



B.Sc. Biochemistry Semester - II

Course Code	US02MABIC01	Title of the Course	Molecules of Life
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	<ol style="list-style-type: none">1. To learn the fundamentals of molecules that deals with life such as amino acids, proteins2. To develop understanding of structure, types and significance of amino acids.3. To learn fundamentals of various types of proteins and their biological role.4. To learn the fundamentals of molecules that deals with life such as nucleic acids and Lipids.5. To develop understanding of structure, types and significance of nucleic acids.6. To learn classification of various types of lipids and their biological role.7. To study the genetic basis of life by having knowledge of nucleic acids such as DNA and RNA.
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Course Content		
Unit	Description	Weightage* (%)
1.	AMINO ACIDS <ul style="list-style-type: none">• Definition, general Structure, properties of amino acids• Structural classification of amino acids based on R groups• Classification of amino acids based on polarity• Classification of amino acids based on their metabolic fates; glycogenic and ketogenic aminoacids.• Nutritional classification of amino acids: essential, semi-essential and nonessential amino acidswith their examples.• Importance of amino acids	25%



2.	PROTEINS <ul style="list-style-type: none">• Definition, Food sources of protein• Classification of proteins based on their composition and solubility (Simple Proteins, Conjugated Proteins and Derived Proteins)• Nutritional classification of protein (Complete protein, partially complete and Incomplete Protein)• Classification of proteins based on their functions• An overview of protein structure, peptide bond, primary and secondary structures of proteins• Various biological functions of protein	25%
3.	NUCLEOTIDES AND NUCLEIC ACIDS <p>Purine and Pyrimidine bases, Structure and nomenclature of nucleosides and nucleotides, Ribose and deoxyribose sugars, Phosphodiester bond Chargaff's Rule Structure of DNA double helix (Watson and Crick model) Structure and functions of Different types of RNA:</p> <ul style="list-style-type: none">• Messenger RNA (m-RNA)• Transfer RNA (t-RNA)• Ribosomal RNA (r-RNA) <p>Functions of nucleic acids</p>	25%
4.	BIOCHEMISTRY OF LIPIDS <ul style="list-style-type: none">• Definition and functions of lipids• Classification of lipids: Simple, Compound, Derived, miscellaneous and natural lipids.• Fatty acids: Saturated and Unsaturated, Essential and non-essential fatty acids• Nomenclature of fatty acids• Dietary sources and functions of fatty acids	25%

Teaching-Learning Methodology	Direct Teaching through Chalk-Walk and Talk ICT enabled teaching Question-Answer Class discussion led by teacher/students Case Studies Literature review Problem solving activities Debate Collaborative and Co-operative Learning Think Pair Share Jigsaw
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	Inquiry Based Learning Panel Discussion Project Based Learning Flipped Classroom Blended Learning designs Concept Mapping
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: On the successful completion of the course, the students will be able to understand	
	Students who complete this course will learn various amino acids, their structure and importance.
	Students will be able to understand fundamental properties of proteins and the types of proteins along with its role.
	Students will have fundamentals of nucleotides along with the structures of DNA and RNA
	Students will able to understand the chemistry of lipids.



Suggested References:

Sr. No.	References
1.	Lehninger Principles of Biochemistry by David L. Nelson, Michael Cox Publisher: WH Freeman
2.	Biochemistry by Donald Voet, Judith G. Voet Publisher: Wiley
3.	Biochemistry – By U Satyanarayana and U Chakrapani Publishers: Elsevier

On-line resources to be used if available as reference material

On-line Resources:

https://onlinecourses.nptel.ac.in/noc22_cy06/preview

https://onlinecourses.nptel.ac.in/noc21_bt19/preview

<https://vlab.amrita.edu/?sub=3&brch=63>

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<https://biotech01.vlabs.ac.in/>

<https://www.nature.com/subjects/biochemistry>

<https://sbcihq.in/>

<https://iubmb.org/resources/biochemistry-education-movies/>

<https://www.chem.fsu.edu/chemlab/bch40531/resources.html>



B.Sc. Biochemistry Semester - II

Course Code	US02MABIC02	Title of the Course	Biochemistry Practical
Total Credits of the Course	04	Hours per Week	08

Course Objectives:	<ol style="list-style-type: none">1. To learn how to work in a laboratory responsibly and safely.2. To understand the use of equipment for doing experiments and handling glassware.3. To study how to make standards and standard biochemical reagents.4. To gain the knowledge of different reactions of various biomolecules like amino acids and protein.5. To learn handling of sophisticated instruments like colorimeter and spectrophotometer.6. To study identification of amino acids, proteins and lipids.7. To have understanding of quantification of proteins, amino acids and nucleic acids.8. To gain knowledge of normality of acids and bases.
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SECTION-I	
1.	Preparation of biochemical reagents <ul style="list-style-type: none">• Normal solution• Molar Solution• Percent solution
2.	Color reaction of amino acids.
3.	Precipitation reaction of Protein.
4.	Estimation of amino acids by ninhydrin method.
5.	Separation of amino acids by paper chromatography.
6.	Estimation of protein by Biuret method
7.	Verification of Beer's law using methylene blue



SECTION-II	
1.	Normality of Acid
2.	Normality of Base
3.	Qualitative analysis of lipid
4.	To find out free fatty acid value of an oil
5.	To find out saponification value of an oil
6.	Estimation of DNA by DPA method
7.	Estimation of RNA by orcinol method

Teaching-Learning Methodology	Direct Teaching through Chalk-Walk and Talk ICT enabled teaching Question-Answer Class discussion led by teacher/students Case Studies Literature review Problem solving activities Debate Collaborative and Co-operative Learning Think Pair Share Jigsaw Inquiry Based Learning Panel Discussion Project Based Learning Flipped Classroom Blended Learning designs Concept Mapping
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Course Outcomes: On the successful completion of the course, the students will be able to understand
By learning this course students will acquire knowledge of lab safety rules and regulations
Students will gain a good understanding of preparation of various reagents and lab instruments.
Students will learn about qualitative analysis of amino acids and nucleic acid.
Students will gain knowledge of normality of acids and bases.



Suggested References:	
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1.	Standard Methods of Biochemical Analysis S.K. Thimmaiah Publishers: Kalyani
2.	Principles & Techniques of Practical Biochemistry – Wilson, Walker- Cambridge Univ. Press.
3.	An Introduction to Practical Biochemistry by David T. Plummer

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https://www.chem.fsu.edu/chemlab/bch4053l/resources.html



B.Sc. Biochemistry Semester - II

Course Code	US02MBIC01	Title of the Course	Fundamentals of Biochemistry-II
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	<ol style="list-style-type: none">1. To develop basic understanding of various subjects that are related with biochemistry and also understanding of significance. To get basic knowledge of structural organization and all systems of human body.2. To learn fundamentals of various biomolecules specially carbohydrates and their chemical reactions.3. To get aware about various types of cells, its structure and functions.2. To get familiar with basic blood cells of human body and their significance.
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Course Content		
Unit	Description	Weightage* (%)
1.	Cell and Cell organelles Introduction to cells Definition of cell, unicellular organism, multicellular organism, prokaryotic cells & Eukaryotic cells Difference between Plant Cell and Animal Cell. Structure and Functions of following Organelles:- a) Plasma membrane b) Cytoplasm c) Mitochondria c) Ribosome e) ER (Endoplasmic Reticulum)	50%
2.	CARBOHYDRATES Introduction and significance of Carbohydrates Classification of carbohydrates with suitable examples <ul style="list-style-type: none">• Monosaccharides- (Triose, Tetrose, Pentose & Hexose sugars), Aldose & Ketose sugars, Epimers, Anomers and Optical isomers• Disaccharides- Maltose, Lactose, Sucrose (Structure and Function) Polysaccharides- Homopolysaccharides and Heteropolysaccharides	50%



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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: On the successful completion of the course, the students will be able to understand	
	Students will gain a good understanding of types of carbohydrates, their chemical basis and significance.
	Students will get information about cell and cell organelles.



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4.	Lehninger Principles of Biochemistry by David L. Nelson, Michael Cox Publisher: WH Freeman
5.	Biochemistry by Donald Voet, Judith G. Voet Publisher: Wiley
6.	Biochemistry – By U Satyanarayana and U Chakrapani Publishers: Elsevier
7.	Molecular Biology of the Cell by Bruce Alberts et al Publisher: Garland Science
8.	Cell and Molecular Biology: Concepts and Experiments By Gerald Karp and James G. Patton Publisher: John Wiley & Sons Inc
9.	The Cell by Cooper

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B.Sc. Biochemistry Semester - II

Course Code	US02MIBIC02	Title of the Course	Biochemistry Practical
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	<ol style="list-style-type: none">1. To gain the knowledge of identification of various biomolecules like carbohydrates.2. To find out λ_{max} of particular substance and verify Beer's Law.3. To learn handling of sophisticated instruments like Microscope.4. To study vital staining of Plant cell and Animal cell.
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Sr No	Name of the Practical
1	Determination of λ_{max} (Absorption maxima)
2	Verification of Beer's law using $KMnO_4$
3	Identification of Biomolecules
4	Qualitative analysis of Carbohydrate (Glucose)
5	Qualitative analysis of Carbohydrate (Fructose)
6	Study of compound microscope
7	Vital staining of plant cell
8	Vital staining of animal cell

Teaching-Learning Methodology	Direct Teaching through Chalk-Walk and Talk ICT enabled teaching Question-Answer Class discussion led by teacher/students Case Studies Literature review Problem solving activities Debate Collaborative and Co-operative Learning Think Pair Share Jigsaw Inquiry Based Learning Panel Discussion
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	Project Based Learning Flipped Classroom Blended Learning designs Concept Mapping
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Course Outcomes: On the successful completion of the course, the students will be able to understand
Students will learn about qualitative analysis of carbohydrates.
Students will understand the structure of plant and animal cell.
Students will able to determine λ_{max} (Absorption maxima).

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1.	Standard Methods of Biochemical Analysis S.K. Thimmaiah Publishers: Kalyani
2.	Principles & Techniques of Practical Biochemistry – Wilson, Walker- Cambridge Univ. Press.
3.	An Introduction to Practical Biochemistry by David T. Plummer

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B.Sc. Biochemistry Semester - II

Course Code	US02IDBIC01	Title of the Course	Basic concepts of Biochemistry-II
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	1. To get aware about various types of cells, its structure and functions. 2. To get familiar with basic blood cells of human body and their significance.
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Course Content		
Unit	Description	Weightage* (%)
1.	FUNDAMENTAL UNIT OF LIFE: CELL Introduction to cells Definition of cell, unicellular organism, multicellular organism, prokaryotic cells & Eukaryotic cells Difference between Plant Cell and Animal Cell. Structure and Functions of following Organelles:- a) Plasma membrane b) Cytoplasm c) Mitochondria c) Ribosome e) ER (Endoplasmic Reticulum)	50%
2.	BLOOD AS A BODY FLUID Basics information of Blood, Plasma, Serum Blood Cells and Functions <ul style="list-style-type: none">• RBCs• WBCs• Platelets Functions of Blood Types of Blood group- ABO system Anaemia: Blood loss Anaemia, Pernicious Anaemia and Aplastic Anaemia	50%



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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: On the successful completion of the course, the students will be able to understand	
	By learning this course students will acquire knowledge of biochemistry subject and career prospects in the field of biochemistry
	Students will gain a good understanding of types of carbohydrates, their chemical basis and significance.

Suggested References:	
Sr. No.	References
1.	Lehninger Principles of Biochemistry by David L. Nelson, Michael Cox Publisher: WH Freeman



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2.	Biochemistry by Donald Voet, Judith G. Voet Publisher: Wiley
3.	Biochemistry – By U Satyanarayana and U Chakrapani Publishers: Elsevier
4.	Molecular Biology of the Cell by Bruce Alberts et al Publisher: Garland Science
5.	Cell and Molecular Biology: Concepts and Experiments By Gerald Karp and James G. Patton Publisher: John Wiley & Sons Inc
6.	The Cell by Cooper Publisher: Sinauer Associates

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B.Sc. Biochemistry Semester II

Course Code	US02IDBIC02	Title of the Course	Biochemistry Practical
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	<ol style="list-style-type: none">1. To learn handling of sophisticated instruments like Microscope.2. To study vital staining of Plant cell and Animal cell.3. To have understanding of blood group system, cross matching and haemoglobin estimation.4. To gain knowledge regarding bleeding and clotting time.
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Sr No	Name of the Practical
8.	Study of compound microscope
9.	Vital staining of plant cell
10.	Vital staining of animal cell
11.	Preparation of biochemical reagents <ul style="list-style-type: none">• Stock solution• Standard solution
12.	Blood Grouping and Rh system
13.	Cross Matching
14.	Estimation of Hemoglobin by Sahli's Method
15.	ESR method
16.	Determination of Bleeding time and Clotting time



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Teaching-Learning Methodology	Direct Teaching through Chalk-Walk and Talk ICT enabled teaching Question-Answer Class discussion led by teacher/students Case Studies Literature review Problem solving activities Debate Collaborative and Co-operative Learning Think Pair Share Jigsaw Inquiry Based Learning Panel Discussion Project Based Learning Flipped Classroom Blended Learning designs Concept Mapping
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Course Outcomes: On the successful completion of the course, the students will be able to understand
By learning this course students will be able to handle sophisticated lab instruments.
Students will gain a good understanding qualitative and quantitative estimation of amino acids, lipids, proteins and DNA.
Students will learn about determination of normality for acids and bases



Suggested References:	
Sr. No.	References
1.	Standard Methods of Biochemical Analysis S.K. Thimmaiah Publishers: Kalyani
2.	Principles & Techniques of Practical Biochemistry – Wilson, Walker- Cambridge Univ. Press.
3.	An Introduction to Practical Biochemistry by David T. Plummer
4.	Textbook of Medical Laboratory Technology by Praful B. Godkar; Darshan P. Godkar

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B.Sc. Biochemistry Semester II

Course Code	US02SEBIC01	Title of the Course	Tools and Techniques in Biochemistry-II
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	<ol style="list-style-type: none">1. To learn concept of pH, buffer and measurement of pH using pH meter.2. To get the knowledge of spectrophotometer for the estimation of various biomolecules
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Course Content		
Unit	Description	Weightage* (%)
1.	Concept of pH, Buffer and measurement of pH Concept of pH Weak Acid and Strong Acid Weak Base and Strong Base H-H equation Fundamentals of buffer solution and preparation Measurement of pH- pH strips and pH meter Importance of pH	50%
2.	Spectrophotometric Technique Electromagnetic radiations and wavelength Understanding of Beer's Law and Lambert's law Basic diagram of UV-Visible spectrophotometer Components of UV-Visible spectrophotometer Various types of Cuvettes Applications of spectrophotometer	50%



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Evaluation Pattern		
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2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: On the successful completion of the course, the students will be able to understand	
	By learning this course students will acquire knowledge of pH, buffers and pH measurement.
	Students will get aware about spectroscope as a concentration measuring instrument.



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