



UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A' GRADE' UNIVERSITY)
(Baba Sahib Ambedkar Road, Jammu-180006 (J&K))

Academic Section

Email: academicsectionju14@gmail.com

NOTIFICATION (24/July/Adp./41)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the Syllabi and Courses of Studies of the subject of **Bio-Chemistry** of Semester Vth, VIth, VIIth and VIIIth for Four Year Under Graduate Programme (FYUGP) as per NEP-2020 (as given in the annexure) for the examinations to be held in the years as per the details given below:

Subject	Semester	For the examinations to be held in the year
Bio-Chemistry	Semester- V	Dec. 2024, 2025 and 2026
	Semester-VI	May 2025, 2026 and 2027
	Semester-VII	Dec. 2025, 2026 and 2027
	Semester- VIII	May 2026, 2027 and 2028

The Syllabi of the courses is also available on the University website: www.jammuuniversity.ac.in.

No. F. Acd/II/24/ 5566-85

Dated: 3/7/24

Copy for information and necessary action to:

1. Dean, Faculty of Life-Science
2. HOD/Convener, Board of Studies in **Biotechnology**
3. Sr. P.A.to the Controller of Examinations
4. All members of the Board of Studies
5. Confidential Assistant to the Controller of Examinations
6. I/C Director, Computer Centre, University of Jammu
7. Deputy Registrar/Asst. Registrar (Conf. /Exams. UG)
8. Incharge, University Website for Uploading of the notification

DEAN ACADEMIC AFFAIRS

Anji blasing 27/7/24
Supriyaad 18 11/7/24
1/7/24 12/7/24

The suggested scheme for B.Sc FYUG Biochemistry as per NEP 2020 for the Vth, VIth, VIIth and VIIIth (honors and honors with research project) semester is as follows:

Semester	Course Code	Course Title	Type of Course	Credits (T+P)
Sem- 5 th	Major	UMJBCHT- 501	Membrane Biochemistry	4 (3+1)
	Major	UMJBCHT- 502	Genetics	4 (3+1)
	Major	UMJBCHT-503	Recombinant DNA Technology	4 (3+1)
	Major	UMJBCHT-504	Basics of Metabolism & Bioenergetics	2 (2+0)
	Minor	UMIBCHT-505	Biochemistry of Membranes	4 (3+1)
	SEC	USEBCHT-506	Summer Internship	2
				20 credits
Sem- 6 th	Major	UMJBCHT-601	Metabolism-I	4 (3+1)
	Major	UMJBCHT-602	Physical Biochemistry	4 (3+1)
	Major	UMJBCHT-603	Basics of Immunology	4 (3+1)
	Major	UMJBCHT-604	Nutritional Biochemistry	4 (3+1)
	Minor	UMIBCHT-605	Metabolism of Carbohydrates & Lipids	4 (3+1)
				20 credits
Sem- 7 th	Major	UMJBCHT-701	Metabolism-II	4 (3+1)
	Major	UMJBCHT-702	Microbial Physiology & Biochemistry	4 (3+1)
	Major	UMJBCHT-703	Molecular Immunology	4 (3+1)
	Major	UMJBCHT-704	Bioinformatics and Biostatistics	4 (3+1)
	Minor	UMIBCHT-705	Metabolism of Amino acids & Nucleic acids	4 (3+1)
				20 credits
Sem- 8 th Honours	Major	UMJBCHT-801	Medical Biochemistry	4 (3+1)
	Major	UMIBCHT-802	Genomics & Proteomics	4 (3+1)
	Major	UMJBCHT-803	Biochemical corelations of diseases	4 (3+1)
	Major	UMJBCHT-804	Plant Biochemistry	4 (3+1)

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Sem- 8 th Research	Minor	UMIBCHT-805	Clinical Biochemistry	4 (3+1)
		Or		20 credits
	Major	UMJBCHT-806	Medical Biochemistry	4 (3+1)
	Major	UMJBCHT-807	Clinical Biochemistry	4 (3+1)
	SEC	USEBCHP-808	Dissertation/Research Project	
				20 credits

Aditya

Yas B. K. Singh R. Anil S.

University of Jammu
Syllabi of Biotechnology for FYUP under CBCS as per NEP-2020
Semester – V
(Examination to be held in December 2024, 2025 & 2026)

Semester	Course Code	Course Title	Type of Course	Credits (T+P)
Sem- 5 th	Major	UMJBCHT- 501	Membrane Biochemistry	4 (3+1)
	Major	UMJBCHT- 502	Genetics	4 (3+1)
	Major	UMJBCHT-503	Recombinant DNA Technology	4 (3+1)
	Major	UMJBCHT-504	Basics of Metabolism & Bioenergetics	2 (2+0)
	Minor	UMIBCHT-505	Biochemistry of Membranes	4 (3+1)
	SEC	USEBCHI-506	Summer internship	2
				20 credits

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V
(Examination to be held in December 2024, 2025 & 2026)
MAJOR COURSE

Course Code : UMJBCHT-501
Course Title : Membrane Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

The course aims to provide students with a deeper understanding of the various biological processes occurring at various cellular membranes. It will help the students to gain a deeper understanding of how the lipid, protein, and carbohydrate components of membranes define and regulate their structures and properties. It will help to comprehend how the membrane structures and resulting biological functions are governed by biophysical forces.

THEORY

UNIT I: Membrane composition and structure

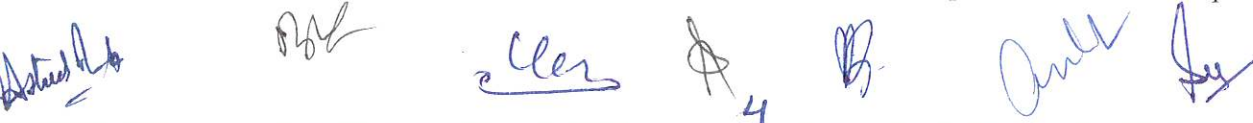
Historical background, various membrane models. Overview of membrane functions. Composition of membranes: Lipids -Phospholipids, Glycolipids, sterols; Proteins - Peripheral Proteins, Integral Membrane Proteins and Lipid-Anchored proteins, and carbohydrates. Comparison of the composition of various cellular and subcellular membranes. Lateral and transverse asymmetry in membranes. Role of Flippase, Floppase and Scramblase. Model systems to study membranes - Lipid Monolayers, Planar Bilayer and Liposome, and their application. Polymorphic Lipid-Water Systems. The various determinants of polymorphic phases: CMC, lipid shape, critical packing parameter.

UNIT II: Membrane dynamics

Membrane fluidity: lateral, transverse and rotational motion of lipids and proteins. Factors affecting membrane fluidity- composition, barriers (tight junctions), cytoskeleton interactions, microdomains – rafts, caveolae. Fence and gate model. Study of RBC membrane architecture. Homeoviscous Adaptation. Techniques to study membrane dynamics: FRAP, TNBS, SPT.

UNIT III: Membrane transport

Thermodynamics of transport. Simple diffusion and facilitated diffusion. Passive transport- glucose transporter and anion transporter. Primary active transporters- P type ATPases, V type ATPases, F type ATPases. Secondary active transporters - lactose permease, Na⁺ -glucose symporter. ABC family of transporters – MDR and CFTR. Group translocation and bacteriorhodopsin. Ion channels: voltage-gated ion channels (Na⁺ /K⁺ voltage-gated channel) and ligand-gated ion channels (acetyl choline receptor), and aquaporins. Ionophores: valinomycin, gramicidin. Relationship of membrane transport and diseases.



University of Jammu
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Semester – V
(Examination to be held in December 2024, 2025 & 2026)
MAJOR COURSE

Course Code : UMJBCHT-501
Course Title : Membrane Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Unit IV: Oxidative phosphorylation

The electron transport chain - its organization and function. Peter Mitchell's chemiosmotic hypothesis and Proton motive force. F_0F_1 ATP synthase, structure and mechanism of ATP synthesis. Metabolite transporters in mitochondria. Regulation of oxidative phosphorylation. ROS production and antioxidant mechanisms. Thermogenesis Alternative respiratory pathways in plants.

PRACTICALS

1. Effect of lipid composition on the permeability of a lipid monolayer.
2. Determination of CMC of detergents.
3. Preparation of RBC ghost cell.
4. Study the photosynthetic O_2 evolution in hydrilla plant.
5. Isolation of chloroplast from spinach leaves and estimation of chlorophyll content.
6. Study the Hill reaction by using artificial electron acceptor.
7. Separation of photosynthetic pigments by TLC.
8. Separation of RBC membrane proteins by SDS-PAGE.
9. Isolation of mitochondria from liver and assay of marker enzyme SDH.
10. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

University of Jammu
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MAJOR COURSE

Course Code : UMJBCHT-501
Course Title : Membrane Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

- External End Semester Theory Examination will have two sections (A & B).
- Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.
- Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

RECOMMENDED TEXTBOOKS:

- Nelson, D.L. and Cox, M.M. (2021) Lehninger: Principles of Biochemistry 8th ed., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.
- Devlin, T.M. (2011) Textbook of Biochemistry with Clinical Correlations 7th ed., John Wiley & Sons, Inc. (New York), ISBN: 978-0-470-28173-4 / BRV ISBN: 978-0-470- 60152-5.
- Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W. (2018) Harper's Biochemistry 35th ed., Lange Medical Books/McGraw Hill. ISBN:978-0-07-176-576-3.
- Voet D, Voet JG and Pratt CW. (2016) Fundamentals of Biochemistry: Life at the Molecular Level 6th ed., John Wiley & Sons. New York. ISBN: 978-1-118-91840



University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V
(Examination to be held in December 2024, 2025 & 2026)
MAJOR COURSE

Course Code : UMJBCHT-502
Course Title : Genetics
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOME

The course provides an introduction to Genetics. After successful completion of course, a student will be able to: 1. Study historical overview and laws Inheritance. 2. Understand Mendel's principles and deviations. 3. Gene interactions and their outcome through gene mapping. 4. Understand effect of mutations and transposable elements

THEORY

UNIT 1: Inheritance and Gene Interaction

History of Genetics, Mendelian Theory, Laws of inheritance - dominance, segregation, co-dominance, Law of independent assortment test cross, back cross. Maternal inheritance: Plastid inheritance in Mirabilis, Kappa particle in Paramecium. Deviations from Mendelian laws, Supplementary gene interaction, Complementary Gene interaction, Epistasis: Recessive and Dominant, Multiple factors: skin colour in human beings. Penetrance and Expressivity, Pleiotropy Multiple alleles: blood groups in human beings & Rh factor; Allelic series, Test for allelism

Unit 2: Linkage and Crossing over

Chromosome theory of Linkage, types of linkage, complete and incomplete linkage, linkage groups; Crossing over: crossing over in meiosis, features of crossing over, types of Crossing over, mechanism of Crossing over and its importance, cytological detection of Crossing over

Unit 3: Chromosomal basis of Mendelism and Human Genetics

Chromosomal theory of inheritance, non-disjunction, Sex linked inheritance, Sex chromosomes and Sex determination, Dosage compensation of X-linked genes. Human Genetics: Pedigree, Mendelian Segregation in Human families, Genetic Counselling

Unit 4: Mutations and Transposable elements

Types of mutations, Mutagens, Mutation at the molecular level, Applications of mutations; Chromosomal variations: General account of structural aberrations and numerical aberrations, chromosomal evolution of wheat and cotton; An overview of transposable elements in bacteria and plants

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V
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MAJOR COURSE

Course Code : UMJBCHT-502
Course Title : Genetics
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Practical

1. Identification, maintenance and culturing of Drosophila stock.
2. Experiments on epistatic interactions including test cross and back cross.
3. Determination of linkage and cross-over analysis
4. Demonstration of Partial or in complete dominance, co-dominance in flowers/ plants.
5. Experiments to understand the basic concept of the ABO blood group type.
6. To study the effect of UV radiations on E. coli for different time periods.
7. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

a) External End Semester Theory Examination will have two sections (A & B).



University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V
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MAJOR COURSE

Course Code : UMJBCHT-502
Course Title : Genetics
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

- b) Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.
- c) Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

Recommended Textbooks:

1. Daniel L. H (1991) Basic Genetics, 2nd ed., Jones & Barlett Publishers USA ISBN: 978-0867201734
2. Monroe W Strickberger (1976) Genetics, Macmillain Publishers, New York ISBN: 9780024180902
3. Elliott S. Goldstein, Jocelyn E. Krebs, and Stephen T. Kilpatrick, Jones (2017) Lewin's Genes XII 12th ed., Bartlett Publishers, Inc ISBN: 9781284104493
4. Sinnott, L.C. Dunn and Dobzhansky (1984) Principles of Genetics, 5th ed., McGraw-Hill. ISBN 978-0070994133
5. E.J. Gardener, M.J. Simmons and D.P. Snustard (2019) Principles of Genetics, 7th Edition–John Wiley & Son Publications ISBN: 9780471533979
6. P.K.Gupta (2018) Genetics, 5th ed., Rastogi Publication, Meerut, India ISBN: 8193775708.

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A series of handwritten signatures and initials in blue ink, including "Aditya", "BCL", "Uan", "9", "Am", and "R. Su".

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V
(Examination to be held in December 2024, 2025 & 2026)
MAJOR COURSE

Course Code : UMJBCHT-503
Course Title : Recombinant DNA Technology
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

This course is about the application of molecular biology and includes the techniques based on it. The student is introduced to basic tools and techniques used in genetic engineering along with the principles they are based on. The course includes nucleic acid extraction, gene cloning, PCR and DNA sequencing along with other topics relevant to genetic engineering.

THEORY

Unit 1: Principles and Tools in Genetic Engineering

Introduction to the principles and significance of genetic engineering; Exploration of essential tools used in genetic engineering, including restriction enzymes, nucleases, ligases, phosphatases, and kinases; Understanding the concept of vectors, Selection and characterization of appropriate vectors for cloning. Nucleic acid extraction, Principles and methods

Unit 2: Cloning - techniques and types

Construction and screening of the genomic and cDNA library for specific for gene of interest: function-based screening and sequence-based screening. Isolation, identification and characterization of specific gene. Introduction to PCR, principle and working; design and importance of primer, PCR program and assay; Types of PCR, conventional PCR, multiplex PCR, nested PCR, Inverse PCR, anchored PCR and real-time PCR. Role of PCR in gene cloning and diagnostics.

Unit 3: DNA Sequencing and DNA synthesis,

Introduction to three generation of DNA sequencing, Detailed account of Sangers method of sequencing, Illumina and PacBio. Introduction to bioinformatic tools to analyse the raw sequence data into meaningful information. Chemical synthesis of DNA, primer and complete gene

Unit 4: Gene Editing and Genome Engineering

Exploration of gene editing technologies, such as CRISPR-Cas9, TALENs, and ZFNs; Site-directed mutagenesis and gene knockout strategies; RNA interference (RNAi) and gene silencing techniques; Study of genome engineering strategies and their implications in genetic modification; Ethical considerations and challenges associated with gene editing and genome engineering

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V
(Examination to be held in December 2024, 2025 & 2026)
MAJOR COURSE

Course Code : UMJBCHT-503
Course Title : Recombinant DNA Technology
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

PRACTICALS

1. Culturing *E.coli* DH5 α in media for isolation of Plasmid DNA.
2. Isolation of plasmid DNA from bacterial cells.
3. Isolation of Genomic DNA from Bacterial Cells.
4. Preparation of Agarose gel for electrophoresis.
5. Checking Bacterial genomic and Plasmid DNA on Agarose gels of different percentages and identifying the differences.
6. Restriction enzyme digestion and analysis of DNA fragments by gel electrophoresis.
7. Demonstrate the process of Ligation of DNA fragments and transformation into bacterial cells.
8. Demonstrate the process of Screening and selection of transformed cells.
9. Demonstrate Polymerase Chain Reaction (PCR) amplification of target DNA sequences.
10. Analysis of PCR products using gel electrophoresis.
11. Cloning and expression of a target gene in a host organism.
12. Analysis of gene expression using reporter assays.
13. Bioinformatics analysis of DNA and protein sequences using online tools.
14. Design and presentation of a genetic engineering project proposal.
15. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva)

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Course Code : UMJBCHT-503
Course Title : Recombinant DNA Technology
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V
(Examination to be held in December 2024, 2025 & 2026)
MAJOR COURSE

Course Code : UMJBCHT-504
Course Title : Basics of Metabolism & Bioenergetics
Credits : 2 (Theory)
Total No. of Lectures: Theory: 30 hours
Maximum Marks: 50

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

This course aims to introduce the students to basics of metabolism and bioenergetics with an expectation to learn how the principles of bioenergetics and thermodynamics hold good in biological systems also and how are these central in understanding metabolism.

THEORY

Unit-I: BIOLOGICAL THERMODYNAMICS

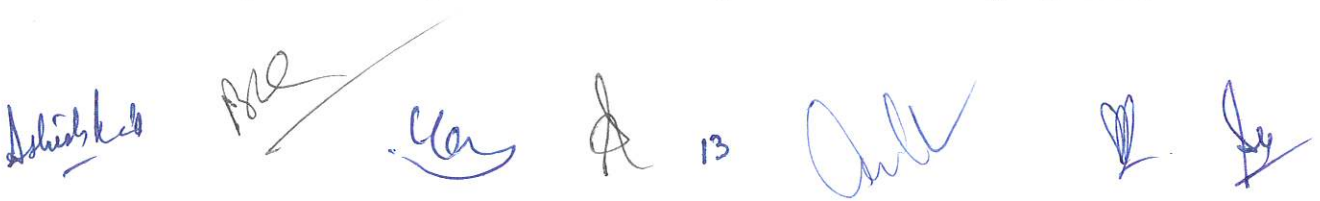
Thermodynamic states, Zeroth law of thermodynamics, First law of thermodynamics and its implications in biological system, Second law of thermodynamics and its significance in biological system, Concept of third law of thermodynamics, Isothermal and adiabatic processes, Concept of heat of a reaction, thermodynamic systems, Thermodynamic properties, Importance of thermodynamics in biological systems.

Unit-II: BIOENERGETICS

Concept of work and energy, Bioenergetics, Energy change during a biochemical reaction, Endergonic and Exergonic reactions, Energy transformation in biological systems, Total internal energy, Gibbs free energy concept, Significance of free energy, Entropy and its significance, Enthalpy, Relation between entropy, enthalpy and free energy, Spontaneity of a biochemical reaction.

Unit-III: BASICS OF METABOLISM

Metabolism, Catabolism, Anabolism, Amphibolism, Types of metabolic reactions, Oxidation- reduction reactions, Redox potential, dehydrogenation reactions, Energy rich compounds in living organisms, classification of energy rich compounds, Phosphoryl transfer potential, Coupled reactions, ATP as energy currency, ATP-ADP cycle, Concept of Biological oxidation, Methods used to study metabolism in living organisms.

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – V
(Examination to be held in December 2024, 2025 & 2026)
MAJOR COURSE

Course Code : UMJBCHT-504
Course Title : Basics of Metabolism & Bioenergetics
Credits : 2 (Theory)
Total No. of Lectures: Theory: 30 hours
Maximum Marks: 50
NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	33%	1 ½ Hours	10
External Theory End Semester	100%	3 Hours	40

A. Internal Assessment Test (10 Marks) Time Allotted 1 Hour

Internal assessment paper of 10 marks shall consist of theory questions from Unit I

B. External End Semester University / College Examination (Time Allotted 2½ Hours)

1. External theory exam shall be of 40 marks and consists of 2 sections.
 - a. Section A shall be of 10 marks and comprise of 10 short answer type questions of 1 mark each, 2 from Unit 1, 2 and 3 (All compulsory).
 - b. Section B shall be of 30 Marks and will comprise of 6 long answer type questions, two from each unit. A candidate will have to attempt 3 questions selecting one question from each unit. Each question will carry 10 marks.

RECOMMENDED TEXTBOOKS:

1. Nelson, D.L. and Cox, M.M. (2021) Lehninger: Principles of Biochemistry 8th ed., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.
2. Devlin, T.M. (2011) Textbook of Biochemistry with Clinical Correlations 7th ed., John Wiley & Sons, Inc. (New York), ISBN: 978-0-470-28173-4 / BRV ISBN: 978-0-470-60152-5.
3. Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W. (2012) Harper's Biochemistry 29th ed., Lange Medical Books/McGraw Hill. ISBN:978-0-07-176-5763.
4. Voet D, Voet JG and Pratt CW. (2016) Fundamentals of Biochemistry: Life at the Molecular Level 5th ed., John Wiley & Sons. New York. ISBN: 978-1-118-91840

14

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V
(Examination to be held in December 2024, 2025 & 2026)
MINOR COURSE

Course Code : UMIBCHT- 505
Course Title : Biochemistry of Membranes
Credits : 4(3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory: 75
Practical: 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

The course aims to provide students with a deeper understanding of the various biological processes occurring at various cellular membranes. to gain a deeper understanding of how the lipid, protein, and carbohydrate components of membranes define and regulate their structures and properties. to comprehend how the membrane structures and resulting biological functions are governed by biophysical forces. to obtain expertise in the planning, delivering, and debating of scientific results.

THEORY

UNIT I: Membrane composition and structure

Historical background, various membrane models. Overview of membrane functions. Composition of membranes: Lipids -Phospholipids, Glycolipids, sterols; Proteins - Peripheral Proteins, Integral Membrane Proteins and Lipid-Anchored proteins, and carbohydrates. Comparison of the composition of various cellular and subcellular membranes. Lateral and transverse asymmetry in membranes. Role of Flippase, Floppase and Scramblase. Model systems to study membranes - Lipid Monolayers, Planar Bilayer and Liposome, and their application. Polymorphic Lipid-Water Systems. The various determinants of polymorphic phases: CMC, lipid shape, critical packing parameter.

UNIT II: Membrane dynamics

Membrane fluidity: lateral, transverse and rotational motion of lipids and proteins. Factors affecting membrane fluidity- composition, barriers (tight junctions), cytoskeleton interactions, microdomains – rafts, caveolae. Fence and gate model. Study of RBC membrane architecture. Homeoviscous Adaptation. Techniques to study membrane dynamics: FRAP, TNBS, SPT.

UNIT III: Membrane transport

Thermodynamics of transport. Simple diffusion and facilitated diffusion. Passive transport- glucose transporter and anion transporter. Primary active transporters- P type ATPases, V type ATPases, F type ATPases. Secondary active transporters - lactose permease, Na⁺ -glucose symporter. ABC family of transporters – MDR and CFTR. Group translocation and bacteriorhodopsin. Ion channels: voltage-gated



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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V
(Examination to be held in December 2024, 2025 & 2026)
MINOR COURSE

Course Code : UMIBCHT- 505
Course Title : Biochemistry of Membranes
Credits : 4(3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory: 75
Practical: 25


ion channels (Na^+/K^+ voltage-gated channel) and ligand-gated ion channels (acetyl choline receptor), and aquaporins. Ionophores: valinomycin, gramicidin. Relationship of membrane transport and diseases.

Unit IV: Oxidative phosphorylation

The electron transport chain - its organization and function. Peter Mitchell's chemiosmotic hypothesis and Proton motive force. FoF1 ATP synthase, structure and mechanism of ATP synthesis. Metabolite transporters in mitochondria. Regulation of oxidative phosphorylation. ROS production and antioxidant mechanisms. Thermogenesis Alternative respiratory pathways in plants.

PRACTICALS

1. Effect of lipid composition on the permeability of a lipid monolayer.
2. Determination of CMC of detergents.
3. Preparation of RBC ghost cell.
4. Study the photosynthetic O_2 evolution in hydrilla plant.
5. Isolation of chloroplast from spinach leaves and estimation of chlorophyll content.
6. Study the Hill reaction by using artificial electron acceptor.
7. Separation of photosynthetic pigments by TLC.
8. Separation of RBC membrane proteins by SDS-PAGE.
9. Isolation of mitochondria from liver and assay of marker enzyme SDH.
10. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.



MINOR COURSE

Practical: 25

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva)

- External End Semester Theory Examination will have two sections (A & B).
- Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.
- Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V
(Examination to be held in December 2024, 2025 & 2026)
MINOR COURSE

Course Code : UMIBCHT- 505
Course Title : Biochemistry of Membranes
Credits : 4(3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory: 75
Practical: 25

RECOMMENDED TEXTBOOKS:

1. Nelson, D.L. and Cox, M.M. (2021) Lehninger: Principles of Biochemistry 8th ed., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.
2. Devlin, T.M. (2011) Textbook of Biochemistry with Clinical Correlations 7th ed., John Wiley & Sons, Inc. (New York), ISBN: 978-0-470-28173-4 / BRV ISBN: 978-0-470- 60152-5.
3. Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W. (2012) Harper's Biochemistry 29th ed., Lange Medical Books/McGraw Hill. ISBN:978-0-07-176-576-3.
4. Voet D, Voet JG and Pratt CW. (2016) Fundamentals of Biochemistry: Life at the Molecular Level 5th ed., John Wiley & Sons. New York. ISBN: 978-1-118-91840

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University of Jammu
Syllabi of Biotechnology for FYUGP under CBCS as per NEP-2020
Semester – V
(Examination to be held in December 2024, 2025, 2026)

SKILL ENHANCEMENT COURSE

Course Code: USEBCHI-506

Course Title: Summer internship

Credits: 2

Maximum marks: 50

OBJECTIVES AND EXPECTED LEARNING OUTCOME

It shall be a short-term internship of 15 days duration in 5th semester for job/professional training in a suitable organization or hands on training or activity-based course at college level in order to gain work experience. All students will undergo internships / Apprenticeships in a firm, industry, or organization or Training in labs with faculty and researchers in their own or other HEIs/research institutions during the summer term. Students will be provided with opportunities for internships with local industry, business organizations, health and allied areas, local governments (such as panchayats, municipalities), Parliament or elected representatives, media organizations, artists, crafts persons, and a wide variety of organizations so that students may actively engage with the practical side of their learning and, as a by-product, further improve their employability.

Community engagement and service: The curricular component of “community engagement and service” seeks to expose students to the socio-economic issues in society so that the theoretical learning can be supplemented by actual life experiences to generate solutions to real-life problems. This can be part of summer term activity.

Field-based learning/minor project: The field-based learning/minor project will attempt to provide opportunities for students to understand the different socio-economic contexts. It will aim at giving students exposure to development-related issues in rural and urban settings. It will provide opportunities for students to observe situations in rural and urban contexts, and to observe and study actual field situations regarding issues related to socioeconomic development. Students will be given opportunities to gain a first-hand understanding of the policies, regulations, organizational structures, processes, and programs that guide the development process. They would have the opportunity to gain an understanding of the complex socio-economic problems in the community, and innovative practices required to generate solutions to the identified problems. This may be a summer term project.

Skill based training: Short term skill-based hands-on training can be conducted on various techniques utilized in biochemistry course. Students can undergo internships in labs with faculty and researchers in their own or other HEIs/research institutions during the summer term. These trainings will enhance the skill of student that can be applicable for getting skill-based jobs.

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University of Jammu
Syllabi of Biotechnology for FYUGP under CBCS as per NEP-2020
Semester – V
(Examination to be held in December 2024, 2025, 2026)

SKILL ENHANCEMENT COURSE

Course Code: USEBCHI-506

Course Title: Summer internship

Credits: 2

Maximum marks: 50

SCHEME OF EXAMINATION

The internship shall be under a college teacher who will be designated as Internship Supervisor. After completion of summer internship students will have to produce a report related to the work carried out signed by internship supervisor and college principal. The internship will be evaluated internally by a Board of Examiners setup by the principal of the college.

Note: The minimum passing criteria for the summer internship is 40%.

Report Guidelines: The interns will write their report as per the format given below:

1. Introduction
2. Materials and Methods
3. Results
4. Discussion
5. Conclusion
6. References


This structure allows participants to gain hands-on experience in various laboratory techniques and apply their knowledge through a project. The project report serves as a valuable component to assess their understanding and application of the learned skills.

Monitoring and Evaluation: The designated Internship Supervisor will monitor the progress and evaluate student's internship course at the end of semester on the basis of

Internship Report/Seminar presentation/Viva-voce. The evaluation of the internship course shall be internal.

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20



University of Jammu
Syllabi of Biotechnology for FYUP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)

Sem- 6th	Major	UMJBCHT-601	Metabolism-I	4 (3+1)
	Major	UMJBCHT-602	Physical Biochemistry	4 (3+1)
	Major	UMJBCHT-603	Basics of Immunology	4 (3+1)
	Major	UMJBCHT-604	Nutritional Biochemistry	4 (3+1)
	Minor	UMIBCHT-605	Metabolism of Carbohydrates & Lipids	4 (3+1)
				20 credits

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-601
Course Title : Metabolism-I
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

The goal of this course is to give the students a comprehensive understanding of metabolism to help students understand how energy is produced and used in biological processes. The course covers the metabolism of carbohydrates and lipid biomolecules, which can aid students in comprehending the chemical processes involved in living systems. After completing the course, students will be able to: 1. Recognize and summarize pertinent data from scientific publications pertaining to metabolic issues. 2. Students will be able to evaluate the data and make a connection to the metabolism context. 3. Students will be able to comprehend the composition, processes of anabolism and catabolism, and the interactions, control, and malfunction of the pathways involved in the metabolism of carbohydrates and lipids.

THEORY

Unit 1 Introduction to Metabolism

Types of Metabolic Pathways, Experimental approaches to study metabolism, Basic principles/mechanisms of metabolic regulation. Basic concepts and design of metabolism. Some activated carriers in metabolism. Basic principles of bioenergetics: chemical basis of large free energy of hydrolysis of some energetic compounds; coupled reactions; group transfer; biological energy transducers. Types of biological oxidation-reduction reactions

Unit 2: Carbohydrate Catabolism

Digestion and absorption of carbohydrates, glycolysis, citric acid cycle, oxidative phosphorylation, pentose phosphate and other pathways, Degradation of di and polysaccharides.

Unit 3 Carbohydrate Anabolism

Gluconeogenesis, Role of nucleotide diphosphate sugars, Biosynthesis of disaccharides and polysaccharides, Regulation of carbohydrate metabolism.

Unit 4 Lipid Catabolism

Digestion and absorption of lipids, transport of lipoproteins, Oxidation of fatty acids, Degradation of triacylglycerols, phosphoglycerides. Sphingolipids, Regulation of lipid Metabolism. Lipid Anabolism: synthesis of fatty acids, triacylglycerols, phosphoglycerides, sphingolipids, cholesterol, prostaglandins and other protanoids.

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-601
Course Title : Metabolism-I
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

PRACTICAL

1. Collection and preservation of biological samples (Blood [plasma& serum] and urine).
2. Estimation of glucose by ortho Toluidine method.
3. Estimation of glucose by Anthrone method.
4. Estimation of glucose by DNS method.
5. Qualitative analysis to identify and differentiate between biomolecules from urine.
6. Qualitative analyses to differentiate between carbohydrates from the urine.
7. Glucose tolerance test glucose tolerance test
8. To determine plant storage and structural saccharides.
9. A visit to nearby Research Institution.

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva)

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-601
Course Title : Metabolism-I
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

- a) External End Semester Theory Examination will have two sections (A & B).
- b) Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.
- c) Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

Recommended Textbooks:

1. Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W. (2012) Harper's Biochemistry 29th ed., Lange Medical Books/McGraw Hill. ISBN:978-0-07-176-576-3.
2. Nelson, D.L. and Cox, M.M. (2021) Lehninger: Principles of Biochemistry 8th ed., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.
3. Devlin, T.M. (2011) Textbook of Biochemistry with Clinical Correlations 7th ed., John Wiley & Sons, Inc. (New York), ISBN: 978-0-470-28173-4 / BRV ISBN: 978-0-470- 60152-5.
4. Voet D, Voet JG and Pratt CW. (2018) Fundamentals of Biochemistry: Life at the Molecular Level 8th ed., John Wiley & Sons. New York. ISBN: 978-1-118-91840.

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-602
Course Title : Physical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

This course introduces students to a range of fundamental biochemical techniques essential for research and applications in biotechnology. Through theoretical and practical sessions, students will gain experience in various laboratory procedures, enabling them to analyse biological molecules and manipulate cellular processes. The course aims to covers in depth various techniques in biochemistry and develop proficiency among the students about the subject.

THEORY

Unit 1 Basic techniques for protein purification

Preparation of solutions & buffers, Methods of cell disintegration; Enzyme assays and controls. Dialysis, Ultrafiltration and precipitation, Chromatography: Principles of chromatography, TLC and Paper chromatography; Gel permeation, Ion exchange, Hydrophobic, Reverse-phase and Affinity chromatography; HPLC and FPLC; Criteria of protein purity.

Unit 2 Centrifugation & Electrophoresis

Basic principles: sedimentation of macromolecules, sedimentation velocity, rpm & RCF. Types of centrifuge & rotors; Principle and applications of preparative and analytical centrifugation. Determination of molecular weight by sedimentation velocity & sedimentation equilibrium methods. Factors affecting migration rate, types of electrophoresis. Theory and applications of PAGE: SDS-PAGE, native PAGE, reducing and non-reducing SDS-PAGE, Gradient gels, 2D electrophoresis, agarose gel electrophoresis, Capillary electrophoresis, Pulsed field gel electrophoresis.

Unit 3 Spectroscopic Techniques

Principle and applications of UV/visible spectroscopy, Lambert Beer law, analysis using light scattering, fluorescence spectroscopy, circular dichroism, NMR and ESR spectroscopy, Mass spectrometry: Ionization methods (electron impact, ESI and MALDI), analysis by quadrupole and TOF, Principle and applications of surface plasmon resonance.

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-602
Course Title : Physical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Unit 4 Structural Determination of Macromolecules

Structure determination of macromolecules: Fundamentals of X-Ray crystallography, NMR spectroscopy & cryo electron microscopy Radiolabeling techniques: Properties of alpha, beta and gamma radiation, half-life, different types of radioisotopes normally used in biology, their detection and measurement: Autoradiography, GM and scintillation counting, applications of radioactivity in biological research, safety guidelines.

PRACTICALS:

1. Demonstration of Beer-Lambert Law and measurement of Molar Extinction coefficient.
2. Preparation of standard graph and determination of unknown protein concentration by Biuret/BCA/Follin Lowry's method using spectrophotometer.
3. Preparation of standard graph and determination on unknown carbohydrate concentration by DNS method using spectrophotometer.
4. Preparation of standard graph and determination on unknown carbohydrate concentration by Anthrone method using spectrophotometer.
5. Fractionization of Cellular component (cytosolic and membrane) by centrifugation of bacteria.
6. Separation of blood corpuscles and plasma from whole blood using centrifugation.
7. Separation of DNA by agarose electrophoresis.
8. Separation of Protein by SDS PAGE electrophoresis.
9. Separation and visualization of amino acids by paper chromatography. (Ninhydrin method).
10. Separation of components of chlorophyll pigment by column chromatography.
11. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

 26

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-602
Course Title : Physical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

- External End Semester Theory Examination will have two sections (A & B).
- Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.
- Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-602
Course Title : Physical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Recommended Textbooks:

1. Wilson K and Walker J (2010) Principles and Techniques of Biochemistry and Molecular Biology 10th ed., Cambridge university press ISBN: 978-0521731676
2. Nelson, D.L. and Cox, M.M. (2021) Lehninger: Principles of Biochemistry 8th ed., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.
3. Rajan K (2011) Analytical Techniques in Biochemistry and Molecular Biology, 1st ed, Springer Publications. ISBN: 978-1441997845
4. Berg, Tymoczko, Stryer, (2019) Biochemistry, 9th ed., WH Freeman and Company, ISBN: 9780716730514
5. Voet D, Voet JG and Pratt CW. (2016) Fundamentals of Biochemistry: Life at the Molecular Level 5th ed., John Wiley & Sons. New York. ISBN: 978-1-118-91840
6. Garrett & Grisham (2016) Biochemistry, 4th ed., Brooks/Cole Cengage learning. ISBN: 978-1305577206
7. Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W. (2012) Harper's Biochemistry 29th ed., Lange Medical Books/McGraw Hill. ISBN:978-0-07-176-576-3.



University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-603
Course Title : Basics of Immunology
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

The main aim of this course is to introduce students to the immune system, its functioning and how immune system works under normal and pathological state. The focus is on the explanation of the components of the various branches of immune system and how they collaborate to activate most effective immune response. Also, students will be taught about lymphoid organs, various immune cells and their role in immunity.

THEORY

Unit 1: Overview of Immune System

Introduction to the study of Immunology from an historical perspective, Innate immune system, components of innate immune system, Adaptive Immune System, characteristic attributes of adaptive immunity, components of Adaptive immune system, Cooperation Between Lymphocytes and Antigen-Presenting Cells, antigenic commitment of B Cell, clonal selection, primary immune response, secondary immune response, Collaboration between Innate and Adaptive Immune System.

Unit 2: Cells and Organs of the Immune System

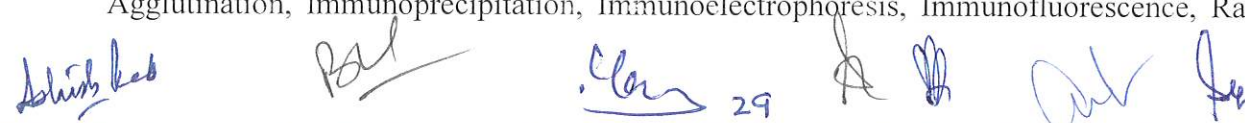
Hematopoiesis, hematopoietic stem cell, lymphoid progenitor cell, myeloid progenitor cell, Factors involved in hematopoietic homeostasis, markers of HSC, Cells of the Immune System: NK cells, NKT cells, T lymphocytes, B lymphocytes, Macrophages, Neutrophils, Eosinophils, Basophils, Mast cells, Dendritic cell, Organs of the Immune System, primary and secondary lymphoid organs.

Unit 3: Antigens and Antibody

Immunogenicity, Antigenicity, adjuvants, Haptens, Epitopes, factors influencing Immunogenicity, Properties of B-Cell Epitopes and T-Cell Epitopes, Basic Structure of Antibodies, hypervariable regions, complementarity determining regions, Antibody-Mediated Effector Functions, Antibody Classes and Biological Activities, Antigenic Determinants on Immunoglobulins; Isotype, Allotype, Idiotypic, B cell receptor, T cell receptor, The Immunoglobulin Superfamily, Monoclonal Antibodies and Hybridoma technology

Unit 4: Antigen- Antibody Reactions: Principles and Applications

Affinity, Avidity, cross-reactivity, Types of Antigen- Antibody Reactions; Precipitation Reactions, Agglutination, Immunoprecipitation, Immunoelectrophoresis, Immunofluorescence, Radioimmunoassay

 29

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-603
Course Title : Basics of Immunology
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

(RIA), Enzyme linked Immunosorbant Assay (ELISA), Variants of ELISA, Flow Cytometry, Immunoelectron Microscopy

PRACTICALS

1. To perform Total Leucocyte Count.
2. To perform Differential Leucocyte Count.
3. To perform Blood grouping.
4. To perform ELISA: Dot/Antigen/antibody capture/sandwich
5. To perform Immunoprecipitation techniques.
6. To perform Ouchterlony double diffusion
7. To perform Immunoelectrophoresis,
8. To perform Western blotting.
9. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours



University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-603
Course Title : Basics of Immunology
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

- a) External End Semester Theory Examination will have two sections (A & B).
- b) Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.
- c) Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

Recommended Textbooks:

1. Kindt, T. J., Goldsby, R. A., Osborne, B. A. and Kuby, J (2018) Immunology. 8th ed., W. H. Freeman and company, New York. ISBN: 9780716767640
2. William, E. P. (2012) Fundamental Immunology, 7th ed., Lippincott Williams & Wilkins, a Wolters Kluwer business. ISBN: 978-1451117837
3. Janeway, C. A. et al. (2017) Immunobiology, 9th ed., Marion Morrow, Rory MacDonald Garland Publishing, New York.
4. Abass, A. K. and Litchman, A. H. (2019) Basic Immunology, 6th ed., An imprint of Elsevier. ISBN: 978-0323549431
5. Roitt, I. M. and Delves, P. J. (2017) Essential Immunology, 13th ed Blackwell Science Ltd a Blackwell Publishing company. ISBN: 978-1-118-41577-1



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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-604
Course Title : Nutritional Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

To gain knowledge about the glycemic index, balanced diets, micronutrient deficiencies and how to treat them, the value of nutraceuticals, and the dangers of junk food. to comprehend why people with diabetes, pregnancy, or inherited genetic disorders require special food. To understand the significance and application of alternative crops, such as pulses and cereals. Recognizing the benefits and drawbacks of both vegetarian and non-vegetarian cuisine.

THEORY

Unit 1: Introduction to Nutrition and Energy Metabolism

Defining nutrition, role of nutrients. unit of energy, biological oxidation of foodstuff. measurement of energy content of food, physiological energy value of foods, Specific Dynamic Activity (SDA). Measurement of energy expenditure - direct and indirect Calorimetry, factors affecting thermogenesis, energy utilization by cells, energy output – Basal and Resting metabolism, physical activity, factors affecting energy input - hunger, appetite, energy balance, energy expenditure in man. Estimating energy requirements, BMR- definition, Factors influencing BMR, Recommended Nutrient Intakes (RNI) and Recommended Dietary Allowances (RDA) for different age groups.

Unit 2: Dietary carbohydrates and lipids.

Review functions of carbohydrates: Digestion, absorption, utilization and storage, hormonal regulation of blood glucose. Dietary requirements and source of carbohydrates. Review of dietary lipid: classification, sources, functions, digestion, absorption, utilization and storage. Essential Fatty Acids; Functions of EFA, RDA, – excess and deficiency of EFA. Lipotropic factors, role of saturated fat, cholesterol, lipoprotein and triglycerides. Importance of the following: a) Omega – fatty acids with Omega 3/ omega 6 ratio b) Phospholipids c) Cholesterol in the body d) Mono, Polyunsaturated and Saturated Fatty Acids. Dietary fibre, role of fibre in lipid metabolism, colon function, blood glucose level and GI tract functions.

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-604
Course Title : Nutritional Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Unit 3: Health impacts of dietary Proteins and Vitamins

Review of functions of proteins in the body, Digestion and absorption. Essential and Non-essential amino acids. Amino Acid Availability Antagonism, Toxicity and Imbalance, Amino acid Supplementation. Effects of deficiency. Food source and Recommended Dietary Allowances for different age group. Amino acid pool. NPU, Biological Value, Nitrogen balance. PEM and Kwashiorkor. Vitamin A, C, E, K, D, B₁, B₂, B₃, B₅, B₆, B₉, B₁₂, B₂ and C Dietary sources, RDA, Adsorption, Distribution, Metabolism and excretion (ADME), physiological role of these vitamins. Disorders related to Deficiency of these vitamins and Hypervitaminosis.

Unit 4: Minerals, Food and drug interactions

Calcium, Phosphorus and Iron - Distribution in the body digestion, Absorption, Utilization, Transport, Excretion, Balance, Deficiency, Toxicity, Sources, RDA. Calcium: Phosphorus ratio, Role of iron in prevention of anaemia. Iodine and iodine cycle. Iodine, Fluoride, Mg, Cu, Zn, Se, Manganese, Chromium, Molybdenum Distribution in the human body, Physiology, Function, deficiency, Toxicity and Sources. Nutrient interactions affecting ADME of drugs, Alcohol and nutrient deficiency, Anti-depressants, psychoactive drugs and nutrient interactions, Appetite changes with drug intakes and malnutrition, Nutraceuticals.

PRACTICALS

1. To perform Bioassay for vitamin B₁₂/B₁.
2. To perform Homocystiene estimation.
3. To perform serum/ urine MMA estimation.
4. Anthropometric identifications for Kwashiorkor, Marasmus and Obesity.
5. Determination of oxidative stress: TBARS, antioxidant enzymes in hemolysate.
6. To perform Vitamin A/E estimation in serum.
7. Demonstration of Bone densitometry/bone ultrasound test (visit to a nearby clinic).
8. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-604
Course Title : Nutritional Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

- External End Semester Theory Examination will have two sections (A & B).
- Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.
- Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
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(Examination to be held in May 2025, 2026 & 2027)
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Course Code : UMJBCHT-604
Course Title : Nutritional Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Recommended Textbooks:

1. Devlin, T.M. (2011) Textbook of Biochemistry with Clinical Correlations, John Wiley & Sons, Inc. (New York), ISBN: 978-0-4710-28173-4.
2. Williams. M.H, Anderson, D.E, Rawson, E.S. (2013) Nutrition for health, fitness and sport McGraw Hill international edition. ISBN: 978-0-07-131816-7.
3. Mahan, L.K Strings, S.E, Raymond, J. (2016) Krause's Food and Nutrition Care process. Elsevier's Publications. ISBN: 978-1-4377-2233-8.
4. G.F. Coombs Jr. (2016) The vitamins, Fundamental aspects in Nutrition and Health. Elsevier's Publications. ISBN: 13- 978-0-12- 183493-7.
5. Rosalind Gibson. (2024) Principles of Nutritional Assessment. 3rd ed., Oxford University Press. ISBN: 978-0195171693
6. Satyanarayana, U. (2022) Biochemistry. 6th ed., Elsevier India. ISBN: 9788131248850

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VI
(Examination to be held in May 2025, 2026 & 2027)
MINOR COURSE

Course Code : UMIBCHT- 605
Course Title : Metabolism of Carbohydrates and Lipids
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

The goal of this course is to give the students a comprehensive understanding of metabolism. to help students understand how energy is produced and used in biological processes. The course covers the metabolism of various biomolecules, which can aid students in comprehending the chemical processes involved in living systems. After completing the course, students will be able to: Recognize and summarize pertinent data from scientific publications pertaining to metabolic issues. Students will be able to evaluate the data and make a connection to the metabolism context. Students will be able to comprehend the composition, processes of anabolism and catabolism, and the interactions, control, and malfunction of the pathways involved in the metabolism of carbohydrates and coordinated regulation.

THEORY

Unit 1 Introduction to Metabolism

Types of Metabolic Pathways, Experimental approaches to study metabolism, Basic principles/mechanisms of metabolic regulation. Basic concepts and design of metabolism. Some activated carriers in metabolism. Basic principles of bioenergetics: chemical basis of large free energy of hydrolysis of some energetic compounds; coupled reactions; group transfer; biological energy transducers. Types of biological oxidation-reduction reactions.

Unit 2: Carbohydrate Catabolism

Digestion and absorption of carbohydrates, glycolysis, citric acid cycle, oxidative phosphorylation, pentose phosphate and other pathways, Degradation of di and polysaccharides.

Unit 3 Carbohydrate Anabolism

Gluconeogenesis, Role of nucleotide diphosphate sugars, Biosynthesis of disaccharides and polysaccharides, Regulation of carbohydrate metabolism.

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
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MINOR COURSE

Course Code : UMIBCHT- 605
Course Title : Metabolism of Carbohydrates and Lipids
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Unit 4 Lipid Catabolism

Digestion and absorption of lipids, transport of lipoproteins, Oxidation of fatty acids, Degradation of triacylglycerols, phosphoglycerides. Sphingolipids, Regulation of lipid Metabolism. Lipid Anabolism: synthesis of fatty acids, triacylglycerols, phosphoglycerides, sphingolipids, cholesterol, prostaglandins and other protanoids.

PRACTICALS

1. Collection and preservation of biological samples (Blood [plasma& serum] and urine).
2. Estimation of glucose by ortho Toluidine method.
3. Estimation of glucose by Anthrone method.
4. Estimation of glucose by DNS method.
5. Qualitative analysis to identify and differentiate between biomolecules from urine.
6. Qualitative analyses to differentiate between carbohydrates from the urine.
7. Glucose tolerance test glucose tolerance test
8. To determine plant storage and structural saccharides.
9. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

37

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
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Course Code : UMIBCHT- 605

Course Title : Metabolism of Carbohydrates and Lipids

Credits : 4 (3Theory+1Practical)

Total No. of Lectures: Theory: 45 hours

Practical : 30 hours

Maximum Marks: 100

Theory : 75

Practical : 25

Recommended Textbooks:

1. Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W. (2012) Harper's Biochemistry 29th ed., Lange Medical Books/McGraw Hill. ISBN:978-0-07-176-576-3.
2. Nelson, D.L. and Cox, M.M. (2021) Lehninger: Principles of Biochemistry 8th ed., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.
3. Devlin, T.M. (2011) Textbook of Biochemistry with Clinical Correlations 7th ed., John Wiley & Sons, Inc. (New York), ISBN: 978-0-470-28173-4 / BRV ISBN: 978-0-470- 60152-5.
4. Voet D, Voet JG and Pratt CW. (2018) Fundamentals of Biochemistry: Life at the Molecular Level 5th ed., John Wiley & Sons. New York. ISBN: 978-1-118-91840.

University of Jammu
Syllabi of Biotechnology for FYUP under CBCS as per NEP-2020
Semester – VII
(Examination to be held in December 2025, 2026 & 2027)

Sem- 7th	Major	UMJBCHT-701	Metabolism-II	4 (3+1)
	Major	UMJBCHT-702	Microbial Physiology & Biochemistry	4 (3+1)
	Major	UMJBCHT-703	Molecular Immunology	4 (3+1)
	Major	UMJBCHT-704	Bioinformatics and Biostatistics	4 (3+1)
	Minor	UMIBCHT-705	Metabolism of Amino acids & Nucleic acids	4 (3+1)

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VII
(Examination to be held in December 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-701
Course Title : Metabolism II
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

The goal of this course is to give the students a comprehensive understanding of metabolism. to help students understand how energy is produced and used in biological processes. The course covers the metabolism of various biomolecules, which can aid students in comprehending the chemical processes involved in living systems. After completing the course, students will be able to: Recognize and summarize pertinent data from scientific publications pertaining to metabolic issues. Students will be able to evaluate the data and make a connection to the metabolism context. Students will be able to comprehend the composition, processes of anabolism and catabolism, and the interactions, control, and malfunction of the pathways involved in the metabolism of proteins, and nucleic acids.

THEORY

Unit 1 Metabolism of Nitrogen

Digestion and absorption of proteins, Nitrogen fixation and its mechanism, Assimilation of ammonia, Nitrogen cycle. Catabolism of Amino Acids: General reactions of amino acids metabolism i.e. transamination, deamination, decarboxylation, Urea cycle, Catabolism of individual amino acids.

Unit 2 Anabolism of amino acids

Biosynthesis of essential and non-essential amino acids, Regulation of amino acid biosynthesis, Metabolism of amino acids precursors: Metabolism of Porphyrins: Biomedical importance, Heme biosynthesis, Disorders of heme metabolism, catabolism of heme bilirubin: its conjugation and secretion, hyperbilirubinemia.

Unit 3 Degradation of Nucleotides

Degradation of purines and pyrimidines, Salvage pathways, Biosynthesis of Nucleotides: Biosynthesis of purine and pyrimidine nucleotides, Biosynthesis of deoxyribonucleotides, Biosynthesis of nucleotide coenzymes, Regulation of nucleotide biosynthesis.



University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
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(Examination to be held in December 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-701
Course Title : Metabolism II
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Unit 4 Integration of Metabolism

Recurring motifs in biochemistry, regulation of major metabolic pathways, metabolic fates of glucose-6-phosphate, pyruvate and acetyl CoA, Metabolic profiles of brain, muscle, adipose tissue, liver and kidney, Hormonal regulation of metabolism, metabolic adaptations.

PRACTICALS

1. Isolation of lecithin and its estimation.
2. Identification lipids by TLC,
3. Isolation of cholesterol from egg yolk and its estimation.
4. RBC ghost cell preparation and to study the effect of detergents on membranes.
5. Effect of lipid composition on the permeability of a lipid monolayer.
6. Qualitative analyses to differentiate between amino acids.
7. Separation amino acids by paper chromatography.
8. Estimation of Glycine by Sorenson formal titration.
9. Isolation of Casein from milk.
10. Estimation of protein by biuret method.
11. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

42

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VII
(Examination to be held in December 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-701
Course Title : Metabolism II
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

NOTE FOR PAPER SETTING

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Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva)

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

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RECOMMENDED TEXTBOOKS:

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43

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VII
(Examination to be held in December 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-702
Course Title : Microbial Physiology & Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

Students will be able to describe the unique features of bacterial cells in comparison to eukaryotic cells. Students will gain knowledge of key catabolic and anabolic pathways in bacteria. Students will develop proficiency in a range of laboratory techniques such as microscopy, Gram staining, calorimetry, chromatography, and enzyme assays, which are fundamental to the study of bacterial physiology and biochemistry. Students would have acquired the skills to explain how bacterial metabolism is regulated at the levels of enzyme synthesis, enzymatic activity, and energetic metabolism.

THEORY

UNIT 1: Introduction to Microbes

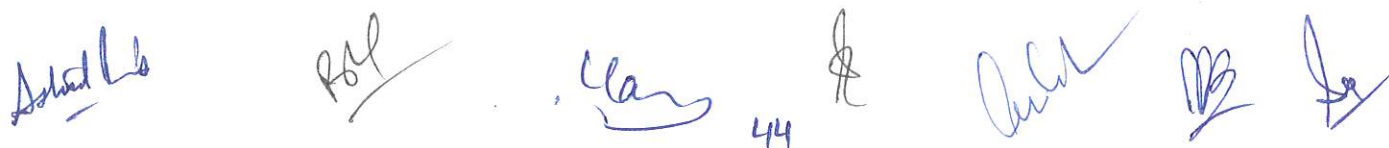
Prokaryotes: Overview of Bacteria, Unique Features of Bacteria, Bacterial Cell Structure and Function; Archaeobacteria, morphology and its types: Halophiles, Methanogens, Hyperthermophile, Thermoplasma. Eukarya: Overview of Algae, Fungi, Slime molds and Protozoa; Viruses: Morphology and structure, Viruses of Prokaryotes and Eukaryotes.

UNIT 2: Introduction to microbial Physiology and Biochemistry

Historical Perspective: Milestones in microbial Physiology; Aerobic and anaerobic microbes (Nitrate reducer and denitrifies, Sulphate reducer), photosynthetic microorganisms and Chemo–autotrophs, Chemoheterotrophs, chemoorganotrophic, chemo lithotrophic (oxidation of ammonia, Sulphur, iron, hydrogen and methane) and, Energy of biochemical reactions; Carriers of hydrogen; The role of ATP and its formation in the bacterial cells. Oxidation of – saccharides, polysaccharides, lipids and hydrocarbons.

UNIT 3: Microbial Metabolism I

Processes of catabolism; Catabolism of carbon compounds and fermentation - Ethanol fermentation, Lactic acid fermentation, Pentose sugars fermentation, Propionic acid fermentation pathway, Butyric acid fermentation and solvent formation, Mixed acid fermentation pathway, Fermentation of sugars and polysaccharides.

The bottom of the page features several handwritten signatures and initials in blue ink. From left to right, there is a signature that appears to be 'Ashish', followed by 'Rohit', 'Clan', '44', a stylized 'K', 'Anshu', 'MB', and a final signature that looks like 'S'. There is also a small '44' written below the 'Clan' signature.

University of Jammu
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MAJOR COURSE

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Course Title : Microbial Physiology & Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

UNIT 4: Microbial Metabolism II

Catabolism of nitrogenous compounds - Dissimilation of proteins and amino acids, Anaerobic degradation (amino acid fermentation), Aerobic catabolism of amino acids. Processes of anabolism - Biosynthesis of saccharides, lipids, amino acids, nucleotides, nucleic acids, proteins. Regulation of metabolism process - Regulation of enzymes synthesis, Regulation of enzymatic activity, Regulation of energetic metabolism.

PRACTICALS:

1. Microscopic Examination of Bacterial Cell Structure.
2. Study the evolutionary history of bacteria through a basic phylogenetic analysis.
3. Investigating Fermentation Pathways for Sugar Utilization in Bacteria.
4. Understanding Acid and Solvent Formation in Bacterial Fermentation
5. Exploring Oxidation of Inorganic Compounds in Chemo-lithotrophic Bacteria.
6. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva)

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Course Title : Microbial Physiology & Biochemistry
Credits : 4 (3Theory+1Practical)
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Theory : 75
Practical : 25

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

- a) External End Semester Theory Examination will have two sections (A & B).
- b) Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.
- c) Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

Recommended Textbooks:

1. Ivan Kushkevych (2022) "Bacterial Physiology and Biochemistry" Academic Press.
2. "Bacterial Physiology and Metabolism" by Byung Hong Kim, Geoffrey Michael Gadd (2019), Springer.
3. "Brock Biology of Microorganisms" by Michael T. Madigan, Kelly S. Bender, Daniel H. Buckley, W. Matthew Sattley (2018), Pearson.
4. "Molecular Biology of the Cell" by Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter (2014), Garland Science.
5. "Essential Cell Biology" by Bruce Alberts, Dennis Bray, Karen Hopkin, Alexander D. Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter (2019), Garland Science.
6. "Microbiology: An Evolving Science" by Joan L. Slonczewski, John W. Foster (2018), W.W. Norton & Company.
7. "Principles of Microbial Ecology" by Ronald M. Atlas (2016), ASM Press.

46

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VII
(Examination to be held in December 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-703
Course Title : Molecular Immunology
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

This course will introduce the molecules employed by the immune system to recognize and initiate responses to antigen. Student will understand the complex cellular interactions that take place to elicit an immune response. Students will be taught about the various receptors involved in the recognition of antigens during the early phases of immunity. Also, the course will focus on the biology, signalling, and molecular regulation of the molecules involved in presenting antigenic peptides to activate the acquired immune response. The ability of receptors to recognize an almost unlimited range of antigenic peptides associated with MHC molecules will also be studied.

THEORY

UNIT 1: Receptors involved in the recognition of antigens

Receptors of Innate immunity; pattern recognition receptors, scavenger receptors, toll-like receptors, Complement, Mannose-binding lectin, C-reactive protein, LPS-binding protein. Receptors of Adaptive immunity; BCR, TCR, Molecular mechanisms of the V(D)J recombination. Costimulatory receptors, microbial targets and location of receptors. Signalling pathways downstream of the receptors and costimulatory receptors of the Innate and Adaptive immune response. Signal transduction downstream of type I and II cytokine receptors.

UNIT 2: Major Histocompatibility Complex and Complement System

General Organization and Inheritance of the MHC, Self-MHC Restriction of T Cells. MHC Molecules and Genes, Detailed Genomic Map of MHC Genes, MHC and Immune Responsiveness and Disease Susceptibility. Molecular mechanisms of antigen presentation on MHC class I and II molecules. Functions of Complement, Complement Components, activation and regulation of the complement System. Biological Consequences of Complement Activation, Complement Deficiencies.

The bottom of the page features several handwritten signatures and initials in blue ink. From left to right, there is a signature that appears to be 'Anil', followed by 'BCL', 'Clan', a small '47' with a flourish, 'Adh', 'B', and 'Sey'.

University of Jammu
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Semester – VII
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MAJOR COURSE

Course Code : UMJBCHT-703
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Total No. of Lectures: Theory: 45 hours
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Maximum Marks: 100
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UNIT 3: Cytokines and Cell-Mediated Effector Responses

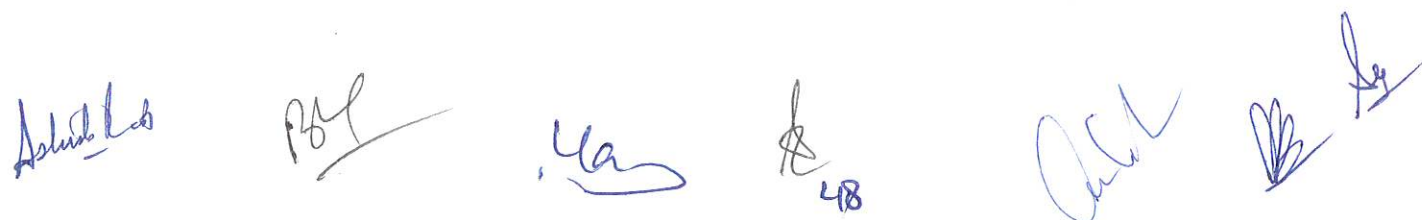
Properties of Cytokines, Cytokine Receptors, Cytokine Antagonists, Cytokine Secretion by T_H1 and T_H2 subsets, Cytokine-Related Diseases and therapeutic Uses of Cytokines and their Receptors, Effector Responses by Effector T Cells, Cytotoxic T Cells, Natural Killer Cells, Antibody-Dependent Cell-Mediated Cytotoxicity

UNIT 4: Hypersensitive reactions and Autoimmunity.

Molecular mechanisms of hypersensitivities, Gell and Coombs Classification IgE-Mediated (Type I) Hypersensitivity. Antibody-Mediated Cytotoxic (Type II) Hypersensitivity, Immune Complex-Mediated (Type III), Hypersensitivity Type IV or Delayed-Type Hypersensitivity (DTH). Molecular mechanisms of autoimmunity and central tolerance. Organ-Specific Autoimmune Diseases, Systemic Autoimmune Diseases. Animal Models for Autoimmune Diseases, Evidence Implicating the $CD4^+$ T Cell, MHC, and TCR in Autoimmunity. Proposed Mechanisms for Induction of Autoimmunity.

PRACTICALS

1. Separation of Immune cells.
2. Identification and viability test by dye exclusion method.
3. Techniques of immunization and use of adjuvants.
4. Separation of hyperimmune serum and purification of antibodies.
5. Detection of antibodies by various techniques.
6. Complement fixation Hemagglutination assays.
7. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.



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University of Jammu
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Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VII
(Examination to be held in December 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-703
Course Title : Molecular Immunology
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Recommended Textbooks:

1. Kindt, T. J., Goldsby, R. A., Osborne, B. A. and Kuby, J. *Immunology*, W. H. Freeman and company, New York. 7th Edition (2014)
2. William, E. P. *Fundamental Immunology*, Lippincott Williams & Wilkins, a Wolters Kluwer business. 7th Edition (2012)
3. Janeway, C. A. et al. *Immunobiology*, Marion Morrow, Rory MacDonald Garland Publishing, New York. 9th Edition (2017)
4. Abass, A. K. and Litchman, A. H. *Basic Immunology*, An imprint of Elsevier. 6th Edition (2019)
5. Roitt, I. M. and Delves, P. J. *Essential Immunology*, Blackwell Science Ltd a Blackwell Publishing company. 13th Edition (2017)

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VII
(Examination to be held in Dec 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-704
Course Title : Bioinformatics and Biostatistics
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Objectives and Expected Learning Outcomes

High-throughput technologies produce massive amounts of data in form of sequences. The goal of this course is to learn how to analyse DNA, RNA, and protein sequences using computers. This course aims to demystify computer science and molecular biology and study their intersection. The course also sensitizes students with the fundamentals of biostatistics.

THEORY

Unit 1: Biostatistics

Definition and scope of biostatistics, Importance in biotechnological research,

Statistical terms and symbols: Sample, data, primary and secondary data, parameter, Designing and methodology of an experiment.

Sampling Techniques and Sampling Distributions: Methods of sampling- simple, random, systematic, stratified, cluster and non-random, Sampling distributions

Collection, representation and classification of data

Methods of representation of statistical data: Tabular, graphical and diagrammatic presentation

Descriptive Statistics: Measures of central tendency: Arithmetic mean, median, mode, percentile

Dispersion: range, standard deviation

Probability and Probability Distributions: Introduction, Types of Probability: Classical, Relative, subjective, Axiomatic; Rules of probability: addition and multiplication rule; Introduction to Probability Distributions

Hypothesis testing: Setting up of hypothesis, type of errors in hypothesis, level of significance, Confidence intervals, One and two-tailed testing

Unit 2: Introduction to Bioinformatics

Overview of Computational Biology: Definition and scope of Bioinformatics, Historical milestones and breakthroughs, Interdisciplinary nature of the field

Biological Databases: Introduction to databases, Types of biological databases: Primary, secondary, composite, Sequence, Structure, Genomic databases;

51

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
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Data formats: FASTA, Fastq, GenBank, PDB.

Data Retrieval: Retrieval techniques and tools (Entrez)

Unit 3: Sequence Analysis and Algorithms

Introduction to sequence alignment, Types of sequence alignment: Pairwise, multiple, global and local.

Sequence Search and Similarity: BLAST and its types (Blastn, Blastp, Blastx, tBlastn, tBlastx), FASTA: theory and applications, E-value, bit score, and significance thresholds

Introduction to phylogenetics: Taxonomic relationship from molecular properties, Tree Topology, gene tree and tools for tree visualisation, Distance and character-based methods for phylogenetic tree construction; ClustalW, Phylip and Mafft.

Unit 4: Structural Bioinformatics

Introduction, target identification strategies, predicting functionally important region from structure

Protein Structure Prediction: Homology modelling and threading techniques, Ab initio methods and their limitations

Protein-Ligand Interactions: Molecular docking principles, Applications in drug discovery and design

PRACTICALS

1. Data collection and calculation of descriptive statistics.
2. Data Visualization using Excel
3. Introduction to Biological Databases like various NCBI databases.
4. Introduction to Data Formats (Fasta, Fastq etc)
5. Retrieve a specific DNA sequence from GenBank, perform a basic analysis, and annotate it using appropriate tools.
6. Sequence Alignment and Analysis
7. Align a set of related protein sequences using a multiple sequence alignment tool (e.g., ClustalW) and analyze the resulting alignment.

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8. Perform a BLAST search using a protein query sequence against a suitable database, analyze the results, and identify potential homologs.
9. Introduction to Protein Databases, data retrieval.
10. Use a homology modeling tool to predict the 3D structure of a target protein based on a known template structure.

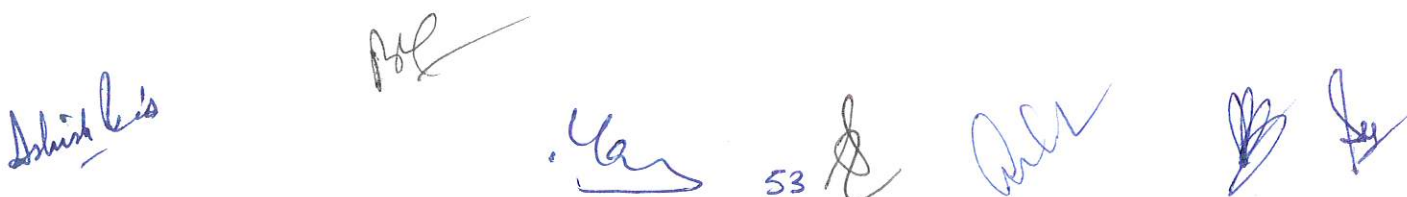
NOTE FOR PAPER SETTING

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Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Internal Practical	-	-	10 (Based on Daily Performance only)
External Practical	-	-	15

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

- a) External End Semester Theory Examination will have two sections (A & B).
- b) Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.
- c) Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.



University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VII
(Examination to be held in Dec 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-704
Course Title : Bioinformatics and Biostatistics
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

RECOMMENDED TEXTBOOKS:

1. "Bioinformatics: Sequence and Genome Analysis" by David W. Mount
2. "Introduction to Computational Biology: An Evolutionary Approach" by Bernhard Haubold and Thomas Wiehe
3. "Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids" by Richard Durbin, Sean R. Eddy, Anders Krogh, and Graeme Mitchison
4. Jonathan Pevsner. Bioinformatics and functional genomics. Wiley Blackwell, Third Edition, 2015
5. Des Higgins and William Taylor. Bioinformatics: Sequence, Structure, and databanks. Oxford University Press, 2001
6. Richard Durbin, Sean R. Eddy, Anders Krogh, Graeme Mitchison. Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids. Cambridge University Press, 1998)

The bottom of the page features several handwritten signatures and initials in blue ink. From left to right, there is a signature that appears to be 'Ashish', followed by a signature that looks like 'Raj', then a signature that is partially obscured and includes the number '54'. To the right of '54' is a signature that looks like 'A', followed by a signature that looks like 'Anil', then a signature that looks like 'B', and finally a signature that looks like 'S'.

Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020

Semester – VII

(Examination to be held in December 2025, 2026 & 2027)

MAJOR COURSE

Course Code : UMJBCHT-705

Course Title : Metabolism of Amino acids and Nucleic acids

Credits : 4 (3Theory+1Practical)

Total No. of Lectures: Theory: 45 hours

Practical : 30 hours

Maximum Marks: 100

Theory : 75

Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

The goal of this course is to give the students a comprehensive understanding of metabolism. to help students understand how energy is produced and used in biological processes. The course covers the metabolism of various biomolecules, which can aid students in comprehending the chemical processes involved in living systems. After completing the course, students will be able to: Recognize and summarize pertinent data from scientific publications pertaining to metabolic issues. Students will be able to evaluate the data and make a connection to the metabolism context. Students will be able to comprehend the composition, processes of anabolism and catabolism, and the interactions, control, and malfunction of the pathways involved in the metabolism of proteins, and nucleic acids.

THEORY

Unit 1 Metabolism of Nitrogen

Digestion and absorption of proteins, Nitrogen fixation and its mechanism, Assimilation of ammonia, Nitrogen cycle. Catabolism of Amino Acids: General reactions of amino acids metabolism i.e. transamination, deamination, decarboxylation, Urea cycle, Catabolism of individual amino acids.

Unit 2 Anabolism of amino acids

Biosynthesis of essential and non-essential amino acids, Regulation of amino acid biosynthesis, Metabolism of amino acids precursors: Metabolism of Porphyrins: Biomedical importance, Heme biosynthesis, Disorders of heme metabolism catabolism of heme bilirubin: its conjugation and secretion, hyperbilirubinemias.

Unit 3 Degradation of Nucleotides

Degradation of purines and pyrimidines, Salvage pathways, Biosynthesis of Nucleotides: Biosynthesis of purine and pyrimidine nucleotides, Biosynthesis of deoxyribonucleotides, Biosynthesis of nucleotide coenzymes, Regulation of nucleotide biosynthesis.

Unit 4 Integration of Metabolism

Recurring motifs in biochemistry, regulation of major metabolic pathways, metabolic fates of glucose-6-phosphate, pyruvate and acetyl CoA, Metabolic profiles of brain, muscle, adipose tissue, liver and kidney, Hormonal regulation of metabolism, metabolic adaptations.

Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VII
(Examination to be held in December 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-705

Course Title : Metabolism of Amino acids and Nucleic acids

Credits : 4 (3Theory+1Practical)

Total No. of Lectures: Theory: 45 hours

Practical : 30 hours

Maximum Marks: 100

Theory : 75

Practical : 25

PRACTICALS

1. Isolation of lecithin and its estimation.
2. Identification lipids by TLC.
3. Isolation of cholesterol from egg yolk and its estimation.
4. RBC ghost cell preparation and to study the effect of detergents on membranes.
5. Effect of lipid composition on the permeability of a lipid monolayer.
6. Qualitative analyses to differentiate between amino acids.
7. Separation amino acids by paper chromatography.
8. Estimation of Glycine by Sorenson formal titration.
9. Isolation of Casein from milk.
10. Estimation of protein by biuret method.
11. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.



Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020

Semester – VII

(Examination to be held in December 2025, 2026 & 2027)

MAJOR COURSE

Course Code : UMJBCHT-705

Course Title : Metabolism of Amino acids and Nucleic acids

Credits : 4 (3Theory+1Practical)

Total No. of Lectures: Theory: 45 hours

Practical : 30 hours

Maximum Marks: 100

Theory : 75

Practical : 25

NOTE FOR PAPER SETTING

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External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

- External End Semester Theory Examination will have two sections (A & B).
- Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.
- Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

RECOMMENDED TEXTBOOKS:

- Nelson, D.L. and Cox, M.M. (2013) Lehninger: Principles of Biochemistry 6th ed., W.H. Freeman and Company (New York), ISBN:13:978-1-4641-0962-1 / ISBN:10:1-4641-0962-1.
- Devlin, T.M. (2011) Textbook of Biochemistry with Clinical Correlations 7th ed., John Wiley & Sons, Inc. (New York), ISBN: 978-0-470-28173-4 / BRV ISBN: 978-0-470- 60152-5.
- Murray, R.K., Granner, D.K., Mayes and P.A., Rodwell, V.W. (2012) Harper's Biochemistry 29th ed., Lange Medical Books/McGraw Hill. ISBN:978-0-07-176-576-3.
- Voet D, Voet JG and Pratt CW. (2016) Fundamentals of Biochemistry: Life at the Molecular Level 5th ed., John Wiley & Sons. New York. ISBN: 978-1-118-91840.

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Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VII
(Examination to be held in December 2025, 2026 & 2027)
MAJOR COURSE

Course Code : UMJBCHT-705

Course Title : Metabolism of Amino acids and Nucleic acids

Credits : 4 (3Theory+1Practical)

Total No. of Lectures: Theory: 45 hours

Practical : 30 hours

Maximum Marks: 100

Theory : 75

Practical : 25












University of Jammu
Syllabi of Biotechnology for FYUP under CBCS as per NEP-2020
Semester – VIII (Honours / Research)
(Examination to be held in May 2026, 2027 & 2028)

Sem- 8th Research Honours	Major	UMJBCHT-801	Medical Biochemistry	4 (3+1)
	Major	UMJBCHT-802	Genomics & Proteomics	4 (3+1)
	Major	UMJBCHT-803	Biochemical correlations of diseases	4 (3+1)
	Major	UMJBCHT-804	Plant Biochemistry	4 (3+1)
	Minor	UMIBCHT-805	Clinical Biochemistry	4 (3+1)
		Or		20 credits
Sem- 8th	Major	UMJBCHT-806	Medical Biochemistry	4 (3+1)
	Minor	UMIBCHT-807	Clinical Biochemistry	4 (3+1)
	SEC	USEBCHP-808	Research project/Dissertation	12
				20 credits



University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VIII (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMJBCHT- 801
Course Title : Medical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

The objective of the course is to introduce students to the concepts of clinical biochemistry. The students shall learn about the typical components of blood and urine and their role in preserving health and underlying the development of kidney and liver diseases. They shall gain knowledge of the most recent theories regarding the mechanisms underlying disease and function of enzymes in the diagnosis of different illnesses. By the end of the course students shall be able to understand the role of water, electrolytes and acid base balance. They shall have understanding of the various metabolic disorders and hormone disturbances along with process of detoxification and use of enzyme based diagnostic tests and organ function tests.

THEORY

Unit 1: Introduction

Definition and scope of clinical biochemistry in diagnosis, use of clinical laboratory and interpretation of results and Factors influencing accuracy of results. Principles of diagnostic methodologies, end-point and Kinetic measurements; Quality control in Clinical Biochemistry: control of pre-analytical variables, external and internal quality control; Quality assurance and related statistics. Chemistry of analysers and use of enzymes and coupled enzyme assays in the quantification of analytes. Body Fluids: Biochemistry of urine, blood and cerebrospinal fluid. Water, Distribution of water in body, water turnover and balance. Electrolyte composition of body fluids, regulation of electrolyte balance.

Unit 2: Haematology and Hepatology

Plasma proteins and their variation in diseases. Hemopoiesis and disorders of hemopoiesis, Hemoglobinopathies, anaemia's, haemorrhagic diseases. Normal and abnormal clotting mechanisms. Plasma lipids and lipoprotein changes in various diseases. Respiratory acidosis and alkalosis. Clinical manifestations and biochemical changes in liver diseases (a) infectious–Viral hepatitis (b) toxic-alcohol. (c) genetic– hemochromatosis (d) immune – auto-immune hepatitis and biliary cirrhosis (e) neoplastic– hepatocellular carcinoma. Diagnosis of liver disorders with special reference to jaundice and cirrhosis. Liver function tests.

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Ashish K

D. Singh

Anil K. Singh

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
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MAJOR COURSE

Course Code : UMJBCHT-801
Course Title : Medical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Unit 3: Clinical enzymology in diagnosis of diseases

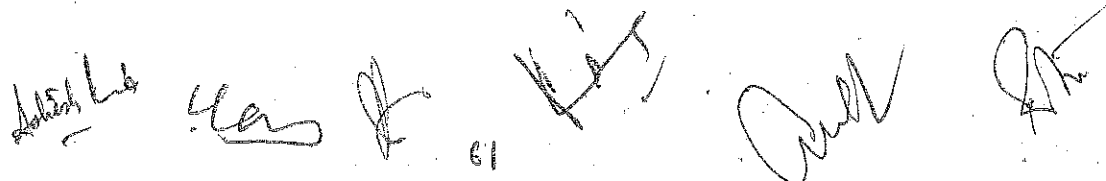
Clinical enzymology – Enzymes in plasma and their origin, general principles of assay, Clinical significance of enzymes (phosphatases, 5' nucleotidase, γ - glutamyltransferase, amylase, lipase, serum choline esterase, LDH, transaminases and creatine kinase). Gastric function tests, Malabsorption syndrome, acidity and peptic ulcer. Renal function tests, Diseases of the kidney (acute and chronic renal failure, diabetes insipidus, glomerulonephritis, nephrotic syndrome, uremic syndrome, renal hypertension, renal calculi, renal tubular acidosis). Drugs and toxins associated with kidney. Hemo-dialysis and peritoneal dialysis. Cardiac Function tests – Myocardial infraction. Prostrate and Thyroid Function tests.

Unit 4: Metabolic disorders and their diagnosis

Clinical aspects of hyperglycemia- Diabetes mellitus, glucose tolerance test, oral hypoglycemic drugs, Inborn errors of metabolism- Glycogen storage diseases- VonGierke' disease, Pompe's disease, Anderson's disease, Mcardle's disease, Cori Forbes disease, Diseases related to amino acid catabolism - Tyrosinemia, Phenylketonuria, Maple syrup urine disease, Histidinemia, hyperprolinemia, methylmalonic acidemia (MMA), homocystinuria and Hartnup's disease. Inherited defects of urea cycle Disorders of porphyrin metabolism. Diseases associated with nucleotide metabolism-Gout, Lesch-Nyhan syndrome. Immunodeficiency disorders.

PRACTICALS

1. Isolation of lecithin and its estimation.
2. Identification lipids by TLC,
3. Isolation of cholesterol from egg yolk and its estimation.
4. RBC ghost cell preparation and to study the effect of detergents on membranes.
5. Effect of lipid composition on the permeability of a lipid monolayer.
6. Qualitative analyses to differentiate between amino acids.
7. Separation amino acids by paper chromatography.
8. Estimation of Glycine by Sorenson formal titration.
9. Isolation of Casein from milk.
10. Estimation of protein by biuret method.
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Course Code : UMJBCHT- 801
Course Title : Medical Biochemistry
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Practical : 25

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A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

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62

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
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Theory : 75
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RECOMMENDED TEXTBOOKS:

1. Alberts B, Heald R, Johnson A, Morgan D, Raff M, Roberts K, Walter P (2022) Molecular biology of the cell, 7th ed., WW Norton & Co, ISBN: 0393884856
2. Watson J.D., Tania A.B, Stephen P. B, Alexander G, Michael L, Richard L (2017) Molecular biology of the gene 7th ed., Pearson Education, ISBN: 9332585474
3. Hofmann A and Clokie S (2018) Wilson and Walker's Principles and techniques of biochemistry and molecular biology. 8th ed., Cambridge university press, ISBN 131661476X
4. Sambrook J and Green M.R (2012) Molecular Cloning, A Laboratory Manual, 4th ed., Cold Spring Harbor Laboratory Press, U.S, ISBN: 1936113422
5. Selvin P.R and Taekjip H (2008) Single-molecule techniques: a laboratory manual edition. Cold Spring Harbor Laboratory, ISBN 087969775X
6. Research articles and papers related to each unit.

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63

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VIII (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMJBCHT-802
Course Title : Genomics and Proteomics
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOME

The course provides an introduction to Genomics and Proteomics. After successful completion of course, the students will be able to understand genome organization, gene identification and gene expression. Students will be acquainted with proteomics and its applications.

THEORY

UNIT I: Genomics

Introduction and structure of genomes, Genome size, C-Values of genomes. Sequence complexity, Introns and Exons, Genome structure in prokaryotes and eukaryotes. Mutations, Gene variation, Genome analysis using Molecular markers - RFLP, RAPD, AFLP, microsatellites and SNPs.

UNIT II: Gene Identification and Expression

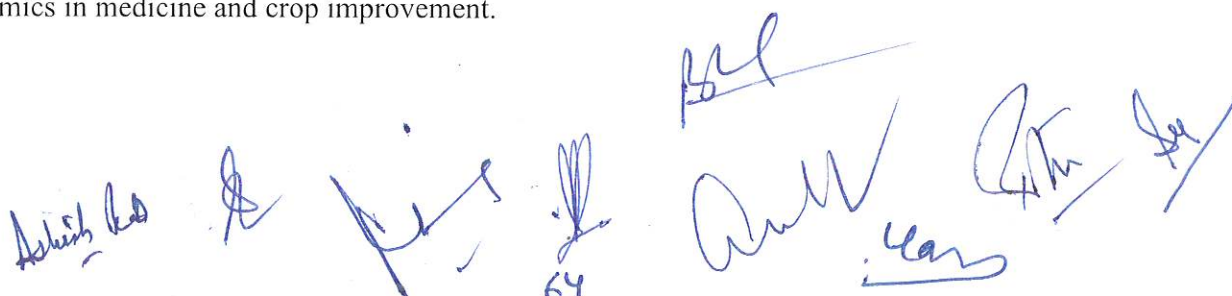
Organization of eukaryotic genome within the nucleus, chloroplast and mitochondria, Regulation of transcription, transcription factors and the co-ordination of gene expression. Genome annotation, traditional routes of gene identification, detecting open-reading Frames, Overview of comparative genomics.

UNIT III: Proteomics

Introduction to Proteomics- Two-dimensional polyacrylamide gel electrophoresis, Mass spectrometry based methods for protein identification: principle, procedure and application, Detection of proteins on SDS gels, Protein cleavage, An overview of Micro array techniques and applications.

UNIT IV: Applications of Genomics and Proteomics

Analysis of Genomes, Functional genomic studies with model systems such as *Drosophila*, *Yeast* or *Caenorhabditis elegans*. Human genome project and the genetic map. Application of proteome analysis- Proteomics in medicine and crop improvement.



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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VIII (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMJBCHT-802
Course Title : Genomics and Proteomics
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

PRACTICALS

1. Isolation of genomic DNA.
2. Preparation of agarose gel.
3. Setting up of a PCR reaction.
4. DNA fingerprinting using gel electrophoresis.
5. Precipitation of proteins with heavy metals.
6. Demonstration of two-dimensional gel electrophoresis.
7. Use of bioinformatics tools to analyse proteomics data.
8. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

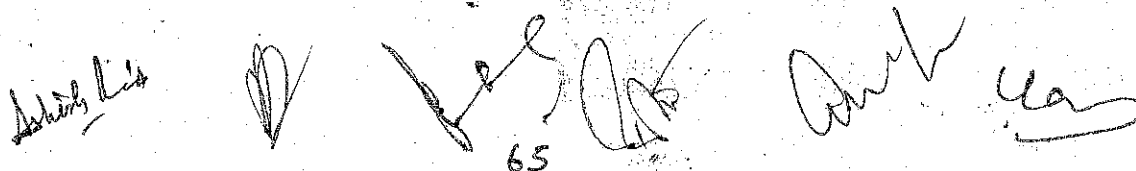
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A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

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- b) Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.


65

University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VIII (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMJBCHT-802
Course Title : Genomics and Proteomics
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

- c) Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

Recommended Books:

1. Introduction to Genomics Arthur M Lesk Oxford University Press 2007.
2. Fundamentals of Genomics. Victor Kennedy, Larsen and Keller Education, 2018.
3. From Proteins to Proteomics: Basic Concepts, techniques and Applications. Snajeeva Srivastava, CRC Press; 1st edition, 2022
4. Plant Genomics: Methods and Protocols, Humana Press, 2018.
5. Genomics and Proteomics Principles, Technologies, and Applications. Devarajan Thangadurai, Jeyabalan Sangeetha, CRC Press, 2021.

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VIII (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMJBCHT-803
Course Title : Biochemical Correlations of Diseases
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

The objective of this course is to provide the students an understanding of the major metabolic pathways associated with biomolecules within a cell and their regulation. It will also provide knowledge about the possible correlation between various metabolic pathways. At the end of the course, the students will be able to understand the basics of metabolic pathways, outline the pathways involved in catabolism and biosynthesis of glucose and describe the mechanism of ATP synthesis. The students will be able to understand the biosynthesis and degradation of glycogen, comprehend the metabolism of fatty acids, amino acids, and nucleotides and develop an understanding of metabolic integration

THEORY

UNIT I: Inherited metabolic diseases

Alkaptonuria, Phenylketonuria, Glycogen storage diseases: Von Gierke, Cori and McArdle, Lipid storage diseases: Gauchers diseases, Niemann-Pick disease, Severe Combined Immuno-Deficiency: Adenosine Deaminase deficiency.

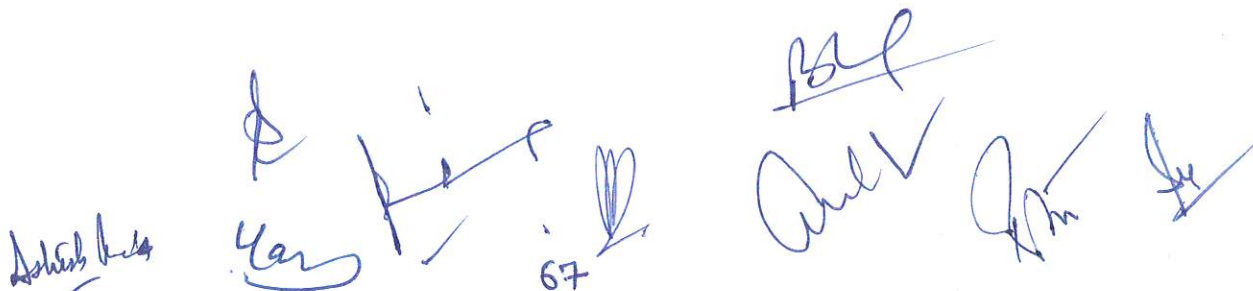
UNIT II: Nutritional deficiency and lifestyle diseases

Kwashiorkar, Marasmus, Beri-beri, Scurvy, Pellagra, Anaemia, Night blindness, Rickets, Osteomalacia, Osteoporosis, Obesity, Cardiovascular diseases, Atherosclerosis, Diabetes Mellitus-II, Inflammatory Bowel Disease (IBD).

UNIT III: Hormonal imbalances and Autoimmune diseases

Hormonal imbalances leading to disease: Diabetes Insipidus, Acromegaly, Gigantism, Dwarfism, Goitre, Cretinism, Cushing and Conn's syndrome, Addison's disease.

Concepts in immune recognition-self and non-self-discrimination, organ specific autoimmune diseases-Hashimoto's thyroiditis, Graves' disease, Myasthenia Gravis, Diabetes Mellitus-I, Systemic diseases: Systemic Lupus Erythematosus (SLE), Rheumatoid arthritis.



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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VIII (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMJBCHT-803
Course Title : Biochemical Correlations of Diseases
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

UNIT IV: Protein misfolding & Infectious diseases

Alzheimer's, Huntington's diseases, Kuru, Creutzfeldt-Jakob disease, Sickle Cell anaemia, Thalassemia. Viral infection: Polio, Measles, Mumps, influenza, HIV. Bacterial infections: Tetanus, Diphtheria, Tuberculosis, Typhoid, Cholera. Protozoan: Malaria and Trypanosomiasis. Parasitic infections: Leishmaniasis.

PRACTICALS

1. Preparation of permanent slides for different types of cancer.
2. Preparation of permanent slides of pathogens. Mycobacterium sp, Leishmania, Plasmodium sp.
3. To perform WIDAL test.
4. To perform Gram staining.
5. To perform Acid fast staining.
6. To perform PCR based diagnosis.
7. To perform Dot Blot based diagnosis.
8. To perform ELISA based diagnosis.
9. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VIII (Honours)
(Examination to be held in May 2026, 2027& 2028)
MAJOR COURSE

Course Code : UMJBCHT- 803
Course Title : Biochemical Correlations of Diseases
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

			Marks Viva)
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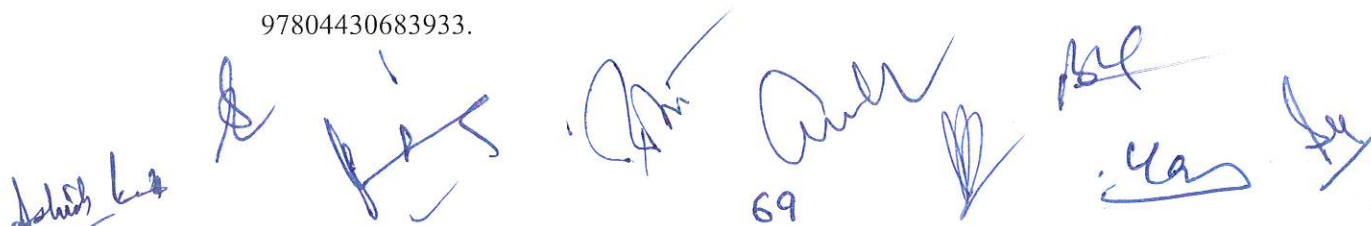
A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

- External End Semester Theory Examination will have two sections (A & B).
- Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.
- Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

RECOMMENDED TEXTBOOKS:

- Devlin, T.M. (2011) Textbook of Biochemistry with Clinical Correlations John Wiley & Sons, Inc. (New York), ISBN: 978-0-4710-28173-4.
- Lauralee Sherwood, Cengage (2012) Introduction to Human Physiology, 8th Ed, Paperback, ISBN: 9781133104544.
- Wayne M.B., Lewis J.K, Jeff H, Gregory P.B (2008) The World of the Cell 7th Ed. Benjamin Cummings, ISBN: 9780805393934
- Snustad D.P and Simmons M.J. Principles of Genetics– 8th Ed, John Wiley & Sons, ISBN: 9781118092422
- Cooper, G.M and Hausman, R.E (2009) The Cell: A Molecular Approach. 6th ed., Sinauer Associates, MA. ISBN: 1605351555
- Wiley, J.M., Sherwood, L.M., Woolverton, C.J (2008) Prescott, Harley, Klein's Microbiology (2008), 7th Ed., Mc Graw Hill (New York) ISBN: 978007126727.
- Mandell G.L, Bennett J.E, (2010) Dolin R. Churchill Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases, 7th ed., (vols 1 and 2) Livingstone ISBN: 9780443068393.



University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – VIII (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMJBCHT-803

Course Title : Biochemical Correlations of Diseases

Credits : 4 (3Theory+1Practical)

Total No. of Lectures: Theory: 45 hours

Practical : 30 hours

Maximum Marks: 100

Theory : 75

Practical : 25

8. Ryan K.J, Elliott S, Joens L, Sterling C, Pottinger P, MD (2014) Sherris Medical Microbiology, 6th ed., McGraw-Hill Medical ISBN: 0071818219

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMIBCHT- 804
Course Title : Plant Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

To impart to students a foundational understanding of biochemistry and its multidisciplinary significance. to impart to students an understanding of the chemical and physical characteristics of molecules as well as their place in the biological system. to acquaint the students with the primary macromolecules that are essential to the structural integrity and functionalities of cells, including proteins, lipids, carbohydrates, and nucleic acids. The course provides guidance on how to maintain a laboratory and what procedures need to be followed there. The course covers the preparation of solutions and reagents for a range of qualitative protein, carbohydrate, and lipid test procedures.

THEORY

UNIT 1: Introduction to Plant Biochemistry

Plant complex tissues; uptake and metabolism of water and mineral nutrients in plants: Ascent of sap, root pressure, trans-evaporation; Metabolism and translocation of sucrose in plant: loading and unloading of phloem; biosynthesis of structural and storage carbohydrates; Sucrose-starch interconversion; Light harvesting complexes; Light reaction and dark reaction; electron transport in photosynthesis; photorespiration; C₃; C₄ and CAM pathways; Nitrogen cycle, nitrate and nitrite reduction, denitrification, symbiotic and non-symbiotic nitrogen fixation; Biochemistry of nitrogen fixation and nitrate assimilation, ammonium assimilation, sulphate reduction and incorporation of sulphur into amino acids.

UNIT 2: Phytohormones

Biosynthesis and signal transduction of various phytohormones such as auxin, gibberellins, cytokinins, abscisic acid, ethylene, brassinosteroids; Auxin transporters and PIN proteins; molecular mechanisms of auxin in plant growth and cell elongation; Role of Phytohormones in seed dormancy; seed germination and development; embryogenesis; Biochemistry of fruit ripening: climacteric and non-climacteric ripening; post- harvest ripening; Structure and function of phytochromes; hormonal regulation of flowering; photoperiodism and vernalization.

UNIT 3: Defence mechanism

Molecular and biochemical mechanisms in signal transduction (signal perception, intracellular signal transduction, hormone signal transduction, signal integration); Metabolism of secondary metabolites – phenolic compounds, alkaloids and N- containing compounds; and their significance in plant physiology; Responses to plant pathogens (pathways for PAMP-triggered immunity and Effector-triggered immunity).

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMIBCHT- 804
Course Title : Plant Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

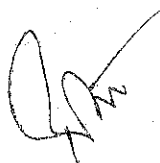
Plant defense response; genes for resistance, hypersensitive response and cell death; systemic and acquired resistance; Responses to plant pathogens (local and systemic defense signalling, control of plant pathogens by genetic engineering) including jasmonic acid, polyamines, salicylic acid, strigolactones and NO in defence mechanism; Responses to abiotic stress (gene expression and signal transduction in oxidative stress: Reactive oxygen species, cross talk in stress responses)

UNIT 4: Transgenics


Genes involved in photosynthesis and nitrogen fixation. Regulation of chloroplast gene expression. Mitochondrial control of fertility; Introduction to transgenic crops. Use of molecular markers in plants and their uses; Plant genetic engineering for crop improvement for biotic stress tolerance against insect, viral, fungal and bacterial diseases; Abiotic stress tolerance against drought, salinity, temperature, heavy metals, air and water pollutants; synthesis and functions of proline and glycine betaine in stress tolerance interaction between biotic and abiotic stresses; Transgenic crops: Herbicide resistance, storage protein quality improvement, increasing shelf- life, oil quality. Biosafety and IPR issues.

PRACTICAL

1. Determination of photosynthetic rate.
2. To visualize different types of plastids from various plant samples.
3. To isolate chlorophylls using ultra centrifugation.
4. To determine plant storage and structural saccharides.
5. To identify the presence of oils and fats in given plant samples.
6. To determine alpha amylase production during seed germination.
7. To determine protein concentration during different stages of seed germination
8. Estimation of ascorbic acid and calcium by titration method.
9. To estimate total phenols in the plant samples.
10. To separate plant pigments by using TLC.
11. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.


72







University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMIBCHT- 804
Course Title : Plant Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

- External End Semester Theory Examination will have two sections (A & B).
- Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.
- Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

Recommended Textbooks:

- Heldt, H.W. and Heldt, F. (2010). Plant Biochemistry, 4th ed. Academic Press. ISBN 9780123849861.
- Buchanan, B.B., Gruissem, W., and Jones, R.L. (2015). Biochemistry & Molecular Biology of Plants. 2nd ed, John Wiley & Sons. ISBN: 978-0470714218
- Taiz, L., Zeiger, E., Møller, I.M. and Murphy, A. (2014). Plant Physiology and Development. 6th ed, Sinauer Associates Inc. ISBN: 978-1605353531

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University of Jammu
Syllabi of Bio-Chemistry for FYUGP under CBCS as per NEP-2020
Semester – V (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMIBCHT- 804
Course Title : Plant Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

4. Plummer, D. T. (2017). An Introduction to Practical Biochemistry, 3rd edition. Mc Graw Hill Education (India) Pvt. Ltd. ISBN 978-0070994874
5. Guyton, A. C. (2020). Text Book of Medical Physiology, 14th ed. W. B. Saunders Co., USA 978-1455770168
6. Heldt, H. S. (2005). Plant Biochemistry and Molecular Biology, 2nd ed. Oxford University Press. ISBN 978-0198501794.
7. Nelson, D. L. and Cox, M. M. (2021) Lehninger's Principles of Biochemistry, 8th edition. W. H. Freeman and company, New York. ISBN 0716764385
8. Dey, P. M. and Harborne J. B (1997). Plant Biochemistry, 1st edition. Academic Press. ISBN: 9780122146749
9. Goodwin, T. W. and Mercer, E. I. (1972). Introduction to Plant Biochemistry. Pergamon Press. ISBN 978-8123906164
10. Khan, N.A. and Singh, K.N. (2014) Laboratory Manual of Biochemistry & Biotechnology. Daya publishing house. ISBN: 978-9351302537

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – VIII (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MINOR COURSE

Course Code : UMIBCHT- 805
Course Title : Clinical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

The objective of the course is to introduce students to the concepts of clinical biochemistry. The students shall learn about the typical components of blood and urine and their role in preserving health and underlying the development of kidney and liver diseases. They shall gain knowledge of the most recent theories regarding the mechanisms underlying disease and function of enzymes in the diagnosis of different illnesses. By the end of the course students shall be able to understand the role of water, electrolytes and acid base balance. They shall have understanding of the various metabolic disorders and hormone disturbances along with process of detoxification and use of enzyme based diagnostic tests and organ function tests.

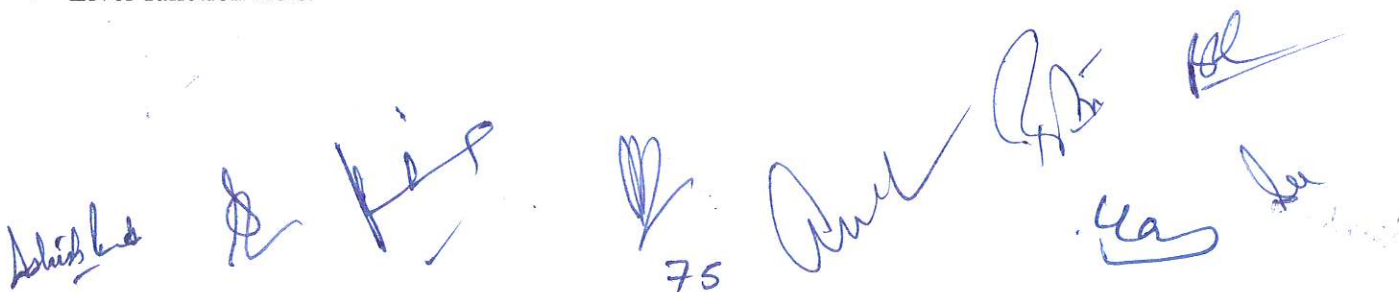
THEORY

Unit 1: Introduction

Definition and scope of clinical biochemistry in diagnosis, use of clinical laboratory and interpretation of results and Factors influencing accuracy of results. Principles of diagnostic methodologies, end-point and Kinetic measurements; Quality control in Clinical Biochemistry: control of pre-analytical variables, external and internal quality control; Quality assurance and related statistics. Chemistry of analysers and use of enzymes and coupled enzyme assays in the quantification of analytes. Body Fluids: Biochemistry of urine, blood and cerebrospinal fluid. Water, Distribution of water in body, water turnover and balance. Electrolyte composition of body fluids, regulation of electrolyte balance.

Unit 2: Haematology and Hepatology

Plasma proteins and their variation in diseases. Hemopoiesis and disorders of hemopoiesis, Hemoglobinopathies, anaemia's, haemorrhagic diseases. Normal and abnormal clotting mechanisms. Plasma lipids and lipoprotein changes in various diseases. Respiratory acidosis and alkalosis. Clinical manifestations and biochemical changes in liver diseases (a) infectious–Viral hepatitis (b) toxic-alcohol. (c) genetic– hemochromatosis (d) immune – auto-immune hepatitis and biliary cirrhosis (e) neoplastic– hepatocellular carcinoma. Diagnosis of liver disorders with special reference to jaundice and cirrhosis. Liver function tests.

The bottom of the page features several handwritten signatures and initials in blue ink. From left to right, there is a signature that appears to be 'Ashish', followed by a stylized 'K', a signature that looks like 'Rishi', a signature that looks like 'Anil', a signature that looks like 'G.D.', a signature that looks like 'H.S.', and a signature that looks like 'S.K.'. Below the 'Rishi' signature, the number '75' is written.

University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – VIII (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MINOR COURSE

Course Code : UMIBCHT- 805
Course Title : Clinical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Unit 3: Clinical enzymology in diagnosis of diseases

Clinical enzymology – Enzymes in plasma and their origin, general principles of assay, Clinical significance of enzymes (phosphatases, 5' nucleotidase, γ - glutamyltransferase, amylase, lipase, serum choline esterase, LDH, transaminases and creatine kinase). Gastric function tests, Malabsorption syndrome, acidity and peptic ulcer. Renal function tests, Diseases of the kidney (acute and chronic renal failure, diabetes insipidus, glomerulonephritis, nephrotic syndrome, uremic syndrome, renal hypertension, renal calculi, renal tubular acidosis). Drugs and toxins associated with kidney. Hemo-dialysis and peritoneal dialysis. Cardiac Function tests – Myocardial infraction. Prostrate and Thyroid Function tests.

Unit 4: Metabolic disorders and their diagnosis

Clinical aspects of hyperglycemia- Diabetes mellitus, glucose tolerance test, oral hypoglycemic drugs, Inborn errors of metabolism- Glycogen storage diseases- VonGierke' disease, Pompe's disease, Anderson's disease, Mcardle's disease, Cori Forbes disease, Diseases related to amino acid catabolism - Tyrosinemia, Phenylketonuria, Maple syrup urine disease, Histidinemia, hyperprolinemia, methylmalonic acidemia (MMA), homocystinuria and Hartnup's disease. Inherited defects of urea cycle Disorders of porphyrin metabolism. Diseases associated with nucleotide metabolism-Gout, Lesch-Nyhan syndrome. Immunodeficiency disorders.

PRACTICALS

1. Isolation of lecithin and its estimation.
2. Identification lipids by TLC,
3. Isolation of cholesterol from egg yolk and its estimation.
4. RBC ghost cell preparation and to study the effect of detergents on membranes.
5. Effect of lipid composition on the permeability of a lipid monolayer.
6. Qualitative analyses to differentiate between amino acids.
7. Separation amino acids by paper chromatography.
8. Estimation of Glycine by Sorenson formal titration.
9. Isolation of Casein from milk.
10. Estimation of protein by biuret method.

University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – VIII (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MINOR COURSE

Course Code : UMIBCHT- 805
Course Title : Clinical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

11. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

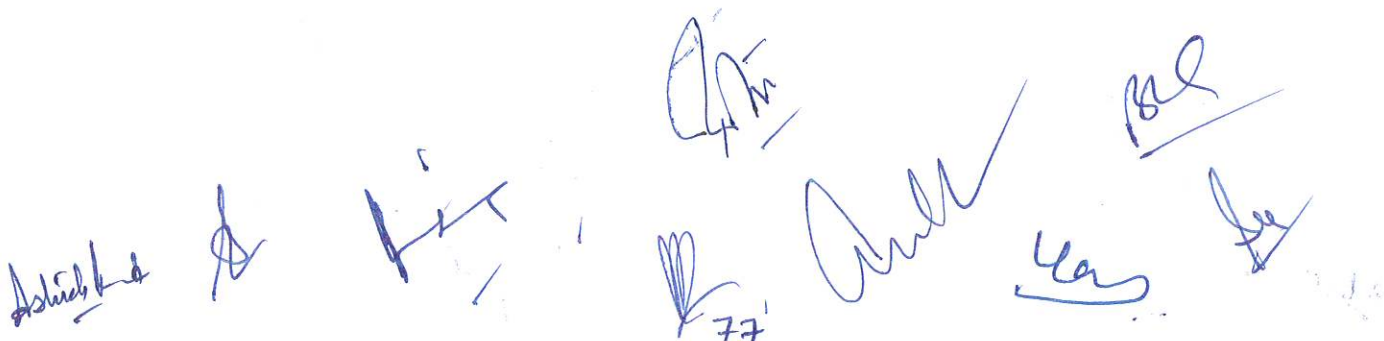
NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
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Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva)

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

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- Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.



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University of Jammu
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Semester – VIII (Honours)
(Examination to be held in May 2026, 2027 & 2028)
MINOR COURSE

Course Code : UMIBCHT- 805
Course Title : Clinical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

RECOMMENDED TEXTBOOKS:

1. Alberts B, Heald R, Johnson A, Morgan D, Raff M, Roberts K, Walter P (2022) Molecular biology of the cell, 7th ed., WW Norton & Co, ISBN: 0393884856
2. Watson J.D., Tania A.B, Stephen P. B, Alexander G, Michael L, Richard L (2017) Molecular biology of the gene 7th ed., Pearson Education, ISBN: 9332585474
3. Hofmann A and Clokie S (2018) Wilson and Walker's Principles and techniques of biochemistry and molecular biology. 8th ed., Cambridge university press, ISBN 131661476X
4. Sambrook J and Green M.R (2012) Molecular Cloning, A Laboratory Manual, 4thed., Cold Spring Harbor Laboratory Press, U.S, ISBN: 1936113422
5. Selvin P.R and Taekjip H (2008) Single-molecule techniques: a laboratory manual edition. Cold Spring Harbor Laboratory, ISBN 087969775X
6. Research articles and papers related to each unit.

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – VIII (Research)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMJBCHT-806
Course Title : Medical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

The objective of the course is to introduce students to the concepts of clinical biochemistry. The students shall learn about the typical components of blood and urine and their role in preserving health and underlying the development of kidney and liver diseases. They shall gain knowledge of the most recent theories regarding the mechanisms underlying disease and function of enzymes in the diagnosis of different illnesses. By the end of the course students shall be able to understand the role of water, electrolytes and acid base balance. They shall have understanding of the various metabolic disorders and hormone disturbances along with process of detoxification and use of enzyme based diagnostic tests and organ function tests.

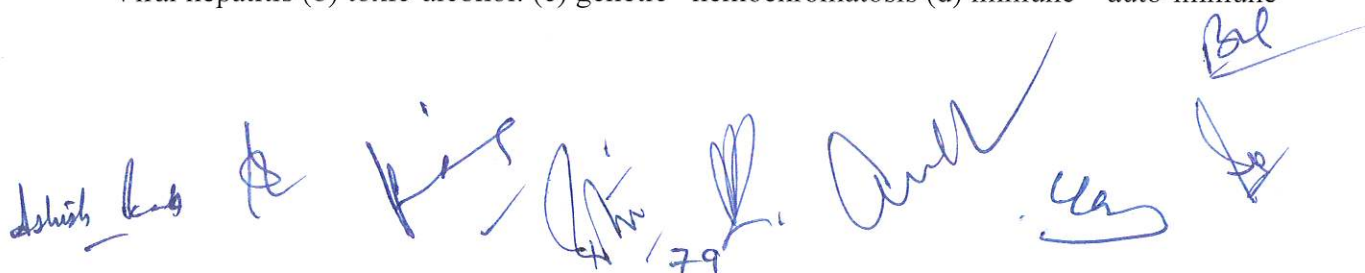
THEORY

Unit 1: Introduction

Definition and scope of clinical biochemistry in diagnosis, use of clinical laboratory and interpretation of results and Factors influencing accuracy of results. Principles of diagnostic methodologies, end-point and Kinetic measurements; Quality control in Clinical Biochemistry: control of pre-analytical variables, external and internal quality control; Quality assurance and related statistics. Chemistry of analysers and use of enzymes and coupled enzyme assays in the quantification of analytes. Body Fluids: Biochemistry of urine, blood and cerebrospinal fluid. Water, Distribution of water in body, water turnover and balance. Electrolyte composition of body fluids, regulation of electrolyte balance.

Unit 2: Haematology and Hepatology

Plasma proteins and their variation in diseases. Hemopoiesis and disorders of hemopoiesis, Hemoglobinopathies, anaemia's, haemorrhagic diseases. Normal and abnormal clotting mechanisms. Plasma lipids and lipoprotein changes in various diseases. Respiratory acidosis and alkalosis. Clinical manifestations and biochemical changes in liver diseases (a) infectious– Viral hepatitis (b) toxic-alcohol. (c) genetic– hemochromatosis (d) immune – auto-immune



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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – VIII (Research)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMJBCHT-806
Course Title : Medical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

hepatitis and biliary cirrhosis (e) neoplastic– hepatocellular carcinoma. Diagnosis of liver disorders with special reference to jaundice and cirrhosis. Liver function tests.

Unit 3: Clinical enzymology in diagnosis of diseases

Clinical enzymology – Enzymes in plasma and their origin, general principles of assay, Clinical significance of enzymes (phosphatases, 5' nucleotidase, γ - glutamyltransferase, amylase, lipase, serum choline esterase, LDH, transaminases and creatine kinase). Gastric function tests, Malabsorption syndrome, acidity and peptic ulcer. Renal function tests, Diseases of the kidney (acute and chronic renal failure, diabetes insipidus, glomerulonephritis, nephrotic syndrome, uremic syndrome, renal hypertension, renal calculi, renal tubular acidosis). Drugs and toxins associated with kidney. Hemo-dialysis and peritoneal dialysis. Cardiac Function tests – Myocardial infraction. Prostrate and Thyroid Function tests.

Unit 4: Metabolic disorders and their diagnosis

Clinical aspects of hyperglycemia- Diabetes mellitus, glucose tolerance test, oral hypoglycemic drugs, Inborn errors of metabolism- Glycogen storage diseases- VonGierke' disease, Pompe's disease, Anderson's disease, Mcardle's disease, Cori Forbes disease, Diseases related to amino acid catabolism - Tyrosinemia, Phenylketonuria, Maple syrup urine disease, Histidinemia, hyperprolinemia, methylmalonic acidemia (MMA), homocystinuria and Hartnup's disease. Inherited defects of urea cycle Disorders of porphyrin metabolism. Diseases associated with nucleotide metabolism-Gout, Lesch-Nyhan syndrome. Immunodeficiency disorders.

PRACTICALS

1. Isolation of lecithin and its estimation.
2. Identification lipids by TLC,
3. Isolation of cholesterol from egg yolk and its estimation.
4. RBC ghost cell preparation and to study the effect of detergents on membranes.
5. Effect of lipid composition on the permeability of a lipid monolayer.

The bottom of the page features several handwritten signatures and initials in blue ink. From left to right, there is a signature that appears to be 'Delish', followed by 'K. P. Singh', a heart symbol, the number '80', 'Anil', 'R. K.', 'S. K.', and '42'.

University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – VIII (Research)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMJBCHT- 806
Course Title : Medical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

6. Qualitative analyses to differentiate between amino acids.
7. Separation amino acids by paper chromatography.
8. Estimation of Glycine by Sorenson formal titration.
9. Isolation of Casein from milk.
10. Estimation of protein by biuret method.
11. To visit nearby research Institution/University/industry to get acquainted with advanced techniques in related subject.

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Mid Term Assessment test	50%	1 ½ Hours	15
External Theory End Semester	100%	3 Hours	60
Daily Practical Evaluation	-	-	10 (Based on Daily Performance only)
Final Practical Exam	-	-	15 (10 Marks Test & 5 Marks Viva)

A) Mid Term Assessment test: (15 Marks) Time Allotted 1 ½ Hours

B) External End Semester Examination: (60 Marks) Time Allotted 3 Hours

- a) External End Semester Theory Examination will have two sections (A & B).
- b) Section A shall be of 12 Marks and will comprise of 4 short answer type questions one question from each unit carrying 03 Marks each. A candidate will have to attempt all the questions.


University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – VIII (Research)
(Examination to be held in May 2026, 2027 & 2028)
MAJOR COURSE

Course Code : UMJBCHT- 806
Course Title : Medical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

- c) Section B shall be of 48 Marks and will comprise of 8 long answer type questions, two from each unit. A candidate will have to attempt four questions selecting one question from each unit. Each question will carry 12 marks.

RECOMMENDED TEXTBOOKS:

1. Alberts B, Heald R, Johnson A, Morgan D, Raff M, Roberts K, Walter P (2022) Molecular biology of the cell, 7th ed., WW Norton & Co, ISBN: 0393884856
2. Watson J.D., Tania A.B, Stephen P. B, Alexander G, Michael L, Richard L (2017) Molecular biology of the gene 7th ed., Pearson Education, ISBN: 9332585474
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5. Selvin P.R and Taekjip H (2008) Single-molecule techniques: a laboratory manual edition. Cold Spring Harbor Laboratory, ISBN 087969775X
6. Research articles and papers related to each unit.



82

University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – VIII (Research)
(Examination to be held in May 2026, 2027 & 2028)
MINOR COURSE

Course Code : UMIBCHT- 807
Course Title : Clinical Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES:

The objective of the course is to introduce students to the concepts of clinical biochemistry. The students shall learn about the typical components of blood and urine and their role in preserving health and underlying the development of kidney and liver diseases. They shall gain knowledge of the most recent theories regarding the mechanisms underlying disease and function of enzymes in the diagnosis of different illnesses. By the end of the course students shall be able to understand the role of water, electrolytes and acid base balance. They shall have understanding of the various metabolic disorders and hormone disturbances along with process of detoxification and use of enzyme based diagnostic tests and organ function tests.

THEORY

Unit 1: Introduction

Definition and scope of clinical biochemistry in diagnosis, use of clinical laboratory and interpretation of results and Factors influencing accuracy of results. Principles of diagnostic methodologies, end-point and Kinetic measurements; Quality control in Clinical Biochemistry: control of pre-analytical variables, external and internal quality control; Quality assurance and related statistics. Chemistry of analysers and use of enzymes and coupled enzyme assays in the quantification of analytes. Body Fluids: Biochemistry of urine, blood and cerebrospinal fluid. Water, Distribution of water in body, water turnover and balance. Electrolyte composition of body fluids, regulation of electrolyte balance.

Unit 2: Haematology and Hepatology

Plasma proteins and their variation in diseases. Hemopoiesis and disorders of hemopoiesis, Hemoglobinopathies, anaemia's, haemorrhagic diseases. Normal and abnormal clotting mechanisms. Plasma lipids and lipoprotein changes in various diseases. Respiratory acidosis and alkalosis. Clinical manifestations and biochemical changes in liver diseases (a) infectious–Viral hepatitis (b) toxic-alcohol. (c) genetic– hemochromatosis (d) immune – auto-



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immune hepatitis and biliary cirrhosis (e) neoplastic– hepatocellular carcinoma. Diagnosis of liver disorders with special reference to jaundice and cirrhosis. Liver function tests.

Unit 3: Clinical enzymology in diagnosis of diseases

Clinical enzymology – Enzymes in plasma and their origin, general principles of assay, Clinical significance of enzymes (phosphatases, 5' nucleotidase, γ - glutamyltransferase, amylase, lipase, serum choline esterase, LDH, transaminases and creatine kinase). Gastric function tests, Malabsorption syndrome, acidity and peptic ulcer. Renal function tests, Diseases of the kidney (acute and chronic renal failure, diabetes insipidus, glomerulonephritis, nephrotic syndrome, uremic syndrome, renal hypertension, renal calculi, renal tubular acidosis). Drugs and toxins associated with kidney. Hemo-dialysis and peritoneal dialysis. Cardiac Function tests – Myocardial infraction. Prostrate and Thyroid Function tests.

Unit 4: Metabolic disorders and their diagnosis

Clinical aspects of hyperglycemia- Diabetes mellitus, glucose tolerance test, oral hypoglycemic drugs, Inborn errors of metabolism- Glycogen storage diseases- VonGierke' disease, Pompe's disease, Anderson's disease, Mcardle's disease, Cori Forbes disease, Diseases related to amino acid catabolism - Tyrosinemia, Phenylketonuria, Maple syrup urine disease, Histidinemia, hyperprolinemia, methylmalonic acidemia (MMA), homocystinuria and Hartnup's disease. Inherited defects of urea cycle Disorders of porphyrin metabolism. Diseases associated with nucleotide metabolism-Gout, Lesch-Nyhan syndrome. Immunodeficiency disorders.

PRACTICALS

1. Isolation of lecithin and its estimation.
2. Identification lipids by TLC,
3. Isolation of cholesterol from egg yolk and its estimation.
4. RBC ghost cell preparation and to study the effect of detergents on membranes.
5. Effect of lipid composition on the permeability of a lipid monolayer.

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6. Qualitative analyses to differentiate between amino acids.
7. Separation amino acids by paper chromatography.
8. Estimation of Glycine by Sorenson formal titration.
9. Isolation of Casein from milk.
10. Estimation of protein by biuret method.
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86

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University of Jammu
Syllabi of Biotechnology for FYUP under CBCS as per NEP-2020
Semester – VIII (Research)
(Examination to be held in May 2026, 2027 & 2028)
DISSERTATION

Course Code : USEBTP-808

Course Title : Dissertation

Credits : 12 (8 Dissertation + 4 Viva)

Maximum Marks: 300

I) Dissertation: 200

II) Presentation and Viva: 100

Objectives and Expected Learning Outcomes

The primary objective of this project work course is to facilitate the application of theoretical knowledge in solving real-world problems, fostering research competencies among undergraduate students. Through hands-on projects, students will develop critical thinking skills and proficiency in data analysis. The course aims to cultivate a problem-solving mindset, enhance self-directed learning, and provide a platform for the acquisition of advanced knowledge through project-based study. Upon completion of the project work course, students will gain practical experience in applying academic concepts to real-life situations. They will develop strong research competencies, including data collection and analysis, literature review skills, and will be able to draw meaningful conclusions. Additionally, students will hone their communication, teamwork, and time management skills, preparing them for the challenges of their future careers or advanced academic pursuits. Overall, the course aims to equip students with the necessary skills and knowledge to thrive in professional and research-oriented environments.


Scheme of Research Project and Dissertation

Allotment of Supervisor

Each student shall carry out a project work in one of the broad areas of Biochemistry in the semester VIII under the supervision of the faculty of the department.

Research Work and Dissertation Writing:

1. After the allotment of supervisor, the student will carry out the proposed research work (field/lab.) and post-completion of the research work, students will write the dissertation. During the field/lab work and compilation of the dissertation, the student will work under continuous guidance of the supervisor who will maintain the regular attendance of the student.
2. Student will submit 2 hard copies of the final dissertation in the department along with a soft copy of the same.

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University of Jammu
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II) Presentation and Viva: 100

Format for dissertation is given below:

The dissertation should be presented chapter wise. Each chapter will have a precise title as given below. A chapter can be subdivided into sections, and sub-section so as to present the content discretely and with due emphasis.

Abstract

Content Page

List of Figures

List of Tables

Acknowledgement

List of Abbreviations

Chapter 1: Introduction:

It shall justify and highlight the problem posed, define the topic and explain the aim and scope of the work presented in the dissertation. This chapter also include objective of the research work. It may also highlight the significant contributions from the investigation.

Chapter 2: Review of Literature:

This Chapter presents a critical appraisal of the previous work published in the literature pertaining to the topic of the investigation.

Chapter 3: Material and Methods:

This chapter deals with a detail methodology/technique/theory by which researcher used to carry out the research work.

Chapter 4: Results and Discussion:

This chapter includes a thorough evaluation of the investigation carried out and brings out the contributions from the study. The discussion shall logically lead to inferences and conclusions as well as scope for possible further future work.

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88

108

108

108

University of Jammu

Syllabi of Biotechnology for FYUP under CBCS as per NEP-2020

Semester – VIII (Research)

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Chapter 5: Summary and Conclusion:

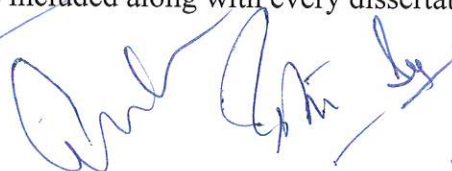
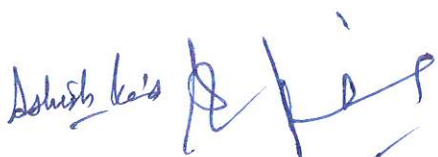
A brief report of the work carried out shall form the first part of the Chapter. Conclusions derived from the logical analysis presented in the results and discussions chapter shall be presented and clearly enumerated, each point stated separately. Scope for future work should be stated lucidly in the last part of this chapter.

Chapter 6: References/Bibliography:

The candidates shall follow the style for references as mentioned below. For journal: Loizides, M., Georgiou, A.N., Somarakis, S., Witten, P.E. and Koumoundouros, G., 2014. A new type of lordosis and vertebral body compression in Gilthead sea bream, *Sparus aurata* L.: aetiology, anatomy and consequences for survival. *Journal of Fish Diseases*, 37(11), pp.949-957.

TYPE -SETTING, TEXT PROCESSING AND PRINTING

1. The text shall be printed employing using a standard text processor. The standard font shall be Times New Roman of 12 pts with 1.5 line spacing.
2. Binding Spiral or hard Binding
3. Front Covers: The front covers shall contain the following details: a. Full title of dissertation in 6 mm/22 point's size font properly centered and positioned at the top. b. Full name of the candidate in 4.5 mm 15 point's size font properly centered at the middle of the page. c. 40 mm wide replica of the College and University emblems followed by the name of department, name of the College, name of the University and the year of submission, each in a separate line and properly centered and located at the bottom of page.
4. Title Sheet: This shall be the first printed page of the thesis and shall contain the submission statement: the dissertation submitted in partial fulfilment of the requirements of the B.Sc. (Honours) Biochemistry, the name, Registration No. and University Roll No. of the candidate, name(s) of the Supervisor, Department, College, University and year of submission.
5. A Declaration of Academic Honesty and Integrity by Candidate: A declaration of Academic honesty and integrity is required to be included along with every dissertation.



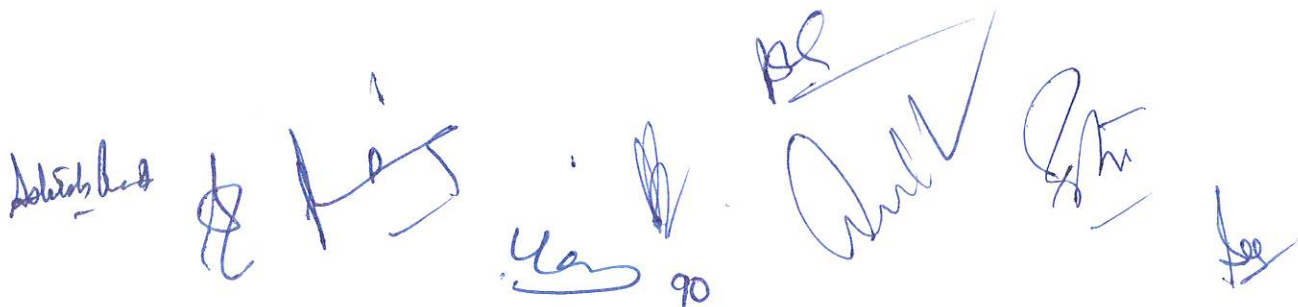
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Syllabi of Biotechnology for FYUP under CBCS as per NEP-2020
Semester – VIII (Research)
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The format of this declaration is given in Annexure-I attached. 6. Certificate from Supervisor (Annexure-II):

7. Abstract: The 500-word (maximum) abstract shall highlight the important features of the dissertation.

Evaluation of the dissertation: 1. The project report/dissertation shall be evaluated by the external expert from other University/Colleges to be nominated by the Principal out of the panel supplied by the College Research Committee (CRC) in accordance with Guidelines for FYUGP issued by the University of Jammu. 2. The students shall be declared pass in the research project course if she/he secures minimum 40% marks (Dissertation and viva).

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