal health supplements	1.1	Health and Nutrition	2	1
	1.2	Role of Nutraceuticals supplements	3	1
	1.3	Lifestyle disorders	3	1
	1.4	Herbal Supplements	2	1
2. Navigating the Nutraceutical landscape: Business, regulations, marketing essential and biochemical entrepreneurship	2.1	Nutraceutical business; Dietary supplements, Functional foods, Phytochemicals, Multivitamins; Nutraceutical product classifications	4	2
	2.2	Regulations and laws; New Product Development and regulatory activities, Good Manufacturing Practice requirements	3	3
	2.3	Key terminologies of marketing; Nutraceutical labelling –FDA, FSSAI labelling, Label claim	3	4
	2.4	Biochemistry Unleashed: Understanding the Entrepreneurial Potential	3	5
	2.5	Emerging Trends: Current landscape, Future projections, Industry insights	3	5
	2.6	Commercializing Biochemical Dreams: From Labto Market	2	5
	2.7	Social Impact Entrepreneurship: Merging Biochemistry with Societal Well-being	2	5
3. Practical	3.1	Survey on the demand and requirement of herbal products/formulations	4	6
	3.2	Product promotion techniques	4	6
	3.3	Product branding and strategy	2	6
	3.4	Public awareness campaign on healthcare needs	10	6
	3.5	Industrial/Field Visit	10	6
4. Teacher facilitated activities	4.1	Prepare a detailed presentation of the history of a pioneer nutraceutical company		

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Direct Instruction: Brainstorming lecture, E-learning Interactive session: Seminar, Group Assignments, Library work and Group discussion, Presentation by individual student Practical: Hands-on learning, real-world application, problem solving
Assessment Types	MODE OF ASSESSMENT A. Continuous Comprehensive Assessment (CCA) (Theory 15 marks) 1. Internal Assessment test (5 marks) 2. Assignments (5 marks) Faculty component: 3. Viva Voce (1 mark) 4. Open Book test (2 marks) 5. Oral presentation (2 marks) Practical 15 marks* 1. Viva (5 marks) 2. Record (5 marks) 3. Laboratory involvement (5 marks) *This mark to be converted to 7.5 marks C. End Semester Examination (ESE) Written internal examination for one hour (35 marks) Practical examination (35 marks)* *This mark to be converted to 17.5 marks

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- Cannon, T. (1991). Enterprise: Creation, Development and Growth. Butterworth-Heinemann, Oxford, p. 65.
- DeFelice, S. (2007). The Foundation for Innovation in Medicine. <http://www.fimdefelice.org>.
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- Global Nutraceuticals Market Report. India's Nutraceuticals Market Should Cross Billion Mark.
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- Lockwood, B. (2007). Nutraceuticals, 2nd Edition. London, UK: Pharmaceutical Press, p. 1.

Suggested Readings

- Adebowale, A. O., Liang, Z., & Eddington, N. D. (2000). Nutraceuticals, a call for quality control of delivery systems: a case study with chondroitin sulfate and glucosamine. J. Nutraceut. Funct. Med. Foods, 2, 15-30.
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- Dickson, M. (1993, September 24). Financial Times, p. 7.
- Enterprise in Higher Education Training Agency, Moorfoot, Sheffield. (1989). Zeisel, S. H. (1999).
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ST THOMAS COLLEGE PALAI

AUTONOMOUS ESTD. 1958 RE-ACCREDITED WITH A** GRADE BY NAAC

Programme	BSc (Hons) Biochemistry					
Course Name	Techniques in Biochemistry and Forensic Science					
Type of Course	DSC B					
Course Code	24U3BCHDSC202					
Course Level	200-299					
Course Summary	This course provides a comprehensive understanding of advanced techniques widely used in biochemistry, molecular biology and forensicscience with a focus on practical applications in research and diagnostics. Students will gain both theoretical knowledge and hands- on experience, preparing them for careers in various scientific fields.					
Semester	3	Credits		4	Total Hours	
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	75
		3	0	1		
Pre-requisites, if any	Nil					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Develop a comprehensive understanding of various biochemical and forensic techniques used in analysing biological samples.	K, U, An	1,2,3,4
2	Evaluate diverse aspects of chromatographic techniques	U, E, A	1,2,3,9, 10
3	Explore electrophoresis and blotting methods	E, An, A	1,2,3,9
4	Explain the fundamental principles of spectroscopy, colorimetry, centrifugation and microscopy	U, An, S	1,2,3,4
5	Demonstrate the crime scene sample collection and processing	U, E, C	1,2,3,9
6	Describe the role of DNA fingerprinting role in clinical settings, such as paternity/maternity testing	U, E, A	1,2,4,6, 8
7	Apply techniques in biochemistry, molecular biology, forensicscience, and biotechnology	U, S, Ap	1,2,3,9, 10

***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill(S), Interest (I) and Appreciation (Ap)**

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1. Separation Techniques	1.1	Introduction to Biochemical Techniques	1	1
	1.2	Chromatography- Terminology, classification based on principle and type of chromatographic bed used, and the physical state of mobile phase.	3	2
	1.3	Planar chromatography-Principle, procedure & applications of paper chromatography and TLC.	3	2
	1.4	Column chromatography- Principle, procedure & applications of Affinity Chromatography, Gel Exclusion Chromatography	3	2
	1.5	Electrophoretic techniques-Introduction, principle, procedure and applications of AGE and PAGE	3	3
	1.6	Blotting techniques- Southern, Northern and Western	2	3
2. Spectroscopy, Colorimetry, Centrifugation and Microscopy	2.1	Spectroscopy- Types of spectroscopy (an outline study)	2	4
	2.2	Colorimetry-Beer Lambert's law	2	4
	2.3	Instrumentation and applications of colorimeter and UV-Visible Spectrophotometer.	4	4
	2.4	Centrifugation-Principle and types	6	4
	2.5	Introduction to Microscopy (Overview)	1	4
3. Crime site sample collection and Processing	3.1	Source of DNA in Forensic cases, PCR	5	5
	3.2	ELISA, RIA	5	5
	3.3	DNA Finger Printing- Paternity and maternity Testing	5	6
4. Practical	4.1	Beer Lambert's law verification	4	7
	4.2	Paper Chromatography/Thin layer Chromatography	8	7
	4.3	Electrophoresis (Demonstration)	8	7
	4.4	DNA Isolation (from onion/Green peas)	5	7
	4.5	Estimation of isolated DNA	5	7
5. Teacher specific content/ Teacher facilitated activities				

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Direct Instruction: Lecture, tutorials, e- resources, animated videos, virtual lab Indirect session: Group discussion, seminar presentation Practical: Hands on learning, real world application, problem solving
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Assessment Types	MODE OF ASSESSMENT
	<p>A. Continuous Comprehensive Assessment (CCA) Theory 25 marks</p> <ol style="list-style-type: none"> 1. Poster making/model building (2 marks) 2. Seminar presentation/Quiz (5 marks) 3. Involvement in group discussion (3 marks) 4. Multiple Choice questions (10 marks) 5. Assignment (2 marks) 6. Open book test (3 marks) <p>Practical 15 marks*</p> <ol style="list-style-type: none"> 1. Viva (5 marks) 2. Record (5 marks) 3. Laboratory involvement (5 marks) <p>*This mark to be converted to 7.5 marks</p>
	<p>B. End Semester Examination</p> <p>Written examination for one and a half hours (50 marks)</p> <p>Practical examination (35 marks)*</p> <p>*This mark to be converted to 17.5 marks</p>

References

1. Braithwaite, A., & Smith, F. J. (1995). Chromatography: Principles and Instrumentation. Blackie Academic and Professional.
2. Butler, J. M. (2005). Forensic DNA Typing. Academic Press Publishers.
3. Goodwin, W., Linacre, A., & Had, S. (Wiley Publishers, 0470710195). An Introduction to Forensic Genetics.
4. Jain, J. L., Jain, S., & Jain, N. (2022). Fundamentals of Biochemistry. S. Chand Publishing
5. Murphy, D. B. (2012). Fundamentals of Light Microscopy and Electronic Imaging. Wiley-Blackwell Publishers.
6. Tang, Y. W., & Stratton, C. W. (2010). Advanced Techniques in Diagnostic Microbiology. Springer New York, NY.
7. Vasudevan, D. M., & Sreekumari. (2022). Textbook of Biochemistry for Medical Students. Jaypee Brothers Medical Publishers.

Suggested Readings

1. Patrono, C., & Peskar, B. A. (Eds.). (1995). Radioimmunoassay in Basic and Clinical Pharmacology (Handbook of Experimental Pharmacology No. 82). Springer Publishers.
2. Pound, J. (2008). Immunochemical Protocols. Springer Science & Business Media



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Programme	BSc (Hons) Biochemistry					
Course Name	Food as Medicine					
Type of Course	MDC					
Course Code	24U3BCHMDC200					
Course Level	200-299					
Course Summary	This course is designed to equip students with a deep understanding of the dynamic relationship between food, nutrition, and health, with a focus on practical applications and real-world experiences. The curriculum contributes to a holistic education in the field of nutrition and health.					
Semester	3			Credits		3
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	Total Hours
		3	0	0	0	45
Pre-requisites, if any	Nil					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Develop an appreciation for the significance of health infostering a high quality of life.	K,U, Ap	1,2,3,4,7, 10
2	Acquire information on energy requirements and recommended dietary allowances, facilitating a better understanding of the correlation between nutrition and overall well-being.	U, E, A	1,2,3,4,6,8
3	Attain knowledge about the roles, metabolism, and effects of nutrients.	U, A, E	1,2,3,4,6
4	Recognize the potential of different functional foods and nutraceuticals in enhancing human health.	K,U, A	1,2,3,4,6
5	Acquire knowledge about the principles of diet therapy and the application of various therapeutic diets	U, S,I	1,2,3,4,6, 10
6	Demonstrate the ability to utilize the knowledge in making informed food choices and achieving a well-balanced diet.	U, C, S	1,2,3,4,6, 10
*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill(S), Interest (I) and Appreciation (Ap)			

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1. Food, Nutrition and Health	1.1	Food for health promotion	2	1
	1.2	Functions of food – Physiological, psychological and socio - cultural functions, constituents of food and their functions.	3	1
	1.3	Introduction to Nutrition, BMR	2	2
	1.4	Carbohydrates, Proteins, Fats and Lipids	4	3
	1.5	Vitamins: Fat soluble and Water soluble vitamins	1	3
	1.6	Minerals: Micro minerals and Macro minerals	1	3
	1.7	Water Balance; Regulation of acid-base balance in the body	2	3
2. Functional Foods	2.1	Functional food of plant and animal origin, Probiotics, prebiotics and synbiotics	2	4
	2.2	Nutraceuticals- herbal nutraceuticals; Phytochemicals, phytosterols and other bioactive compounds	3	4
3. Dietetics and Diet Therapy	3.1	Objective of diet therapy; Principles of diet preparation and counselling.	5	5
	3.2	Therapeutic diets for disorders; Nutritional status assessment of the critically ill patients	5	5
	3.3	Diet in Allergy; Diet in febrile conditions; Diet in relation to deficiency diseases	5	5
	3.4	Preparation of dietary charts	3	6
	3.5	Comparative chart for nutraceutical plants	2	6
	3.6	Integrative workshop on dietetics	5	6
4. Teacher specific content/ Teacher facilitated activities				

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Direct Instruction: Brainstorming lecture, E-learning Interactive session: Seminar, Group Assignments, Library work and Group discussion, Presentation by individual student, real world application
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Assessment Types	MODE OF ASSESSMENT
	<p>A. Continuous Comprehensive Assessment (CCA) 25 marks</p> <ol style="list-style-type: none"> 1. Internal test paper (15 marks) 2. Seminar presentation/Quiz (2 marks) 3. Assignments and group discussion (3 marks) 4. Viva (3 marks) 5. Report of the workshop (2 marks)
	<p>B. End Semester Examination</p> <p>Written examination for one and a half hours (50 marks)</p>

References

1. Bamji, M. S., Krishnaswamy, K., & Brahmam, G. N. V. (2009). Textbook of Human Nutrition (3rd ed.). Oxford and IBH Publishing Co. Pvt. Ltd.
2. Dash, B. N. (2003). Health & physical education (1st ed.). Neelkamal Publications.
3. Ghosh, D., et al. (2012). Innovations in Healthy and Functional Foods. CRC Press.
4. Krause, L., & Mahan, S. (Eds.). (1992). Food, nutrition, and diet therapy (6th ed.). W.B. Saunders Company.
5. Madhavi, D. L., Deshpande, S. S., & Salunkhe. (1995). Food Antioxidants: Technological, Toxicological and Health Perspective. CRC Press.
6. Shakuntalamanay, N., & Shadaksharaswam, M. (2008). Food Facts and Principles (3rd ed.). New Age International.
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12. Yadav, S. (1997). Basic principles of nutrition (1st ed.).

Suggested Reading

1. Antia, F. P. (1987). Clinical dietetics and nutrition. Oxford University Press.
2. Robinson, et al. (1987). Normal and therapeutic nutrition (17th ed.) Mac Millan P



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Programme	BSc (Hons) Biochemistry					
Course Name	Microplastics and Environment					
Type of Course	VAC					
Course Code	24U3BCHVAC200					
Course Level	200-299					
Course Summary	This course offers an in-depth knowledge of the origins, destiny, movement, and effects of microplastics within the environment. Students will analyze the consequences of microplastic pollution and explore potential strategies for alleviation and control.					
Semester	3			Credits		3
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	Total Hours
		3	0	0	0	45
Pre-requisites, if any	Nil					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Discuss the sources and types of microplastics	K, U	1,2,3,4
2	Analyze the transport and fate of microplastics in various environmental compartments	U, An, E	1,2,3,4,7,10
3	Evaluate impacts of microplastic pollution on aquatic and terrestrial ecosystems.	U, E, I	1,2,3,6,8
4	Explore the effects of microplastics in food and drinking water	U, A, I	1,2,3,6
5	Evaluate health risks along with regulatory perspectives, concerning the impact of microplastics on biological systems.	E, A	2,3,6,8,10
6	Develop strategies for mitigating and managing microplastic pollution	U, A, Ap	1,2,6,7,8,10

***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill(S), Interest (I) and Appreciation (Ap)**

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1. Introduction to Microplastics	1.1	Overview of microplastics: definition, classification, and size range	2	1
	1.2	Sources of microplastics: primary and secondary sources	2	1
	1.3	Types of microplastics, microbeads, microfiber, Degradation	3	1
	1.4	Environmental pathways: air, water, soil	3	2
2. Fate and Transport of Microplastics	2.2	Bioaccumulation and biomagnification	5	2
	2.3	Microplastic transport in different ecosystems	5	2
3. Impact of Microplastics on biological systems and climate change & microplastic removal	2.1	Effects of microplastics on marine and freshwater ecosystems	3	3
	2.2	Impact on terrestrial ecosystems, wildlife exposure and responses	3	3
	2.3	Microplastics in food and drinking water	4	4
	2.4	Health risks and uncertainties, Regulatory perspectives	5	5
	2.5	Impact of Microplastics on climate change	5	6
	2.6	Microplastic removal strategies	5	6
4. Teacher specific content/ Teacher facilitated activities				

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Direct Instruction: Lecture, tutorials, e resources, animated videos, virtual lab Indirect session: Group discussion, assignments
Assessment Types	MODE OF ASSESSMENT A. Continuous Comprehensive Assessment (CCA) 25 marks 1. Multiple Choice Questions (10 marks) 2. Seminar presentation (2 marks) 3. Assignment and discussions (3 marks) 4. Viva (3 marks) 5. Report of awareness programmes and seminars (2 marks) 6. Report of field visit (5 marks)
	B. End Semester Examination Written examination for one and a half hours (50 marks)

References

1. Bank, M. S. (2022). Microplastic in the environment: Pattern and process. In *Environmental Contamination Remediation and Management*. Springer.
2. Cole, M., Lindeque, P., Halsband, C., & Galloway, T. S. (2011). Microplastics as contaminants in the marine environment: A review. *Marine Pollution Bulletin*, 62(12), 2588-2597.
3. Geyer, R., Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Science Advances*, 3(7), 1700782.
4. Wright, S. L., & Kelly, F. J. (2017). Plastic and human health: A micro issue? *Environmental Science & Technology*, 51(12), 6634-6647.
5. Ziajahromi, S., Neale, P. A., Rintoul, L., Leusch, F. D., & Wasternack, D. (2017). Occurrence and fate of microplastics in wastewater treatment plants: Implication to environmental management. *Water Research*, 123, 448-456.

Suggested Readings

1. Hester, R. E., & Harrison, R. M. (2019). *Plastics and the environment*. In *Issues in Environmental Science and Technology*. Royal Society of Chemistry





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AUTONOMOUS ESTD. 1950 RE-ACCREDITED WITH A** GRADE BY NAAC

Programme	BSc (Hons) Biochemistry					
Course Name	Metabolism of Carbohydrates, Proteins and Lipids					
Type of Course	DSC C					
Course Code	24U4BCHDSC202					
Course Level	200-299					
Course Summary	This course offers a thorough examination of the biochemical processes that regulate the metabolism and corresponding energetics of carbohydrates, proteins, and lipids in living organisms.					
Semester	4	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
Pre-requisites,if any	Nil	3	0	1	0	75

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe the mechanisms involved in the digestion and absorption of carbohydrates, proteins, and lipids	K, U, E	1,2,3,4
2	Explain the enzymatic reactions and energetics of breakdown and synthesis of carbohydrates	U, E	1,2,3,4,6
3	Discuss the processes and pathways involved in proteinMetabolism	U, An,E	1,2,3,4
4	Compare the catabolic and anabolic pathways of lipids	U, An,	1,2,3,4
5	Analyze and calculate energy yield in oxidation of Palmitic acid	An, A, S	1,2,3,4,6
6	Develop practical skills to determine the amount of carbohydrates, lipids and amino acids in a biological source	An, S, Ap	1,2,3,6,9, 10

***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill(S),Interest (I) and Appreciation (Ap)**

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1. Metabolism of Carbohydrates	1.1	Introduction to carbohydrate metabolism, Digestion and Absorption	1	1
	1.2	Glycolysis (with structure), Energetics and its Regulation (Over view)	2	2
	1.3	Fates of Pyruvate and TCA Cycle and energetics	3	2
	1.4	Electron Transport Chain and Oxidative Phosphorylation	2	2
	1.5	Gluconeogenesis (With Structure)	2	2
	1.6	HMP Shunt Pathway (structure not necessary)	2	2
	1.7	Glycogen Metabolism -Glycogenolysis and Glycogenesis	3	2
2. Metabolism of Proteins	2.1	Introduction to protein metabolism, Digestion and Absorption	3	1
	2.2	Oxidation of amino acids- transamination, deamination, (oxidative and Nonoxidative), Decarboxylation	4	3
	2.3	Glucogenic and ketogenic amino acids	2	3
	2.4	Nitrogen excretion, Urea cycle (structure Not necessary)	3	3
	2.5	Inborn errors of Protein metabolism – albinism, Alkaptonuria, Phenylketonuria (defensive enzyme, Symptoms and effects)	3	3
3. Lipid Metabolism	3.1	Lipids- Introduction to Lipid metabolism, Digestion, Absorption	3	1
	3.2	Fatty acid Oxidation-Alpha, Beta, Omega (Overview)	2	4
	3.2	Beta Oxidation (Activation, Transport with structure),Energy yield in oxidation of Palmitic acid, Ketone bodies	5	5
	3.4	Fatty acid synthesis (in detail), Desaturases and elongases (outline only)	5	4
4.	4.1	Beer Lamberts law verification (Mandatory)	6	6
	4.2	Estimation of carbohydrates (Anthrone Method, DiNitro Salicylic acid, Folin Wu Method, Nelsons –Any 2)	6	6

Practical	4.3	Protein Estimation (Lowry and Biuret method)	6	6
	4.4	Amino acid estimation (Ninhydrin Method)	3	6
	4.5	Estimation of Cholesterol	3	6
	4.6	Enzymatic breakdown of starch	6	6
5. Teacher specific content/ Teacher facilitated activities				

Teaching and Learning Approach	<p>Classroom Procedure (Mode of transaction)</p> <p>Direct instruction: Lecture, E-learning Indirect session: Seminars, Power point presentations, Group discussions, Questions and clarifications, Assignments, Laboratory sessions including demonstrations, hands on training</p>
Assessment Types	<p>MODE OF ASSESSMENT</p> <p>A. Continuous Comprehensive Assessment (CCA) Theory 25 marks</p> <ol style="list-style-type: none"> Poster making/model building (2 marks) Seminar presentation/Quiz (5 marks) Involvement in group discussion (3 marks) Multiple Choice questions (10 marks) Assignment (2 marks) Open book test (3 marks) <p>Practical 15 marks*</p> <ol style="list-style-type: none"> Viva (5 marks) Record (5 marks) Laboratory involvement (5 marks) <p>*This mark to be converted to 7.5 marks</p> <hr/> <p>B. End Semester Examination</p> <p>Written examination for one and a half hours (50 marks) Practical examination (35 marks)* *This mark to be converted to 17.5 marks</p>

References

- Nelson, D. L. (2005). Lehninger Principles of Biochemistry. New York: W.H. Freeman.
- Murray, R., Granner, D., Mayes, P., & Rodwell, V. (2006). Harper's Illustrated Biochemistry (Harper's Biochemistry) (27th ed.). McGraw-Hill Medical.
- Voet, D., Voet, J. G., & Pratt, C. W. (2016). Fundamentals of Biochemistry (5th ed.). John Wiley & Sons
- Jain, J. L., Jain, S., & Jain, N. (2022). Fundamentals of Biochemistry. S. Chand Publishing.
- Vasudevan, D. M., & Sreekumari, S. (2022). Textbook of Biochemistry for Medical Students. Jaypee Brothers Medical Publishers

Suggested Readings

- McKee, T., & McKee, J. R. (2009). Biochemistry: The Molecular Basis of Life. Oxford University Press.
- Berg, J. M., Tymoczko, J. L., & Stryer, L. (2007). Biochemistry. W. H. Freeman.



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Programme	BSc (Hons) Biochemistry					
Course Name	Biochemical Tests in Disease Diagnosis					
Type of Course	SEC					
Course Code	24U4BCHSEC200					
Course Level	200-299					
Course Summary	This course provides a focused exploration of the clinical significance of biochemical tests in the field of disease diagnosis. Its aim is to equip students with the essential knowledge and abilities to identify and apply biochemical tests, facilitating accurate and efficient monitoring and treatment of various diseases.					
Semester	4	Credits			3	
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	Total Hours
		3	0	0	0	
Pre-requisites, if any	Nil					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Explain the fundamentals of biochemical tests used in disease diagnosis and the ethical practices	U, E, A	1,2,3,4, 6,8
2	Discuss the various methods for collecting blood, urine and CSF, ensuring accuracy and patient comfort.	K, U, E	1,2,3,4, 6
3	Interpret blood analysis results accurately and communicate these findings effectively.	A, An, E, Ap	1,2,3, 4, 6, 10
4	Develop a comprehensive understanding of various tests used in diagnosing and monitoring diabetes	U, An, E	1,2,6,8
5	Explore the identification and applications of biomarkers in liver function Tests	U, A, An	1,2,3,4
6	Attain proficiency in accurately interpreting results of thyroid function tests results	An, E, S	1,2,3, 9, 10
7	Evaluate how results of renal function test aid in diagnosing and monitoring kidney diseases	An, E, I	1,2,3,9
8	Enhance the ability to present and communicate observations obtained from experiments, laboratory visits, as well as share insights on emerging techniques.	E, An, S	1,2,4, 9, 10

***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill(S), Interest (I) and Appreciation (Ap)**

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1. Introduction to Biochemical tests	1.1	Overview of biochemical tests and its importance in disease diagnosis, Ethical practices in laboratory medicine	3	1
	1.2	Sample collection and handling of blood, urine and cerebrospinal fluid.	3	2
	1.3	Blood routine analysis- Erythrocyte Sedimentation Rate (ESR), Hemoglobin (Hb), Red Blood Cell (RBC) Count, White Blood (WBC) Count, Platelets, Differential Count (DC), Packed Cell Volume (PCV)	5	3
	1.4	Lipid profiling - Total cholesterol, High Density Lipoprotein (HDL) Cholesterol, Low Density Lipoprotein (LDL) Cholesterol, Triglyceride (TG)	4	3
2. Common biochemical tests in diagnosis and their clinical interpretation	2.1	Tests related to Diabetes Mellitus -Fasting Blood Sugar (FBS), Post Prandial Blood Sugar (PPBS), Random Blood Sugar (RBS), Glycosylated	3	4
	2.2	Hemoglobin (HbA1C), Glucose Challenge Test (GCT), Glucose Tolerance Test (GTT)	3	4
	2.3	Liver Function Test- Total protein, Albumin, Globulin A/G ratio, Total bilirubin, Serum Glutamate Oxaloacetate Transaminase (SGOT), Serum Glutamate Pyruvate Transaminase (SGPT), Alkaline Phosphatase (ALP), Alpha Feto Protein (AFP).	3	5
	2.4	Thyroid Function Tests-Thyroid Stimulating Hormone (TSH), T3, T4, Thyroxine Binding Globulin antibody (antithyroglobulin), Thyroid peroxidase antibody (TPO)	3	6
	2.5	Renal Function Tests-Urea, Creatinine, Uric acid	2	7
	2.6	Emerging technologies in biochemical testing	1	8
3. Laboratory visit and Case study	3.1	Laboratory Visit and Report Submission	8	8
	3.2	Case Study-Interpretation of a clinical Laboratory report	7	8
4. Teacher specific content/ Teacher facilitated activities				

Teaching and Learning Approach	<p>Classroom Procedure (Mode of transaction)</p> <p>Direct Instruction: Lecture, tutorials, e resources, animated videos</p> <p>Indirect session: Group discussion, assignments</p> <p>Practical: case study, laboratory visit</p>
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Assessment Types	MODE OF ASSESSMENT
	<p>A. Continuous Comprehensive Assessment (CCA) 25 marks</p> <ol style="list-style-type: none"> 1. MCQ test for one and a half hour (10 marks) 2. Assignment- (2 marks) 3. Involvement in group discussion (2 marks) 4. Viva (3 marks) 5. Case study report (3 marks) 6. Report of Laboratory visit (5 marks)
	<p>B. End Semester Examination</p> <p>Written examination of one and a half hours (50 marks)</p>

References

1. Bishop, M. L., Fody, E. P., & Schoeff, L. E. (2013). Clinical Chemistry: Principles, Techniques, and Correlations (7th ed.)
2. Burtis, C. A., & Bruns, D. E. (2005). Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics. Elsevier (8th ed.).
3. Goldberg, S. (2010). Clinical Biochemistry Made Ridiculously Simple. MedMaster Inc.
4. Vasudevan, D. M., Sreekumari, S., & Vaidyanathan, K. (2023). Textbook of Biochemistry for Medical Students. Jaypee Publishers.
5. Walker, S. W., Beckett, G. J., Rae, P., & Ashby, P. (2013). Clinical Biochemistry. John Wiley & Sons.

Suggested Readings

1. Gaw, A., Murphy, M. J., Srivastava, R., Cowan, R. A., & O'Reilly, D. St. J. (2013). Clinical Biochemistry: An Illustrated Colour Text. Churchill Livingstone/Elsevier.
2. Wallach, J. (2000). Interpretation of Diagnostic Tests. Lippincott Williams & Wilkins.



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Programme	BSc (Hons) Biochemistry					
Course Name	Narcotics and Psychotropic Substances					
Type of Course	VAC					
Course Code	24U4BCHVAC200					
Course Level	200-299					
Course Summary	This course seeks to equip students with knowledge that goes beyond conventional limits, encouraging critical thinking and well-informed decision-making in both personal and professional realms. Student's will gain insight into the fundamental principles governing the utilization, impacts, and control of narcotics and psychotropic drugs.					
Semester	4	Credits			3	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		3	0	0	0	45
Pre-requisites, if any	Nil					

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Demonstrate how narcotics and psychotropic drugs interact with the human body	K, U, E	1,2,4,8
2	Describe the different classes of NDPSs, their mechanism of action	K, U, An	1,2,3,4
3	Analyse the potential risks associated with the use of narcotics and psychotropic drugs	U, An, I	1,2,3,6
4	Evaluate the mechanism for drug addiction and formulate management strategies	U, E, A	1,2,3,4,8
5	Assess the legal and ethical implications of using narcotics and psychotropic substances.	U, E, I, Ap	1,2,3,4,6,8
6	Communicate and educate effectively about the risks, benefits, and responsible use of narcotics and psychotropic substances, orally/writing, to diverse communities	U, E, C,S, Ap	2,4,5,6,8,9,10

***Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill(S), Interest (I) and Appreciation (Ap)**

COURSE CONTENT

Content for Classroom transaction (Units)

Module	Units	Course description	Hrs	CO No.
1. Overview of NDPSs	1.1	Introduction to NDPSs, understanding the basic principles of how drugs interact with the body, including pharmacokinetics (how the body affects the drug) and pharmacodynamics (how the drug affects the body).	5	1
	1.2	Study of narcotic drugs, their classification, mechanisms of action (in brief), therapeutic uses, and potential for abuse or addiction. Examples include opioids like morphine, heroin, oxycodone	5	2
	1.3	Exploring drugs that affect mental processes, including antipsychotics, antidepressants, anxiolytics, and mood stabilizers. Study of their mechanism of action, indications, and potential side effects. Examples include MDMA, LSD, Barbiturates	5	3
2. Addiction and Dependence	2.1	Investigation of the physiological and psychological mechanisms behind drug addiction and dependence. This includes studying tolerance, withdrawal symptoms	6	4
	2.2	Strategies for managing addiction.	3	4
	2.3	Narcotic Drugs and Psychotropic substances Act 1985 - use, prescription, and distribution of narcotics and psychotropic drugs.	6	5
3. Deaddiction centre visit and awareness programmes	3.1	Conduct of awareness programmes	10	6
	3.2	Deaddiction centre visit and submission of report	5	6
4. Teacher specific content/ Teacher facilitated activities				

Teaching and Learning Approach	<p>Classroom Procedure (Mode of transaction)</p> <p>Direct Instruction: Lecture, tutorials, e resources, animated videos Indirect session: Group discussion, assignments, seminar presentation, involvement in awareness programmes, Deaddiction centre visit</p>
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Assessment Types	MODE OF ASSESSMENT
	<p>A. Continuous Comprehensive Assessment (CCA) 25 marks</p> <ol style="list-style-type: none"> 1. MCQ test for one hour (10 marks) 2. Assignment- (2 marks) 3. Involvement in group discussion (2marks) 4. Viva (2 marks) 5. Involvement in awareness programmes (2 mark) 6. seminar presentation (2 marks) 7. Report of deaddiction centre visit (5 marks)
	<p>B. End Semester Examination</p> <p>Written Examination of one and a half hours (50 marks)</p>

References

1. Jeffries, J. J. (Ed.), Bezchlibnyk-Butler, K. Z. (Ed.), & Procyshyn, R. M. (Ed.). (2021). Clinical Handbook of Psychotropic Drugs. Hogrefe Publishing.
2. Knollmann, B., & Brunton, L. (2022). Goodman and Gilman's The Pharmacological Basis of Therapeutics [Hardcover]. McGraw-Hill Education.
3. Liese, B. S., & O'Connor, C. K. (2006). Substance Use Disorders: A Practical Guide (2nd ed.). Lippincott Williams & Wilkins.
4. Pagliaro, L. A., & Pagliaro, A. M. (2004). Pagliaros' Comprehensive Guide to Drugs and Substances of Abuse. American Pharmacists Association.
5. Tozer, T. N., & Rowland, M. (2006). Introduction to Pharmacokinetics and Pharmacodynamics: The Quantitative Basis of Drug Therapy [Paperback]. Lippincott Williams and Wilkins.
6. The Narcotic Drugs and Psychotropic Substances Act, 1985.

Suggested Readings

1. Abadinsky, H. (2017). Drug Use and Abuse: A Comprehensive Introduction (9th ed.). Cengage Learning.
2. Stahl, S. M., & Muntner, N. (2013). Stahl's Essential Psychopharmacology: Neuroscientific Basis and Practical Applications (4th ed.). Cambridge University Press.