



UNIVERSITY OF JAMMU

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

Academic Section

Email: academicsectionju14@gmail.com

NOTIFICATION

(23/April/Adp./14)

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 in the subject of **Biochemistry** for Semester IIIrd and IVth of **Four Year Under Graduate Programme (FYUGP)** under the **Choice Based Credit System** 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
Biochemistry	Semester-III Semester-IV	December 2023, 2024 and 2025 May 2024, 2025 and 2026

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

Sd/-

DEAN ACADEMIC AFFAIRS

No. F. Acd/II/23/1620-1640

Dated: 04/05/23

Copy for information and necessary action to:

1. Dean Faculty of Science
2. HOD/Convener, Board of Studies Biotechnology
3. Sr. P.A. to the Controller of Examinations
4. All members of the Board of Studies
5. C.A. to the Controller of Examinations
6. Director, Computer Centre, University of Jammu
7. Deputy Registrar/Asst. Registrar (Conf. /Exams. UG. Exam. Non.Prof)
8. Incharge University Website for necessary action please

Sumitashano
4/5/23
Deputy Registrar (Academic)

3/5 *7/03/5/23*

UNIVERSITY OF JAMMU

**SYLLABI AND COURSE OF STUDY IN
BIOCHEMISTRY**

**For the Examination to be held in Year 2023, 2024, 2025,
2026**

BIOCHEMISTRY COURSE

UG SEMESTER III & IV

UNDER NEP-2020

NSL

Dr. Anshu

S. Bhat

Dr. G. K. /

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UNIVERSITY OF JAMMU
SYLLABI AND COURSES OF STUDY IN BIO-CHEMISTRY
For the examination to be held in December 2023, 2024 & 2025
UG SEMESTER-III
UNDER NEP-2020

S. No.	Course Type	Course No.	Course Title	Credits (T+P)	Marks				Total Marks
					Theory		Practical		
1	Major	UMJB CHT-301	Chemical Foundation of Biochemistry	4 (3T+1P)	Mid Semester: 15 Marks	End Semester Exam: 60Marks	Daily Assessment: 10 Marks	Final Exam: 15 Marks	100
2	Major	UMJB CHT-302	Chemistry of Biomolecules	4 (3T+1P)	Mid Semester: 15 Marks	End Semester Exam: 60Marks	Daily Assessment: 10 Marks	Final Exam: 15 Marks	100
3	Minor	UMIB CHT-303	Biomolecules	4 (3T+1P)	Mid Semester: 15 Marks	End Semester Exam: 60Marks	Daily Assessment: 10 Marks	Final Exam: 15 Marks	100
4	Multidisciplinary	UMDB CHT-304	Nutrition and Health	3+0	Mid Semester: 15 Marks	End Semester Exam: 60Marks	NA	NA	75
5	Skill Enhancement	USEB CHT-305	Biochemical Diagnostics	2 (1+1)	Mid Semester: 10 Marks	End Semester Exam: 40Marks	10	15	50

per

S. B. Anil

Dr. Anil K. Singh

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

Course Code : UMJBCHT-301
Course Title : Chemical Foundation of 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 will instil confidence and clarity of mind in students to understand the chemical structures of Biomolecules and Biological reactions. After successful completion of course, the students will be able to:

1. understand fundamental properties of elements, their role in formation of biomolecules and in chemical reactions within living organisms.
2. understand the concepts of mole, mole fraction, molarity, etc. and to apply them in preparations of solutions of desired strengths.
3. refresh fundamentals of chemical bonds, electronic configuration, theories of bond formation.
4. understand the fundamentals of chemical processes in biological systems.
5. appreciate the roles of metals, non-metals, transition metals and coordination compounds in biological systems.

Unit-1 Atomic structure and Chemical Bonding

Structure of an atom, electrons & Quantum numbers, orbitals, shapes of orbitals, s, p, d, and f sub shells, K, L, M, N, O, P, and Q shells. Illustration of Pauli's exclusion principle, Aufbau principle, and Hund's rule, electron configuration up to atomic number 20, octet rule. Formation and properties of non-covalent and covalent bonds, hydrogen bonds, ionic bonds, van der Waals interactions, dipole-dipole interactions, electrostatic interactions, and hydrophobic interactions. Sigma, pi and co-ordinate bonds, back bonding, corresponding energy associated, outline of theories of bonding: valence bond theory, molecular orbital theory and crystal field theory.

Unit-2 Electrochemistry and Redox Reactions

Scope of electrochemistry, electrochemical cells and types, electrode potential and its measurement, electrolysis, types of electrolytes, electrodes, half-cell reaction, standard electrodes. Laws of thermodynamics, entropy, enthalpy and their relation, Gibb's energy, free energy change, ion. Redox reactions: types, change in oxidation number and combination, redox potential, application of redox potential, energy linked to redox reactions, reduction of oxygen. Endergonic and exergonic reactions with examples, their importance in biological systems, oxidation and reduction of iron in haemoglobin, biologically active forms of zinc, calcium, nickel, molybdenum, selenium, and cobalt, NAD^+/NADH , $\text{NADP}^+/\text{NADPH}$, FAD/FADH^2 , FMN/FMNH^2 .

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Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Unit 3: Organic Compounds and their Nomenclature

Organic compounds: classification, IUPAC nomenclature, compounds containing one, two functional groups with chains, homologous series. Stereochemistry, geometrical and structural isomerism, conformation and free rotation. Optical isomerism, symmetry of elements. Nomenclature of enantiomers, epimers, racemic mixture. Fischer and Newmann projection formulae, molecule with one and two chiral and achiral centres. Priority rules; E and Z (CIP rules), R and S, D and L notations, absolute (r and s) and relative (d and l) configuration. Role of stereochemistry in biological systems.

Unit 4: Inorganic Chemistry and Organometallic compounds

Inorganic molecules and coordination compounds: nomenclature and formula. Central metal ion, ligand, coordination number, sphere, complex ion, oxidation number of central atoms, homoleptic and heteroleptic complexes. Isomerism in complexes, structural, ionization, solvate (hydrate), linkage and coordination, Stereoisomerism, geometrical, optical isomerism with simple inorganic complexes. Applications of qualitative/quantitative analysis; photographic, metallurgy, medicine, catalysis and bio systems. Metal atom linked organic compounds. Porphyrins and Metal ions: Role of metal ions in biological systems, Fe, Cu, Zn, structure and functions of porphyrins, metalloporphyrins and iron-sulphur clusters with suitable examples and their role in biological systems.

Practicals

1. Calibration of volumetric glassware (Burette, pipette, standard flasks).
2. Concept of molarity, molality and normality. Calculation and preparation of molar solutions, normal solutions, percent solutions and dilute solutions.
3. Preparation of standard Sodium carbonate solution, standardization of HCl (Methyl orange) and estimation of NaOH in the given solution (Methyl orange or phenolphthalein).
4. Preparation of standard Potassium dichromate and estimation of ferrous/ferric mixture using diphenylamine indicator.
5. Preparation of buffers; phosphate, bicarbonate and acetate buffers.
6. Verification of Beer's Law. (i) Estimation of unknown concentration of a biomolecule by using colorimeter (ii) Determination of molar extinction coefficient.
7. Calibration of pH meter and determination of pH of few solutions.

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

Course Code : UMJBCHT-301
Course Title : Chemical Foundation of 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.

Suggested Books:

- Vogel's textbook of quantitative chemical analysis, Vogel, A.I., Mendhan, J., Denney, R.C. and Barnes, J.D., Prentice Hall, 6th Edition (2000).
- Physical Chemistry, Atkins, P., de Paula, J. and Keeler, J., W.H. Freeman and Company, International Edition (2018).
- Inorganic Chemistry: Principles of Structure and Reactivity, Huheey, J.E., Keiter, E.A., Keiter, R.L. and Medhi, K.O., Pearson Education India, 5th Edition (2022).
- Stereochemistry: Conformation and Mechanism, Kalsi, P.S., New Age International Publications, 11th Edition (2022).
- Introduction to Stereochemistry, Mislow, K., Dover Publications (2012).
- A Text book of Organic Chemistry, Bansal, R.K., New Age International Publications, 6th Edition (2016).

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

Course Code : UMJBCHT-301
Course Title : Chemical Foundation of Biochemistry
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

7. Advanced Inorganic Chemistry, Cotton, F.A., Wilkinson, G., Murillo, C.A. and Bochmann, M. A, Wiley, 6th Edition (2007).
7. Principles of organometallic Chemistry, P. Powell, ELBS, 2nd Edition (1991).
8. Inorganic Chemistry, 2022, 32nd Edition, J.E. Huheey, Harper International.
9. Organic Chemistry, Claden J., Greeves, N. and Warren, S., Oxford University Press, 2nd Edition (2020).
10. Inorganic Chemistry, 1987, R.W. Hay, Ellis Harwood.
11. Bioinorganic Chemistry, Roat-Malone, R.M., John-Wiley, 3rd Edition (2002).

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – III
(Examination to be held in December 2023, 2024 & 2025)
MAJOR COURSE

Course Code : UMJBCHT-302
Course Title : Chemistry of Biomolecules
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 provides detailed aspect of Biomolecules. After successful completion of course, the students will be able to:

1. understand the classification, properties of carbohydrates, amino acids, proteins, lipids, cholesterol, DNA, RNA, glycoproteins, glycolipids and their importance in biological systems.
2. understand the structure of Monosaccharides, Oligosaccharides, Polysaccharides, amino acids.
3. identify the various biomolecules in the laboratory.
4. understand the level of protein architecture i.e. Primary, Secondary, Tertiary and Quaternary.

Unit 1: Carbohydrates

Definition, importance, detailed classification of carbohydrates, isomerism in carbohydrates, structure of monosaccharides, anomeric forms, mutarotation, reaction of monosaccharides with special reference to glucose, reducing and non-reducing sugars. Disaccharides: classification, structure and functions of important disaccharides - maltose, lactose, sucrose, lactose intolerance. Polysaccharides: classification, structure and functions of storage and structural polysaccharides, sugars of bacterial cell wall, role of proteoglycans, glycoproteins and glycolipids (gangliosides and lipopolysaccharide).

Unit 2: Lipids

Lipids: Definition, importance and functions, classification of lipids: simple, complex, derived and miscellaneous lipids. Fatty acids: Nomenclature, structure and properties of fatty acids, Classification of Fatty acids: saturated and unsaturated fatty acids, essential fatty acids and non-essential fatty acids, odd chain and even chain fatty acids. Chemical properties and characterization of fats: hydrolysis, saponification value, Reichert-meissel number, iodine number, acid number, rancidity of fats. General structure and functions of major lipid subclasses: acylglycerol, phosphoglycerides, sphingolipids, terpenes, steroids, eicosanoids.

Unit 3: Proteins

Amino acids: structure & classification, properties of amino acids, structure of peptide bond. Organizational levels of protein structure, relationship between primary and higher order structures, supramolecular assemblies of proteins, solubility, denaturation, functional diversity and species specificity of proteins, protein classification, chemical synthesis of polypeptides. Conformation of

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

Course Code : UMJBCHT-302
Course Title : Chemistry of Biomolecules
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

proteins: Ramachandran plot, secondary, tertiary and quaternary structure; domains; motif and folds, stabilizing interactions: vander waals, electrostatic, H-bonding and hydrophobic interactions. **Unit 4: Unit 4: Nucleic Acids**

Nucleic acids, composition and importance in living system, types and structure of purine and pyrimidine bases, structure of nucleosides, nucleotides and deoxynucleotides, the binding of nucleotide components, structure of DNA, Chargaff's rules, features of Watson and Crick model, various form of DNA, structure and roles of different types of RNA, differences between properties of DNA and RNA, cot curves and cot value, T_m , hypo and hyper-chromicity.

Practicals:

1. Qualitative tests for carbohydrates.
2. Qualitative tests for reducing sugars.
3. Qualitative tests for Ketose sugar.
4. Qualitative tests for polysaccharides.
5. Scheme for identification of unknown carbohydrates.
6. Qualitative tests for amino acids.
7. Quantitative test for proteins.
8. Methods of precipitation of proteins.
9. Qualitative tests for lipids.
10. Qualitative tests for nucleic acids.

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).

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Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – III
(Examination to be held in December 2023, 2024 & 2025)
MAJOR COURSE

Course Code : UMJBCHT-302
Course Title : Chemistry of Biomolecules
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.

Suggested Books:

1. Leininger's Principles of Biochemistry, Nelson and Cox, W. H. Freeman and company, New York. 8th Edition (2021).
2. Biochemistry, Satyanarayana, U. and Chakrapani, U., Relx India Pvt. Ltd., 6th Edition (2021).
3. Biochemistry, John, M.B., Tymoczko, J.L., Gatto Jr., G.J. and Styrer, L., W. H. Freeman and company, New York. 9th Edition (2019).
4. Fundamentals of Biochemistry, Jain, J.L., Jain, S. and Jain, N., S. Chand. 7th Edition (2016).
5. Standard Methods of Biochemical Analysis, Thimmaiah, S. K., Kalyani Publisher. 2nd Edition (2016).
6. Principles of Biochemistry, Voet, D., Pratt, C.W. and Voet, J.G., John Wiley & Sons, Inc. 4th Edition (2012).
7. Biochemistry, Voet, D. and Voet, J.G., John Wiley & Sons, Inc. 4th Edition (2002).
8. Laboratory Manual of Microbiology and Biotechnology, Aneja, K. R., Medtech., 2nd Edition (2018).
9. Laboratory Manual of Biochemistry & Biotechnology, 2011, Rizvi, S. E. H., Mr. Books Fairdeal Shopping Complex Residency Road Srinagar. 1st Edition (2011)

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – III
(Examination to be held in December 2023, 2024 & 2025)
MINOR COURSE

Course Code : UMIBCHT-303
Course Title : Biomolecules
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 provides detailed aspect of Biomolecules. After successful completion of course, the students will be able to understand:

1. the classification, properties of carbohydrates, amino acids, proteins, lipids, cholesterol, DNA, NA, glycoproteins, glycolipids and their importance in biological systems.
2. structure of Monosaccharides, Oligosaccharides, Polysaccharides, amino acids.
3. identify the various biomolecules in the laboratory.
4. level protein architecture i.e., Primary, Secondary, Tertiary and Quaternary.

Unit 1: Carbohydrates

Definition, importance, detailed classification of carbohydrates, isomerism in carbohydrates, structure of monosaccharides, pen and ring structure of aldoses and ketoses, anomeric forms, mutarotation, reaction of monosaccharides with special reference to glucose, reducing and non-reducing sugars, disaccharides: classification, structure and functions of important disaccharides - maltose, lactose, sucrose, lactose intolerance. Polysaccharides: classification, structure and functions of storage and structural polysaccharides, sugars of bacterial cell wall, role of proteoglycans, glycoproteins and glycolipids (gangliosides and lipopolysaccharide).

Unit 2: Lipids

Lipids: Definition, importance and functions, classification of lipids: simple, complex, derived and miscellaneous lipids, Fatty acids: Nomenclature, structure and properties of fatty acids, Classification of Fatty acids: saturated and unsaturated fatty acids, essential fatty acids and non-essential fatty acids, odd chain and even chain fatty acids. Chemical properties and characterization of fats: hydrolysis, saponification value, Reichert-meissel number, iodine number, acid number, rancidity of fats. General structure and functions of major lipid subclasses: acylglycerol, phosphoglycerides, sphingolipids, terpenes, steroids, eicosanoids.

Unit 3: Proteins

Amino acids: structure & classification, properties of amino acids, structure of peptide bond. Organizational levels of protein structure, relationship between primary and higher order structures, supramolecular assemblies of proteins, solubility, denaturation, functional diversity and species specificity of proteins, protein classification, chemical synthesis of polypeptides. Conformation of proteins: Ramachandran plot, secondary, tertiary and quaternary structure; domains; motif and folds, stabilizing interactions: Vander waals, electrostatic, H-bonding and hydrophobic interactions.

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – III
(Examination to be held in December 2023, 2024 & 2025)
MINOR COURSE

Course Code : UMIBCHT-303
Course Title : Biomolecules
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Unit 4: Nucleic Acids

Nucleic acids, composition and importance in living system, types and structure of purine and pyrimidine bases, structure of nucleosides, nucleotides and deoxynucleotides, the binding of nucleotide components, structure of DNA, Chargaff's rules, features of Watson and Crick model, various form of DNA, structure and roles of different types of RNA, differences between properties of DNA and RNA, cot curves and cot value, T_m , hypo and hyper-chromicity.

Practicals:

1. Qualitative tests for carbohydrates.
2. Qualitative tests for reducing sugars.
3. Qualitative tests for Ketose sugar.
4. Qualitative tests for polysaccharides.
5. Scheme for identification of unknown carbohydrates.
6. Qualitative tests for amino acids.
7. Quantitative test for proteins.
8. Methods of precipitation of proteins.
9. Qualitative tests for lipids.
10. Qualitative tests for nucleic acids.

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

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – III
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MINOR COURSE

Course Code : UMIBCHT-303
Course Title : Biomolecules
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

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.

Suggested Books:

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – III
(Examination to be held in December 2023, 2024 & 2025)
MULTIDISCIPLINARY COURSE

Course Code: UMDBC HT-304

Course Title: Nutrition and Health

Credits: 3

Total No. of Lectures: Theory: 45 hours

Maximum Marks: 75

Theory: 75

OBJECTIVES AND EXPECTED LEARNING OUTCOMES

The course provides awareness about Life style diseases and their management. After successful completion of course, the students will be able to understand:

1. Functions of food, food pyramid, concept of nutrition, RQ of food stuff, Basal Metabolic Rate, composition of balance diet, RDA for different age groups.
2. Nutritional significance of carbohydrates, amino acids, proteins, lipids, macro elements and trace elements in diet.
3. Principles of diet therapy, diet therapy for various life style disease and Protein energy malnutrition.
4. Knowledge on food safety and their implications on health

Unit 1: Introduction to Nutrition

Functions of food, food groups, food pyramid; Nutrition: Ideal, under and over nutrition; Nutrition and Energy supply; Nutrition utilization in man; Energy content of foods, Respiratory Quotient of foodstuffs; Basal Metabolic Rate (BMR), factors affecting BMR, significances of BMR; Energy requirements for different physical activities; Recommended Dietary allowances (RDA) for Infants, Children, Adolescent, Adult male, female, Pregnant, Lactating women and old age.

Unit 2: Elements of Nutrition

Dietary Carbohydrates; Composition, physiological functions, food sources, digestion, lactose intolerance, dietary requirements, Dietary fibre; types, Benefits and adverse effects.

Dietary lipids; Classification, sources, functions; Essential fatty acids (EFA): functions and their deficiencies, Cholesterol requirement in the body; Saturated and unsaturated fatty acids.

Dietary Proteins; Composition, physiological role of proteins in the body: Essential and nonessential amino acids; Food source and RDA of proteins for different age groups; Biological value of proteins; Nitrogen balance.

Unit 3: Dietetics

Dietetics and its principle; Therapeutic diet for anaemia, heart diseases, obesity, hypertension and diabetes; Protein Energy; Malnutrition (Kwashiorkor) and Under-nutrition (Marasmus): their preventive and curative measures; Balanced diet and its importance. Dietary requirements: sources and diseases; Impact of macronutrients and micronutrients on health: Deficiency and excess: Probiotics and prebiotics

Unit 4: Health & Food safety

Definition, components and factors affecting health; Health supplements, processed food, organic food; food guides for health promotion; Water: Importance, distribution in the body, functions of water, water intake and loss, dehydration, oedema; Electrolytes: sources, maintenance of electrolyte balance and imbalance.

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – III
(Examination to be held in December 2023, 2024 & 2025)
MULTIDISCIPLINARY COURSE

Course Code: UMDBCHT-304
Course Title: Nutrition and Health
Credits: 3
Total No. of Lectures: Theory: 45 hours
Maximum Marks: 75
Theory: 75

Food contaminants: Physical, chemical and biological contaminants; Food hygiene law and the importance of food safety; Food Safety Hazards; Cross-Contamination; Food Borne infections and intoxications; Risk Factors.

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Internal Theory Assessment	50%	1½ Hours	15
External Theory End Semester	100%	3 Hours	60

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. Each question will carry 12 marks.

Suggested Books:

1. Textbook of Medical Physiology, Guyton and J. E. Hall, Elsevier Saunders, 13th Edition (2015).
2. Biochemistry, Satyanarayana, U. and Chakrapani, U., Relx India Pvt. Ltd., 6th Edition (2021).
3. Cell and Molecular Biology Concepts and Experiments, Karp, G., John Wiley & Sons, Inc., 8th Edition (2021).
4. Textbook of Medical Biochemistry, Chatterjee, M. N. and Shinde, R., Jaypee Brothers Medical Publishers (P) Ltd., 8th Edition (2012).
5. Textbook of Medical Biochemistry, Vasudevan, D.M., Sreekumari, S., Vaidyanathan, K., Jaypee Brothers Medical Publishers (P) Ltd., 9th Edition (2019).

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – III
(Examination to be held in December 2023, 2024 & 2025)
SKILL ENHANCEMENT COURSE

Course Code : USEBCHT-305
Course Title : Biochemical Diagnostics
Credits : 2 (1Theory+1Practical)
Total No. of Lectures: Theory: 15 hours
Practical : 30 hours
Maximum Marks: 50
Theory : 25
Practical : 25

OBJECTIVES AND EXPECTED LEARNING OUTCOMES

The course also covers the general aspects of diagnosis, and clinical interpretation. After successful completion of course, the students will:

1. be able to perform measurements of various parameters such as Glucose, cholesterol, electrolytes and enzymes assays.
2. be able to interpret results of various clinical parameters against normal value references.

THEORY

Unit-1: Diabetics Mellitus and Cardiovascular Diseases

Diabetics Mellitus: Blood glucose estimation by Ortho-Toluidine, Folin Wu & Glucose oxidase method, Glucose Tolerance Test, HbA_{1c}; methodology, reference values & clinical significance. Cardiovascular Diseases: Analysis of Cholesterol (free & total), LDL-cholesterol, HDL-cholesterol, Triglycerides, C-Reactive Proteins (CRP), Sodium and potassium level-methodology, reference values & clinical Significance, Usefulness of enzymes in assessing the myocardial infraction.

Unit-2: Liver and Kidney diseases

Liver function Test: Estimation of bilirubin (total & conjugated), serum albumin, serum A/G ratio, Prothrombin Time Index (PTI) test, Alanine Transaminase (ALT), Aspartate Transaminase (AST), Gamma-Glutamyl Transpeptidase (GGT), Lactate Dehydrogenase (LDH), 5'-nucleotidase and Alpha-Fetoprotein (AFP), reference values, clinical significance and usefulness of these tests in differential diagnosis of hepatitis. Kidney Function test: Estimation of Urea, Creatinine and uric acid-methodology, reference values & clinical Significance. Clearance test-Urea, Creatinine, Para-Amino Hippurate test (PAH).

Practicals:

1. Estimation of blood glucose by Folin-Wu method.
2. Estimation of blood glucose by O-Toluidine method.
3. Estimation of serum urea by Diacetyl monoxine method.
4. Estimation of serum creatinine by Jaffe's method.
5. Estimation of serum cholesterol by Zak's method.

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – III
(Examination to be held in December 2023, 2024 & 2025)
SKILL ENHANCEMENT COURSE

Course Code : USEBCHT-305
Course Title : Biochemical Diagnostics
Credits : 2 (1Theory+1Practical)
Total No. of Lectures: Theory: 15 hours
Practical : 30 hours
Maximum Marks: 50
Theory : 25
Practical : 25

1. Estimation of sodium in serum.
2. Estimation of blood Bilirubin (total & conjugate).
3. Estimation of serum Protein.
4. Assay of activity of alkaline phosphatase in serum.
5. Assay of serum Transaminases (SGOT, SGPT).

NOTE FOR CONDUCTING EXAMINATION IN USEBCHT-301 & PAPER SETTERS

Total marks of the USEBCHT-305 are 50 (25 marks for theory and 25 Marks for practical). In theory, 20% marks shall be reserved for internal assessment (5 Marks). 80% of the marks (20 marks) shall be reserved for external examination to be conducted by the University / College. In practical, 40% marks shall be reserved for internal assessment (10.0 Marks) and 60% of the marks (15.0 marks) shall be reserved for external examination.

Internal Assessment Test (5 Marks) Time Allotted 1 Hour

Internal assessment paper of 5 marks shall consist of theory questions from Unit I and II.

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

1. External theory exam shall be of 20 marks and consists of 2 sections.
 - a. Section A shall be of 6 marks and comprise of 4 short answer type questions of 1½ marks each, 2 questions each from Unit I and II (All compulsory)
 - b. Section B shall be of 14 marks and will comprise of four medium answer type questions of 7 marks each, two each from Unit I and Unit II. A candidate has to attempt one question from each unit.
2. Internal Practical Exam shall be of 12.5 marks and External Practical Exam shall be of 12.5 marks. Distribution of marks for practical exercise and Viva voce will be decided in consultation with external examiners

Suggested Books:

1. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, Burdis, C.A. and Ashwood, E.R., Burns, D.E., WB Saunders, 6th Edition (2017).
2. Clinical Chemistry in Diagnosis and Treatment, Philip D. Mayne, CRC Press Latest Edition (1988).
3. Textbook of Biochemistry with Clinical Correlation, T. M. Devin, John Wiley & Sons. 7th Edition (2010).
4. Textbook of Medical Biochemistry, M. N. Chatterjee and R. Shinde, Jaypee Brothers Medical Publishers Pvt. Ltd., 8th Edition (2012).
5. Textbook of Medical Biochemistry, Vasudevan, D.M., Sreekumari, S. and Vaidyanathan, K., Jaypee Brothers Medical Publishers (P) Ltd., 9th Edition (2019).

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UNIVERSITY OF JAMMU
SYLLABI AND COURSES OF STUDY IN BIO-CHEMISTRY
(For the examination to be held in May 2024, 2025 & 2026)
UG SEMESTER-IV
UNDER NEP-2020

S. No.	Course Type	Course No.	Course Title	Credits (T+P)	Marks				Total Marks
					Theory		Practical		
1	Major	UMJBCH T-401	Molecular Biology	4 (3T + 1P)	Mid Semester: 15 Marks	End Semester Exam: 60 Marks	Daily Assessment 10 Marks	Final Exam: 15 Marks	100
2	Major	UMJBCH T-402	Enzymology	4 (3T + 1P)	Mid Semester: 15 Marks	End Semester Exam: 60 Marks	Daily Assessment 10 Marks	Final Exam: 15 Marks	100
3	Major	UMJBCH T-403	Cell Biology	4 (3T+ 1P)	Mid Semester: 15 Marks	End Semester Exam: 60 Marks	Daily Assessment 10 Marks	Final Exam: 15 Marks	100
4	Major	UMJBCH T-404	Hormones	4 (3T + 1P)	Mid Semester: 15 Marks	End Semester Exam: 60 Marks	Daily Assessment 10 Marks	Final Exam: 15 Marks	100
5	Minor	UMIBCH T-405	Basics Molecular Biology	4 (3T + 1P)	Mid Semester: 15 Marks	End Semester Exam: 60 Marks	Daily Assessment :10 Marks	Final Exam: 15 Marks	100

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

Course Code : UMJBCHT-401
Course Title : Molecular biology
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 guide students about the basic background (physical and chemical) of molecular biology. After successfully completing this course, the students will be able to understand the basic concepts in molecular biology, basic composition of nucleic acids, their structure and their mode of replication, conversion of genetic information coded in DNA to cellular macromolecules.

Unit I: Structure of Nucleic Acid

Structure of nucleic acids: nucleosides & nucleotides, purines and pyrimidines. Watson and Crick model of DNA structure, A, B & Z forms of DNA, supercoiled and relaxed DNA, denaturation and renaturation of DNA, melting temperature (T_m), hyperchromic effect. RNA structure and types of RNA, i.e mRNA, tRNA, rRNA, siRNA, miRNA, sno RNA, Sn RNA

Unit II: Replication

Semiconservative replication, chromosomal replication and regulation with reference to *E.coli*: initiation, elongation and termination; factors and elements required in replication; regulation of replication. DNA replication vis a vis cell cycle in *E.coli* and replication of plasmid DNA. Introduction to replication in eukaryotic organisms: replication in yeast and SV 40.

Unit III: Transcription

Organization of gene: concept of promoter, enhancer, silencer; transcription factors, RNA polymerase. Transcription in prokaryotes: initiation, elongation and termination; operon concept, inducible and repressible operons. Transcription in eukaryotes: initiation, elongation and termination. Co and post transcriptional processing of RNA transcripts.

Unit IV: Translation

Genetic code: salient features, start codon, stop codon, wobble hypothesis, degeneracy of codon, codon bias; concept of reading frame. Translation: structure and function of ribosomes; protein synthesis in prokaryotes: initiation, elongation and termination. Protein synthesis in eukaryotes initiation, elongation and termination. Post translational modification of proteins.

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

Course Code: UMJBCHT-401
Course Title: Molecular biology
Credits: 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical: 30 hours
Maximum Marks: 100
Theory: 75
Practical: 25

Practicals:

1. Preparation of stock solutions, concept of molarity, normality and concentration.
2. Isolation of DNA from living cell.
3. Quantification of DNA by spectrophotometer.
4. Agarose gel electrophoresis of isolated DNA.
5. Estimation of purity of DNA by spectrophotometry.
6. Quantification of DNA using agarose gel by normalization.
7. Determination of molecular weight of given DNA sample using semi log paper.
8. Effect of concentration of agarose on the migration of DNA through agarose gel.
9. Effect of various physical agents on DNA.
10. Effect of various chemical agents on DNA.

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Internal Theory Assessment	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.

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

MAJOR COURSE

Course Code: UMJBCHT-401

Course Title: Molecular biology

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.

Suggested Books:

1. Cell and Molecular Biology: Concepts and Experiments, Karp, G., John Wiley & Sons. Inc. 8th Edition (2021).
2. Cell Biology, De Robertis, E.D.P. and De Robertis, E.M.P, Blaze publishers & Distributors Pvt. Ltd., 8th Edition (2017).
3. The Cell: A Molecular Approach- Cooper, G.M. and Hausman, R.E, Sinauer Associates Inc. and ASM Press, 8th Edition (2019).
4. Principles of Gene Manipulations and Genomics, Primrose, S.B. and Twyman, R., Black Well Scientific Publications, 8th Edition (2016).
5. Lewin's Genes XII, Goldstein, E.S., Krebs, J.E., Kilpatrick, S.T., Jones and Bartlett Publishers, Inc., 12th edition, (2020).

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

Course Code : UMJBCHT-402
Course Title : Enzymology
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 provides an insight in to the fundamentals of enzyme, mechanisms and kinetics with integrated practical knowledge to prepare students work proficiently with enzyme systems in Academia, Clinical Laboratory and Industry on current applications and future potential of enzymes. By the end of the course, a student shall be able to:

1. understand about the importance of enzymes in biological reactions and able to differentiate between chemical catalyst and biocatalyst.
2. aware of molecular basis of enzyme catalysed reactions along with their kinetics and inhibition.
3. become conscious about importance of enzymes in clinical diagnosis and industrial applications.

Unit 1: Introduction to Enzymes and Enzyme catalysis

Enzyme concept - catalyst vs biocatalyst, chemical nature and properties of enzymes-isoenzymes, enzyme specificity, active site, units of enzyme activity, basis of IUBMB classification and nomenclature of enzymes, role of cofactors, coenzymes, prosthetic group in enzyme catalysis and metal ions with special emphasis on coenzyme functions, models for understanding the binding of substrate to active site.

Unit 2: Enzyme Kinetics

Presteady - state kinetics and relaxation kinetics, kinetics of uni-substrate reactions: derivation of Michaelis-Menton equation, k_m and its significance, Lineweaver Burk plot and its limitations, Eadie-Hofstee plot. Concepts of multi-substrate enzyme kinetics - Ping-pong bi-bi, random order and compulsory order mechanism. Enzyme inhibition: competitive, non-competitive and uncompetitive inhibition (Concepts with example).

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

Course Code : UMJBCHT-402
Course Title : Enzymology
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Unit 3: Mechanism of Enzyme action

Mechanisms of catalysis: acid base catalysis, covalent catalysis, electrostatic catalysis, metal ion catalysis, proximity and orientation effects, mechanism of actions of chymotrypsin and carboxypeptidase. Determination of active site amino acids and functional group analysis by different methods. Biochemical basis of factors influencing the enzyme activity.

Unit 4: Regulation of Enzyme action

General Mechanisms for regulation of metabolic pathways by enzyme: covalent and noncovalent modification of enzymes, feedback inhibition and repression, partial proteolysis. Allosteric enzymes: sigmoidal kinetics - Hill's equation coefficient, MWC and KNF models. Importance of allosteric enzymes in physiology and metabolism.

Practicals

1. Extraction of amylase from germinating wheat seeds and estimation of its activity
2. Effect of incubation time on enzyme activity.
3. Effect of temperature on enzyme activity and determination of optimum temperature.
4. Effect of pH on enzyme activity and determination of optimum pH.
5. Effect of substrate concentration on enzyme activity.
6. Effect of inhibitor on enzyme activity.
7. Assay of serum/tissue alkaline / acid phosphatase activity.
8. Assay of serum creatinine phosphokinase activity
9. Assay serum alanine transaminase activity.
10. Assay serum aspartate transaminase activity.
11. Subcellular fractionation of organelles from liver cells and identification by marker enzymes-LDH.

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

Course Code : UMJBCHT-402
Course Title : Enzymology
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)
Internal Theory Assessment	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.

Suggested Books:

- Enzymes: Biochemistry, Biotechnology and Clinical Chemistry, Palmer, T. and Bonner, P., Woodhead Publishing Limited, 2nd Edition (2007).
- Understanding enzymes, Palmer, T., Ellis Horwood., 2nd Edition (1995).
- Biocatalysis – Fundamentals and Applications, Bommarius, A.S. and Riebel- Bommarius, B.R., Wiley VCH, Verlag GmbH & Co., USA, 1st Edition (2004).
- Biochemistry, van Holde, M. and Atherm, K.G., Pearson Education Inc., Singapore, 3rd Edition (2003).
- Fundamentals of Enzymology, Nicholas, C. P. and Lewis, S., Oxford University Press Inc. (New York), 3rd Edition (2009).
- Understanding Enzymes: An Introductory Text, Arya, A., Kumar, A. and Jha, J., Drawing Pin Publishing, New Delhi, India, 1st Edition (2018).

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

Course Code: UMJBCHT-402

Course Title: Enzymology

Credits: 4 (3Theory+1Practical)

Total No. of Lectures: Theory: 45 hours

Practical: 30 hours

Maximum Marks: 100

Theory: 75

Practical: 25

7. An Introduction to Practical Biochemistry, Plummer, D., Mc Graw Hill Education (India) Pvt. Ltd., 3rd Edition (2017).
8. Standard Methods of Biochemical Analysis, Thimmaiah, S. R., Kalyani Publisher, 2nd Edition (2016).
9. Biochemistry, Voet, D. and Voet, J., John Wiley & Sons, USA, 3rd Edition (2004).

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – IV
(Examination to be held in December 2023, 2024 & 2025)
MAJOR COURSE

Course Code : UMJBCHT-403
Course Title : Cell Biology
Credit : 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 provides insights related to Cell Biology. After successful completion of course, the students will:

1. be able to understand principles and applications of different microscopes.
2. be able to understand cell theory and basic cell structure.
3. have knowledge about the structure and function of various cell organelles in eukaryotic cell.
4. have knowledge about composition of cytoskeleton and extracellular matrix.
5. have knowledge about cell division and cell death mechanisms.

UNIT-1: Introduction and tools of cell biology

An overall view of cells-origin and evolution of cells, Cell theory, Principle and applications of Light microscopy, phase contrast microscopy, fluorescence microscopy, confocal microscopy, electron microscopy, Prokaryotic and eukaryotic cell, General organisation of bacterial cell, ultra-structure of eukaryotic cell, Molecular composition of Cells-Water, Carbohydrates, Lipids, Nucleic acids and Proteins.

UNIT-2: Sub-cellular organelles and Plasma membrane

Ultrastructure, organization and functions of mitochondria, nucleus, endoplasmic reticulum, Golgi apparatus, lysosomes, peroxisomes, Vacuoles – special functions in plants, Structure of a typical plant cell, Ultrastructure of chloroplast.

Plasma membrane; Introduction, Various models that lead to evolution of plasma membrane, Composition - nature of lipids, proteins, carbohydrates and other molecules, Structure of Singer and Nicholson model (fluid-mosaic model), Functions of biological membranes, Transport function of membranes, active and passive transport, uniport, antiport and symport.

UNIT -3: Cell wall, Cytoskeleton and Extracellular matrix

Prokaryotic and eukaryotic cell wall, Structure and composition of Microtubules, organisation of actin filaments, role of ATP in microfilament polymerization, assembly organization and movement of cilia and flagella, Cell-matrix interactions and cell-cell interactions, Adherence junctions, tight junctions, gap junctions, desmosomes, hemidesmosomes.

UNIT-4: Cell cycle and Cell communications

Cell cycle, phases cell division. Mitosis and meiosis, regulation of cell cycles, cell cycle checkpoints, Significance of cell cycle, Cell Senescence and Apoptosis, Necrosis. General principles

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University of Jammu
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Semester – IV
(Examination to be held in December 2023, 2024 & 2025)
MAJOR COURSE

Course Code : UMJBCHT-403
Course Title : Cell Biology
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

of cellular signalling, Cytoskeleton and Cell Adhesion: microtubules, intermediate filaments and actin filaments, extra cellular matrix.

Practicals:

1. To study different components, operation and care of compound microscope.
2. Micrographs of prokaryotic and eukaryotic.
3. To study features of plant cell and animal cell.
4. Micrographs of different cell components.
5. To prepare a temporary mount (slide) of an onion peel.
6. Study of mitosis in onion root tip.
7. Sub-cellular fraction.
8. Cytochemical staining of proteins by methylene blue.
9. Cytochemical staining of polysaccharides by PAS.
10. To study effect of isotonic, hypotonic and hypertonic solutions.

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Internal Theory Assessment	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)

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

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

- b) External End Semester Theory Examination will have two sections (A & B).
- c) 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.
- d) 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 FYUP under CBCS as per NEP-2020
Semester – IV
(Examination to be held in December 2023, 2024 & 2025)
MAJOR COURSE

Course Code: UMJBCHT-403
Course Title : Cell Biology
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Suggested Books:

1. Molecular and Cell Biology, Lodish, H., W. H. Freeman and company, New York, 8th Edition (2016).
2. The Cell: A Molecular Approach- Cooper, G.M. and Hausman, R.E, Sinauer Associates Inc. and ASM Press, 8th Edition (2019).
3. Cell and Molecular Biology Concepts and Experiments, Karp, G., John Wiley & Sons Inc., 8th Edition (2015).
4. Biochemistry, Satyanarayana, U. and Chakrapani, U., Relx India Pvt. Ltd., 6th Edition (2021).
5. Textbook of Microbiology, Baveja, C.P., Arya Publications, 6th Edition (2019).
6. Cell Biology, Rastogi, S.C., New age International Publisher, 4th Edition (2019).
7. Cell and Molecular Biology, Rastogi, V.B., Medtech, 1st Edition (2021).
8. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, Verma, P.S., and Agarwal, V. K., S. Chand & Co. Ltd., 1st Edition (2004), re-print edition (2006).

Dr. Anil

Dr. Ravi

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – IV
(Examination to be held in December 2023, 2024 & 2025)
MAJOR COURSE

Course Code : UMJBCHT-404
Course Title : Hormones
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 acquaint students with fundamental pathophysiology, clinical symptoms and underlying cause of hormonal dysfunction, management of common diseases. After successful completion of course, the students will be able to:

1. understand the structure of hormones and receptors. classify hormones based on nature, mechanism of action.
2. explain the biological action and regulation of hypothalamic and pituitary hormones.
3. illustrate the structure, biological action and regulation of thyroid and pancreatic hormones.
4. understand about the actions of adrenal hormones.
5. the structure, biological action and metabolic effects of sex hormones.

UNIT – I Hormones: Classification and mode of action

Hormones: definition, chemical nature and classification. General mechanism of action of group I and group II hormones, secondary messengers, G protein cycle, signal transduction and hormonal receptors.

UNIT – II Hormones of Pituitary and Hypothalamus

Hypothalamus and hypothalamic releasing factor. Pituitary hormones: chemistry, secretion, functions and regulation of anterior pituitary hormones - GH, LH, FSH and ACTH and posterior pituitary hormones - vasopressin and oxytocin.

UNIT – III Hormones of Thyroid and Pancreas

Thyroid and parathyroid hormones: chemistry, synthesis, secretion, functions and regulations, disorders related to hypo and hyper secretion of thyroid and parathyroid hormones. Pancreatic Hormones: chemistry, secretion, functions and regulations of pancreatic hormones, mechanism of action of insulin and glucagon, disorders related to hypo and hyper secretion of insulin and glucagon.

UNIT – IV Hormones of Adrenal gland and Gonads

Adrenal gland hormones: chemistry, secretion, functions, regulations and disorders of glucocorticoids. mineralocorticoids, epinephrine and nor-epinephrine. Chemistry, secretion, functions, regulations and disorders of gonadal hormones: testosterone, estrogen and progesterone.

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – IV
(Examination to be held in December 2023, 2024 & 2025)
MAJOR COURSE

Course Code : UMJBCHT-404
Course Title : Hormones
Credits : 4 (3Theory+1Practical)
Total No. of Lectures: Theory: 45 hours
Practical : 30 hours
Maximum Marks: 100
Theory : 75
Practical : 25

Spermatogenesis and its regulation, ovarian cycle and its regulation. Placental hormones: parturition, Lactation.

PRACTICALS

1. Glucose tolerance test.
2. Estimation of serum Ca^{2+} .
3. Estimation of serum T_4 .
4. HCG based pregnancy test.
5. Estimation of serum electrolytes.
6. Separation of isoenzymes of LDH by electrophoresis.
7. Dissection and localization of endocrine glands in rat. Or To show endocrine glands in rat through charts/models/video clipping.
8. Permanent slide preparations of various endocrine glands
9. To study the histology of endocrine glands through permanent slides.
10. To study the effect of insulin administration on the blood sugar level in rat.
11. Estimation of ascorbic acid and cholesterol in normal animal (mice/rat) and after the administration of ACTH / Epinephrine.
12. Paper chromatographic separation of corticoids.

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Internal Theory Assessment	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.

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Anil

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University of Jammu
Syllabi of Bio-Chemistry for FYUP under CBCS as per NEP-2020
Semester – IV
(Examination to be held in December 2023, 2024 & 2025)
MAJOR COURSE

Course Code: UMJBCHT-404
Course Title: Hormones
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.

Suggested Books:

1. Harper's Biochemistry, Botham, K., McGuinness, O., Weil, P.A., Kennelly, P., Rodwell, V., Prentice Hall, New Jersey, 32nd Edition (2022).
2. Guyton Human Physiology and Mechanisms of Disease, Guyton, A.C., Hall, J.E., Saunders Publications, 6th Edition (1996).
3. Williams Textbook of Endocrinology, Melmed, S., Koenig, R., Rosen, C., Auchus, R., Goldfine, A., Elsevier, New Delhi. 14th Edition (2020).
4. Textbook of Medical Biochemistry, M. N. Chatterjee and R. Shinde, Jaypee Brothers Medical Publishers Pvt. Ltd., 8th Edition (2012).
5. Leininger's Principles of Biochemistry, Nelson and Cox, W. H. Freeman and company, New York. 8th Edition (2021).
6. Biochemistry, Voet, D. and Voet, J.G., John Wiley & Sons, Inc. 4th Edition (2002).
7. Biochemistry, Zubay, G.L., WCB, McGraw-Hill, New York. 4th Edition (1997).

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

Course Code: UMIBCHT-405
Course Title: Basic Molecular biology
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 guide students about the basic background (physical and chemical) of molecular biology. After successfully completing this course, the students will be able to understand the basic concepts in molecular biology, basic composition of nucleic acids, their structure and their mode of replication, conversion of genetic information coded in DNA to cellular macromolecules.

Unit I: Structure of Nucleic Acid

Structure of nucleic acids: nucleosides & nucleotides, purines and pyrimidines. Watson and Crick model of DNA structure, A, B & Z forms of DNA, supercoiled and relaxed DNA, denaturation and renaturation of DNA, melting temperature (T_m), hyperchromic effect. RNA structure and types of RNA, i.e mRNA, tRNA, rRNA, siRNA, miRNA, sno RNA, Sn RNA

Unit II: Replication

Semiconservative replication, chromosomal replication and regulation with reference to *E.coli*: initiation, elongation and termination; factors and elements required in replication; regulation of replication. DNA replication vis a vis cell cycle in *E.coli* and replication of plasmid DNA. Introduction to replication in eukaryotic organisms: replication in yeast and SV 40.

Unit III: Transcription

Organization of gene: concept of promoter, enhancer, silencer; transcription factors, RNA polymerase. Transcription in prokaryotes: initiation, elongation and termination; operon concept, inducible and repressible operons. Transcription in eukaryotes: initiation, elongation and termination. Co and post transcriptional processing of RNA transcripts.

Unit IV: Translation

Genetic code: salient features, start codon, stop codon, wobble hypothesis, degeneracy of codon, codon bias; concept of reading frame. Translation: structure and function of ribosomes; protein synthesis in prokaryotes: initiation, elongation and termination. Protein synthesis in eukaryotes initiation, elongation and termination. Post translational modification of proteins.

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Practicals:

1. Isolation of DNA from living cell.
2. Quantification of DNA by Spectrophotometer.
3. Agarose gel electrophoresis of isolated DNA.
4. Estimation of purity of DNA by spectrophotometry.
5. Quantification of DNA using agarose gel by normalization.
6. Preparation of stock solutions, concept of molarity, normality and concentration.
7. Determination of molecular weight of given DNA sample using semi log paper.
8. Effect of concentration of agarose on the migration of DNA through agarose gel.
9. Effect of various physical agents on DNA.
10. Effect of various chemical agents on DNA.

NOTE FOR PAPER SETTING

Examination Theory / Practical	Syllabus to be covered in the Examination	Time Allotted for Exam	% Weightage (Marks)
Internal Theory Assessment	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).

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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.

Suggested Books:

1. Cell and Molecular Biology: Concepts and Experiments- Karp, G., Iwasa, J. and Marshall, W., Wiley and Sons Inc., 8th Edition (2021).
2. The Cell: A Molecular Approach- Cooper, G.M. and Hausman, R.E., Sinauer Associates Inc. and ASM Press, 8th Edition (2019).
3. Lewin's Genes XII- Goldstein, E.S., Krebs, J.E. and Kilpatrick, S.T., Jones and Bartlett Publishers Inc., 12th Edition (2020).
4. Cell And Molecular Biology- De Robertis, E.D.P. and De Robertis, E.M.F., Blaze publishers and Distributors Pvt. Ltd., 8th Edition (2017).
5. Principles of Gene Manipulations and genomics- Primrose, S.B and Twyman, R., Black Well Scientific Publications, 8th Edition (2016).

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