ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
CUDDALORE-1

PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
UG SYLLABUS 2019-2022

PG&RESEARCH DEPARTMENT OF BIOCHEMISTRY

Minutes of the Board of Studies (14.03.19)

The members of the Board of studies recommended the following modifications to be carried out in the syllabus for UG, PG, value added course and Diploma course to be implemented from 2019 onwards

UG

INCLUSIONS

- In Cell biology paper, the topics to be included in Unit I -diffusion and facilitated diffusion and in Unit III, types of lysosomes, ribosomes and ER to be included along with their enzymes.
- In Biomolecules-II paper, phosphatidyl serine in Unit I and oxytocin in Unit V should be included.
- In Nutritional Biochemistry paper, the topic "Role of vitamins as antioxidants and cofactor" in Unit II, in Unit IV - Mineral toxicity with reference to iron & copper and in Unit V - Nutritional requirements in disease condition such as Hypertension and Diabetes mellitus to be included.
- In Allied paper-Biophysics, carbohydrate-classification and properties was included in Unit I and FTIR in Unit V.
- In Advanced Biochemistry paper, the topics to be included: tyrosinases in Unit IV, Obesity in Unit III and Lipid profile in Unit V.
- In the skill paper- First Aid, the topics Bandages- general rules of applying bandages and its types to be included in the Unit I and Smoking -hazards & prevention, alcoholic hallucinations & management in Unit II.
- New allied paper for Zoology "Allied Biochemistry" to be implemented from the year 2019.
- New skill elective paper "Office Automation & Designing" to be included for II year Biochemistry students from the batch 2018 onwards.

MODIFICATIONS

- In Biomolecules-I paper, the topic inversion of sucrose will be shifted from Unit II to Unit III.
- In Cell Biology paper, the topics in Unit I were rearranged–Active transport:sodium potassium, Ca^{2+} and ATPase pumps, passive transport: endocytosis and exocytosis.

- In Biophysics paper Unit I & II were rearranged after inclusion of new topics.
- For Iyr Microbiology, the allied Biochemistrypracticalwill be split into two and the exams will be conducted semester wise from 2019 onwards.

DELETIONS

- In Biomolecules-I paper, in Unit I - scope & importance of Biochemistry, Kilani synthesis in Unit II, in Unit III- introduction&inUnit V heme synthesis should be removed.
- In Cell Biology paper, in Unit I-introduction& classification of cell and liposomes, Unit II- Zellweger syndrome and Unit IV- structure & organization of chromatin should be removed.
- In Biomolecules II paper, Unit I -steroids &carotenoids, Unit II - definition and amino acids, unit IV-hydrazinolysis and in unit V- insulin and lipoprotein should be removed.
- In Nutritional Biochemistry paper, the role of iron in prevention of anemia removed from unit IV. Role of Vitamin A & E in antioxidant and visual cycle and Vitamin C as co-factor in amino acid metabolism removed from Unit III.
- In Biophysics paper, Unit II - biological functions of fibrous proteins, globular proteins and lipoproteins, pH dependent ionization of amino acids to be removed from Unit II.
- In Practical I, Estimation of chloride by Mohr's method should be removed.
- In allied paper-Advanced Biochemistry, the topic glycogen metabolism to be removed in Unit I and dehydration in Unit III and triglycerides in Unit V to be removed.
- In allied paper-Basic Biochemistry,stereoisomerism and optical isomerism in unit I and examples in saturated and unsaturated fatty acids in Unit V to be removed.

PG

INCLUSIONS

- The expert suggested that the following papers should be renamed as:
  - Enzymes ------Enzymology
  - Molecular physiology ------- Human physiology
  - Bioinformatics----- Bioinformatics & computational Biology
  - Advanced Clinical Biochemistry ----- Clinical Biochemistry & clinical research
  - Advanced Endocrinology ---------- Endocrinology
  - Principles of cell biology -------- Cell Biology
- In Bio-organic chemistry paper, in Unit IV - the topic micro RNA to be added.
- In Cell Biology paper, new Unit IV with cell signalling topics &mTOR pathways to be created.

- In Intermediary metabolism paper, in Unit II - glycogen storage diseases in unit IV lipid storage diseases and in unit III - inborn errors of metabolism–PKU, Alkaptonuria and tyrosinosis to be included.
- In Clinical Nutrition paper, in Unit IV- the topic glycemic index, disorders of protein malnutrition in unit I, BOD-POD in unit II and nutritional dietary management on certain diseases in unit IV and in Unit V - Phytoceuticals should be included.
- In MLT paper, in Unit II - the following topics MCH,MCHC& MCV to be included and Lipid profile, A/G ratio and HbA1C to be included in unit-IV.
- In enzymology, Purification and characterization of enzymes to be included in unit V.
- In Analytical Biochemistry,the topics LCMS,GCMS, ICPMS in unit IV and HPTLC, Column chromatography and its types to be included in Unit I.
- In Endocrinology paper, New unit IV was created for pancreatic hormones and Unit V for sex hormones.
- In plant Biochemistry, polyphenols, flavonoids andsaponinsto be included in unit IV.
- Question paper pattern changed from the batch 2019 onwards.

DELETIONS

- In cell biology paper, the topics Liposomes, orientation, lectins to be deleted from Unit I.
- In Intermediary metabolism paper, Unit II - the topic mTOR pathway to be removed.
- In Cell biology paper, Unit II - mitosis & meiosis, Unit V -genetic basis and onset of cancer, tumour suppressor gene products should be removed.
- In Clinical Nutrition, the topics metabolic and clinical complications and recent advances in the medical nutritional management to be removed.
- In Advanced Endocrinology paper, in Unit I - cell signalling pathway topics should be removed.
- In Analytical Biochemistry, the topics Principle, instrumentation and applications of colorimeterandFPLCto be deleted.

MODIFICATIONS

- In Bio-organic chemistry paper, the heading in Unit V - Nucleic acid in cell to be renamed as DNA- protein interaction.
- In Cell Biology paper, Unit I & Unit II are merged and in Unit V - the title topic has been changed to cell cycle and cell death.
- In Intermediary metabolism paper, the topic anaplerotic reaction in Unit II is shifted to Unit I
- In MLT paper, the topics in Unit IV to be rearranged.
- In Endocrinology paper, units I & V were rearranged

- **DMLT**

INCLUSIONS

- In practical III, Diagnostic enzymes- SGOT, SGPT & ALP to be included andBlood grouping shifted to hematology practical.

VALUE ADDED COURSE

WATER QUALITY ANALYSIS

INCLUSIONS

- Estimation of elements (any three likeFe,Cu,Mg) should be included.

As per the suggestions from the university nominee, subject expert, industry expert, alumnus and other members of the board, the following corrections were made in the new syllabus which to be implemented from the year 2019 **o**nwards.

There is no change in the existing M.Phil syllabus as per experts' suggestions.

The above recommendations of the board of studies are placed before the Academic Council for its perusal and to be approved for its implementation.

The following members were present

1. **Dr.P.MarieArockianathan** **Chairman**
   Head of the Department
2. **Dr.Hannah Rachel Vasanthi** **University Nominee**
   Professor,Department of Biotechnology
   Pondicherry University,
   Pondicherry
3. **Dr.C.Sankaranarayanan** **Member(subject expert)**
   Asst.Professor,
   Department of Biochemistry& Biotechnology
   Annamalai University
   Chidambaram
4. **R.Priyanka** **Member (Alumni)**
   Asst.Professor,Prist University
   Pondicherry
5. **Mr.P.Hari Narayanan** **Member (Industry)**
   Senior Manager, QA
   Solara Active Pharma Sciences
   Cuddalore

Dr.S.Celine Hilda Mary **Member**
Assistant professor

6. **Mrs.D.Leema Rose Mary** **Member**
   Assistant professor
7. **Mr.A.Lawrence** **Member**
   Assistant professor
8. **Mr. John Robert** **Member**
   Assistant professor
9. **Miss.R.Anitha** **Member**
   Assistant professor
10. **Mrs.S.Seethalakshmi** **Member**
    Assistant professor
11. **Dr.K.Shagirtha** **Member**
    Assistant professor
12. **Dr.S.Silvan** **Member**
    Assistant professor
13. **Dr. R.Ramakrishnan** **Member**

Assistant professor

14. **Dr.N.Priya** **Member**
    Assistant professor

B.Sc BIOCHEMISTRY
CURRICULUM DESIGN TEMPLATE FROM 2019

PROGRAMME OUTCOMES (PO)

1. Students find their footings in life through wholesome and integral education.
2. Students are encouraged to climb the academic ladder by pursuing Post Graduate Education in different domain.
3. The students are academically and technically equipped to steer the Nation along the path of progress and peace.
4. The students are trained to be Employable and entrepreneurial Citizen of the nation.
5. The students are fortified intellectually, ethically, and socially to face the challenges in life.

PROGRAMME SPECIFIC OUTCOMES (PSO)

1. Students are able to gain knowledge and demonstrate their understanding of fundamental principles in Biochemistry such as structure and functions of Biomolecules, metabolism and regulation of biochemical process.
2. Students are trained to gain skill in biochemical techniques and able to evaluate and apply scientifically in both experimentation and in a real life situations.
3. Students are inculcated with moral, ethical, scientific reasoning or issues surrounding biological process or research.
4. Students are groomed to communicate their ideas and thoughts effectively and also apply their critical scientific approach in their knowledge development.
5. Students are encouraged to acquire knowledge and skill throughout the life in order to meet the ever changing scenario in the society.
6. Students are encouraged to articulately interpret and predict various cause and effect relationship inn biological process or investigation or research.
7. Students are entrusted to work independently to enrich their skill and knowledge through various activities like seminar, Assignment, Quiz etc.
8. Students are empowered to gain effective skill for their future growth with existing knowledge to identify their carrier in diverse fields.

B.Sc BIOCHEMISTRY

CURRICULUM DESIGN TEMPLATE FROM 2019

Sem	Subject code	Part	Subject Title	Hrs	Cr	Exam. Hrs
I	LE101T	I	English- I	4	3	3
	LT101T	II	Language – I	4	3	3
	19BC101	III	Main Paper – I(Biomolecules-1)	4	3	3
	19BC102	III	Main Paper – II(Cell Biology)	4	3	3
	BCP201S	III	Main Practical – I *	3	-	-
	ACH101T	III	Allied 1 (Chemistry)	5	4	3
	ACHP101	III	Allied 1 (Chemistry Practical)	3	2	3
	VE101T	IV	Value education	2	2	3
	19AEC101	IV	English communication	1	1	
			Total	**30**	**21**	
II	LE202T	I	English-II	4	3	3
	LT202T	II	Language-II	4	3	3
	19BC203	III	Main Paper – III (Biomolecules-II)	4	3	3
	19BC204	III	Main Paper – IV(Nutritional Biochemistry)	4	3	3
	BCP201S	III	Main Practical – I *	3	4	6
	ACH202T	III	Allied 2 (Analytical Chemistry)	5	4	3
	ACHP202	III	Allied 2 Analytical chemistry Practical	3	2	3
	EPD201T	IV	Personality development	3	2	3
	19AEC202	IV	English communication	1	1	
			Total	**30**	**25**	
III	LE303T	I	English III	4	3	3
	LT303T	II	Language III	4	3	3
	19BC305	III	Main Paper – V(Enzymology)	4	3	3
	19BC306	III	Main Paper–VI(Analytical biochemistry-I)	4	3	3
	BCP402S	III	Main Practical – II *	3	-	-
	AMBC302	IV	Allied 3 Principles of Microbiology	5	4	3
	AMBCP301	III	Allied 3 Microbiology Practical	3	2	3
	19AOA301	IV	Skill –Office automation and designing	3	2	3
			Total	**30**	**20**	
IV	LE404T	I	English-IV	4	3	3
	LT404T	II	Language-IV	4	3	3
	19BC407	III	Main Paper –III(Intermediary Metabolism)	4	3	3

	19BC408	III	Main Paper– IV(Analytical Biochemistry-II)	4	3	3
	BCP402S	III	Main Practical – II *	3	4	6
	AZBC401T	III	Allied 4 Advanced Zoology	5	4	3
	AZBP401	III	Allied 4 Advanced Zoology Practical	3	2	3
	EVS401S	IV	EVS	3	2	3
			Total	**30**	**24**	

V	19BC509	III	Main Paper – IX(Molecular Biology)		5	5	3
	19BC510	III	Main Paper – X(Immunology)		5	5	3
	19EBC51A	III	Elective paper-1	Food Technology	5	4	3
	19EBC51B			Environmental Toxicology & Herbal Medicine			
	19EBC52A	III	Elective paper-2	Plant Biochemistry	5	4	3
	19EBC52B			Pharmaceutical Biochemistry and Bioinformatics			
	BCP603S	III	Main Practical – III *1		4		-
	BCP604S	III	Main Practical – IV *1		4		-
	19SBC51	IV	Skill paper		2	2	3
	19SSBC52		SSC(Optional)			2*	
				Total	**30**	**20**	
VI	19BC611	III	Main Paper – XII(Medical Biochemistry)		5	5	3
	19BC612	III	MainPaper–XIII(Biotechnology&Genetic Engineering)		5	5	3
	19EBC63A	III	Elective paper-3	Clinical Endocrinology	5	4	3
	19EBC63B			Human Physiology			
	19EBC64A	III	Elective paper-4	Biostatistics & Clinical research	5	4	3
	19EBC64B			Medical Laboratory Technology			
	BCP603S	III	Main Practical – III *1		4	4	6
	BCP604S	III	Main Practical – IV *1		4	4	6
	19SBC62	IV	Skill course		2	2	3
				Total	**30**	**28**	
	EU601	V	Extension activities			2	
				Total credits		**140**	

*End of the Academic Year

I B.Sc (Biochem)	BIOMOLECULES-I(60 hrs) For the students admitted from the year 2019	19BC101
SEMESTER-I		HRS/WK-4
CORE-1		CREDIT-3

Learning objectives:

- To provide information about biochemically important aspects of carbohydrates and nucleic acids using appropriate examples.
- To understand the structural principles that govern reactivity/physical properties of molecules as opposed to learning structural detail
- To acquire knowledge about the structure and function of heterocyclic compounds.

Course outcomes

CO1-Students are able to understand the nature and types of chemical bonds and types of isomerism.

CO2-Students are able to comprehend the classification of monosaccharides and their properties.

CO3-Students are able to gain knowledge about classification and properties of disaccharides and polysaccharides.

CO4-Students are able to acquire knowledge about the structure and types of DNA and RNA

CO5-Students are able to exhibit the understanding about the structure and functions of heterocyclic compounds

SEMESTER I	SUB CODE: NEW CODE					BIOMOLECULES I								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	4	5	4	3	4	4	4	4	3	4	3	4	4	3.5
CO2	3	4	4	4	4	4	3	4	4	4	3	4	4	3.8
CO3	4	4	3	4	4	3	4	4	4	3	4	3	4	3.7
CO4	4	4	4	3	4	3	3	3	5	5	5	5	3	4.3
CO5	4	4	4	4	3	4	3	3	3	4	3	4	3	3.7
Mean overall score														3.8

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I CHEMICAL BONDING [10 hrs]

Chemical Bonding- nature and types- ionic bond (or) polar bond, covalent (or) non-polar bonds, co-ordinate bond and non-covalent bonds (Hydrogen, hydrophobic, Vander walls interactions). Isomerism - structural isomerism and stereoisomerism.

UNIT II CARBOHYDRATES I [15 hrs]

Carbohydrates: definition, classification – monosaccharides, oligosaccharides and polysaccharides; occurrence, structure and functions of monosaccharides (glucose and fructose).General properties with reference to glucose, anomers, epimers, enantiomers and mutarotation.Ring and straight chain structure of glucose (Haworth projection formula).

UNIT III CARBOHYADRATES II [10 hrs]

Structure, occurrence, properties and biological importance of disaccharides(sucrose, lactose, maltose). Inversion of sucrose. Structure, occurrence, properties and biological importance of polysaccharides: Storage polysaccharides (starch, glycogen & inulin), Structural polysaccharides (cellulose, chitin, pectin), Heteropolyasaccharides (hyaluronic acid & heparin).

UNIT IV NUCLEIC ACIDS [10 hrs

Nucleic acids – Bases, Nucleosides and Nucleotides, Phosphodiester linkage, DNA and RNA, Structure –double helical structure of DNA, Properties of DNA – Denaturation, Renaturation, Tm and Hyperchromicity, Effect of acid & alkali on DNA. Types of DNA, Structure of RNA and its major types - tRNA, mRNA and rRNA.

UNIT V HETEROCYLIC COMPOUNDS [15 hrs]

Porphyrin nucleus and its classification. Biological importance of Heterocylic compounds- Thiazole, Indole, Pyridine, Pteridine, Pyrrole and Imidazole.

TEXTBOOKS:

1. Renuka Harikrishnan, 1995, " Biomolecules and Enzymes" (second edition), Madurai, IndrajaPathipagam
2. J.L.Jain, Sanjay Jain and Nitin Jain, 1997, "Fundamentals of Biochemistry"(6^{th} Edition) , New Delhi, S.Chand& Company Ltd

REFERENCES:

1. Power & Chatwal "Biochemistry", 4^{th}edition , Himalaya Publishing House
2. Cambell&Farrell, 2007, "Biochemistry" 5^{th} edition, Delhi, Baba Borkhanath printers
3. T.N.Pattabiraman, 1993"Principles of Biochemistry" 5^{th} edition, Bangalore, Gajanana Book Publishers and Distributors

4.Dr.A.C.Deb, 1983,"Fundamentals of Biochemistry" (8th edition), Kolkata, New Central Book Agency
5. Lehninger, Nelson And Cox ,1982, " Principles of Biochemistry", (4th ed)UK, Macmillan Worth Publishers.
6. Chemistry of chemical bonding, Jyothi Roshan Kumar.2008

I B.Sc (Biochem)	CELL BIOLOGY (60 hrs) For the students admitted from the year 2019	19BC102
SEMESTER-I		HRS/WK-4
CORE-2		CREDIT-3

Learning objectives:

- To understand the structure and purpose of the basic components of the Cell and its organelles
- To understand the phases of cell cycle and cell division.
- To acquire knowledge about microfilaments and microtubules.

Course Outcomes:

CO1: To understand the structure and basic components of prokaryotic and eukaryotic cells and also gain insights about various types of membrane transport.

CO2: Students gain knowledge and understanding about the morphology, types and functions of cell organelles such as lysosomes, ribosomes and chloroplast.

CO3: Students acquire knowledge about the morphology and functions of cell organelles like Mitochondria, Golgi complex and micro bodies.

CO4: Tounderstand the structure and functions of chromosomes and learn the phases of cell cycle and cell division.

CO5: Students are able to understand the components and functions of cytoskeleton and their distribution.

SEMESTER I	SUB CODE: NEW CODE					CELL BIOLOGY								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	5	2	2	2	5	2	5	3	2	5	5	4	3.6
CO2	5	5	2	2	2	5	2	2	2	2	2	5	3	3.0
CO3	5	5	2	2	2	5	2	2	2	2	2	5	3	3.0
CO4	5	5	2	2	5	5	3	5	5	5	5	5	2	3.9
CO5	5	5	2	2	2	5	2	3	2	2	5	5	3	3.0
Mean overall score														3.3

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I CELL AND TRANSPORT [15 hrs]

Prokaryotic and eukaryotic cell. Cell membrane: chemical composition of Fluid Mosaic Model. Carbohydrate, lipids, proteins and their function in FMM. Membrane transport – Types of transport, passive- (diffusion, facilitated diffusion, osmosis) and active transport-Na+-K+, ATPase, sodium potassium pump, $Ca^{2+}$and ATP_{ase} pumps, endocytosis and exocytosis. Symport and antiport.

UNIT II CELL ORGANELLES -I [10 hrs]

Endoplasmic reticulum: occurrence, morphology, types and function. Enzymes of the ER membrane. Lysosomes: structure, types and chemical composition and enzymes of lysosomes. Ribosomes: structure, types and functions. Chloroplast – structure and function.

UNIT III CELL ORGANELLES -II [10 hrs]

Mitochondria: morphology and function. Golgi complex: structure & function. Microbodies: structure, morphology and function, peroxisomes and glyoxysomes

UNIT IV CELL DIVISION AND CELL CYCLE [15 hrs]

Nucleus – structure, composition and biochemical function, chromosome structure -polytene and lambrush chromosome with example. Cell cycles – Phases of cell cycle, mitotic and meiotic cell cycle, apoptosis and necrosis.

UNIT-V MICROTUBULES AND MICROFILAMENTS [10 hrs]

Cytoskeleton - components and biological functions. Microtubules, Microfilaments and IF proteins: Distribution, chemical composition and function.

TEXTBOOKS:

1. Verma. P.S and Agarwal .P.K,1999, "Cell biology, Genetics, Molecular biology, Evolution and Ecology",(24th edition) New Delhi, S.Chand& Company Ltd
2. De Robertis EDP and De Robertis EMF, 1987, "Cell and Molecular Biology", (8^{th}edition),New Delhi, B.I.WaverlyPvt Ltd

REFERENCES:

1. Sheela A. Stanly ,2008,"Cell biology for biotechnologist", (I Edition), Narosa Publishing House Pvt-Ltd
2. PrakashS.Lohar, 2007, "Cell and Molecular biology" (I edition),Chennai, MJP publishers
3. Darnell J, Lodish H, Baltimore D,1986, "Molecular cell biology", England, WH Freeman.
4. Cell biology –Gerald karp (7^{th} edition) –International student version, Wiley publications

I B.Sc (Biochem)	BIOMOLECULES-II(60 hrs) For the students admitted from the year 2019	19BC203
SEMESTER-II		HRS/WK-4
CORE-3		CREDIT-3

Learning objectives:

- To provide information about biochemically important aspects of the chemistry of lipids and proteins using appropriate examples.
- To understand the structural principles that govern reactivity/physical properties of molecules as opposed to learning structural detail
- To acquire knowledge about the structure and function of biologically important peptides/proteins.

Course Outcomes:

CO1: Students are able to understand the classification, structure and functions of lipids and their properties.

CO2: Students are able to gain knowledge about the classification of amino acids and their properties.

CO3: Students are able to learn and understand the different classification of proteins, properties, and their separation methods.

CO4: Students are able to acquire knowledge about the different levels of protein structure apart from the determination of amino acid sequences and chemical synthesis of proteins.

CO5: To acquire knowledge about the structure and function of biologically important peptides.

SEMESTER II	SUB CODE: NEW CODE					BIOMOLECULES-II								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	3	5	2	2	2	4	4	4	3	2	4	4	4	3.3
CO2	5	4	2	3	2	5	5	5	5	3	3	4	3	3.8
CO3	4	5	3	2	3	4	4	4	4	3	4	3	4	3.6
CO4	5	4	2	2	2	3	5	5	3	2	3	4	4	3.4
CO5	4	5	2	3	3	5	5	5	5	2	4	4	4	3.4
Mean overall score														3.5

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I LIPIDS[15 hrs]

Lipids - definition and classification of lipids, Physical properties, classification of fatty acids – saturated, unsaturated and essential fatty acids, properties of fatty acids (Iodine number, Acid number, RM number, Saponification number and Rancidity). Structure and function of commonly occurring phospholipids (Lecithin, cephalin, phosphatidyl inositol and phosphotidylserine) Sphingomyelin, plasmalogen, sterols(cholesterol), Glycolipids- cerebrosides and gangliosides.

UNIT II AMINO ACIDS [10 hrs]

Classification of Amino acids based on structure, metabolism & Polarity. Essential & Non essential amino acids, Non protein amino acids. General properties of amino acids. Titration curve of amino acids.

UNIT III PROTEIN [10 hrs]

Classification of proteins based on size and shape, solubility, composition & functions. Peptide bond.General reactions of proteins (Reactions of both NH_2 group & COOH group).Separation technique of protein-Ammonium salt fractionation, solvent fractionation, dialysis and lyophilisation.

UNIT IV PROTEIN STRUCTURE [15 hrs]

Structure of proteins: primary, secondary, tertiary & quaternary. Ramachandran plot and forces stabilizing the structure of proteins, Determination of amino acid sequence, N -terminal determination- Edman's and Dansylchloride method. C- terminal determination-enzymatic method, solid phase polypeptide synthesis.

UNITV BIOLOGICAL IMPORTANT PROTEINS [10 hrs]

Structure and functions of biologically important peptides: Glutathione, vasopressin &oxytocin. Biologically important proteins- structure and functions of Globular proteins (Haemoglobin, Myoglobin), Fibrous protein (Keratins, collagen).

TEXTBOOKS:

1. Renuka Harikrishnan ,1995, " Biomolecules and Enzymes" (second edition), Madurai, IndrajaPathipagam
2. J.L.Jain, Sanjay Jain and Nitin Jain,1997, "Fundamentals of Biochemistry"(6^{th} Edition) ,New Delhi, S.Chand& Company Ltd

REFERENCES:

1. Power &Chatwal "Biochemistry" 4th edition , Himalaya Publishing House
2. Cambell&Farrell, 2007, "Biochemistry" 5th edition, Delhi ,Baba Borkhanath printers

3. Dr.A.C.Deb ,1983,“Fundamentals of Biochemistry” (8th edition), Kolkata,New Central Book Agency
4. Lehninger,Nelson And Cox ,1982, “ Principles Of Biochemistry”, (4TH Ed)UK, Macmillan Worth Publishers.
5. Donald Voet and Judith Voet,”Biochemistry”,2nd edition,John Wiley &Sons,Inc,NY

I B.Sc (Biochem)	NUTRITIONAL BIOCHEMISTRY	19BC204
SEMESTER-II	(60 hrs)	HRS/WK-4
CORE-4	For the students admitted from the year 2019	CREDIT-3

Learning objectives:

- To study the nutritional aspects of various foodstuffs and its measurement.
- To study the functional aspects of vitamins and minerals
- To enable them to gain knowledge in the nutritional management of different age groups

Course outcomes:

CO1: To understand and demonstrate their nutritional measurement of different food stuffs.
CO2: Able to gain knowledge about the biological value of proteins by different methods
CO3: To gain insights depth about the deficiency and functional aspects of different types of vitamins
CO4: To acquire knowledge about the physiological functions and deficiency of minerals
CO5: Able to demonstrate different dietary plan for different age groups

SEMESTER II	SUB CODE: NEW CODE					NUTRITIONAL BIOCHEMISTRY								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	4	3	4	4	3	4	3	5	4	3	4	4	3.8
CO2	4	3	3	5	5	3	3	4	5	4	5	4	4	4.0
CO3	3	5	3	3	3	4	5	3	3	5	4	3	5	3.8
CO4	3	4	4	5	5	3	2	4	5	4	5	3	4	3.7
CO5	5	3	3	3	3	2	3	3	5	3	3	2	3	3.2
Mean overall score														3.7

This Course is having**HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I FOOD NUTRITION [15 hrs]

Basic food groups – Energy yielding, body building and protective foods. Basic concepts of energy expenditure, Unit of energy, measurement of foodstuffs by bomb calorimeter, Calorific value of proteins, carbohydrates and lipids, RQ of foods, Basic metabolic rate (BMR), its measurements and influencing factors, SDA of foods. Role of fibre and dietary lipids (Omega 3 and 6 fatty acids) in health.

UNIT II BIOLOGICAL VALUE OF PROTEIN [10 hrs]

Biological value of proteins, evaluation of proteins by nitrogen balance method – DC, BV, NPU and NAP, sparing action of carbohydrates, single cell proteins (SCPs) (e.g., spirulina only). PCM: Kwashiorkor and Marasmus- preventive and curative measures.

UNITIII VITAMINS [10 hrs]

Vitamins –classification- sources, RDA, deficiency and functions of fat soluble vitamins (A,D,E,K) and water soluble vitamins (B – complex – B_1, B_2, B_5, B_6, B_9, B_{12} and vitamin – C). Role of Vitamin as antioxidant and co-factor.

UNIT IV MINERALS [10 hrs]

Minerals – physiological role and nutritional significance of principal and essential trace elements (sodium, potassium, calcium. Magnesium, phosphorous, copper, zinc, iron, iodine, fluorine, selenium, Molybdenum). Mineral toxicity with reference to copper & iron.

UNIT V NUTRITIONAL REQUIREMENTS [15 hrs]

Composition of balanced diet. RDA. Nutritional requirements for infants, children, adolescents, adult (male and female), pregnant and lactating women and old age. Nutritional requirements in disease condition – hypertension and diabetes.

TEXTBOOKS:

1. Dr. M. Swaminathan,1987, "Food and Nutrition Vol I&II ", Second edition, Bangalore, Bappco Publishers.
2. M.N Chatterjea and Rana Shinde," Text book of Medical Biochemistry",4th edition, Jaypee Publishers, New Delhi

REFERENCES:

1. Patricia Trueman, 2007, "Nutritional Biochemistry" (I edition), Chennai, MJ publishers
2. Darnell J, Lodish H, Baltimore D, 1986, "Molecular Cell Biology", England, WH Freeman publishers.
3. William's Basic Nutrition and Diet Therapy Williams (14th edition), Staci Nix.
4. U. SathyanarayanaandU.Chakrapani ,"Biochemistry", Books And Allied Publishers.
5. Dr.A.C.Deb ,1983,"Fundamentals of Biochemistry" (8th edition), Kolkata,New Central Book Agency

ALLIED PAPERS

I B.Sc MICROBIOLOGY	BASIC BIOCHEMISTRY (75 hrs) For the students admitted in the year 2009	19ABC101
SEMESTER-I		HRS/WK-5
ALLIED-1		CREDIT-3

Learning objectives:

To learn and understand the structure, properties and functions of Biomolecules like carbohydrate, proteins, lipids and nucleic acids.

Course Outcomes:

CO1: To gain the knowledge about the classification, structure, properties and functions of carbohydrates.

CO2: Able to understand the classification, structure, properties and importance of amino acids.

CO3: To understand and gain knowledge about the classification of proteins, levels of structural organization of proteins and its properties.

CO4: To gain insights about the types, structure and properties of nucleic acids.

CO5: To acquire knowledge about the classification, structure and properties of different types of lipids.

SEMESTER II	SUB CODE: NEW CODE					BASIC BIOCHEMISTRY								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	5	2	2	2	4	2	2	3	3	3	5	3	3.2
CO2	4	3	2	2	2	4	4	3	3	3	3	5	3	3.2
CO3	3	3	2	3	2	3	5	3	3	4	4	5	3	3.3
CO4	4	4	4	3	2	3	5	5	5	5	5	5	5	4.2
CO5	3	3	2	2	2	4	5	5	4	3	5	5	3	3.5
Mean overall score														3.5

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I CARBOHYDRATES [20 hrs]

Carbohydrates:Definition, classification of carbohydrates; linear and ring forms (Haworth formula) Monosaccharides (Glucose , Fructose), Disaccharides (Lactose and Sucrose), Physical properties – Muta rotation, stereo isomerism and optical isomerism chemical properties- oxidation, reduction and osazone formation. Polysaccharides: starch and cellulose- structure and functions**.**

UNIT II AMINOACIDS [15 hrs]

Aminoacids- structure and classification based on structure. Standard and non standard amino acids, essential and non essential amino acid. Physical properties: isoelectric points and zwitter ions. General reactions of amino acids – Edman's reaction, Sanger's reaction, reaction with Dansyl chloride, Van Slyke reaction and Ninhydrin reaction.

UNIT III PROTEINS [10 hrs]

Proteins-Definition, classification of proteins based on size, solubility, chemical composition functions , structure of proteins- peptide bond, primary, secondary, tertiary and quaternary structure of proteins, forces that determine folding and conformation and structural organization, Physical properties: salting in and salting out and denaturation.

UNIT IV CHEMISTRY OF NUCLEIC ACIDS [15 hrs]

Nucleic acid- base, Nucleotides and Nucleosides, phosphodiester linkage; Nucleic acid types – DNA and RNA; structure- double helical structure of DNA; Denaturation , Tm and hyperchromicity structure of RNA; tRNA, mRNA and rRNA.

UNIT V CHEMISTRY OF LIPIDS [15 hrs]

Classification of lipids- simple, compound(phospholipids) and derived lipids (cholesterol).Classification and nomenclature of fatty acids – saturated fatty acid and unsaturated fatty acid. Physical property- emulsification.Chemical properties- saponification number, Rancidity, acid number, Iodine number and Reichert – Meissl number.

TEXTBOOKS :

1. Deb, A.C (2004). Fundamentals of Biochemistry. 8th Edition, New Central Book Agency,
2. Jain, J.L & Jain, (2005) Fundamentals of Biochemistry. Sixth Edition,S.Chand& Company, New Delhi.

REFERENCES:

1. Nelson, D. L. & Cox, M. M. Lehninger Principles of Biochemistry. Freeman, 5th edn, 2008.
2. Robert Murray, Bender, (2012) Harper's Illustrated Biochemistry.McGraw Hill
3. U.Sathayanarayana,(2006). Biochemistry. 3rd Edition by Books and Allied (P) Ltd., India.
4. Mallikarjuna Rao N,2002, " Medical Biochemistry",2nd Edition, New Delhi, New Age International Publishers

I B.Sc MICROBIOLOGY	ADVANCED BIOCHEMISTRY (75 hrs) For the students admitted in the year 2019	19ABC202
SEMESTER-II		HRS/WK-5
ALLIED-2		CREDIT-4

Learning objectives:

To learn the key metabolic pathways and its energetics.

To teach the classification,nature and mechanism of action of enzymes.

To educate them with various types of enzyme inhibition.

To educate them with few common disorders by knowing their causes,symptoms and prevention.

Course Outcomes:

CO1: To understand and gain knowledge about the metabolic pathways of carbohydrate such as Glycolysis, TCA cycle and HMP shunt.

CO2: Able to understand the classification of enzymes, mechanism of enzyme action and its inhibition.

CO3: To gain and understand the metabolic disorders such as diabetes mellitus, obesity, jaundice and gout.

CO4: To acquire knowledge about the amino acid metabolism and its inborn errors of metabolism.

CO5: To gain insights about the biochemical parameters and involved in the diagnostic purpose.

SEMESTER II	SUB CODE: NEW CODE					ADVANCED BIOCHEMISTRY								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	4	3	2	3	5	5	4	4	3	5	4	3	3.8
CO2	4	3	3	2	3	4	3	3	4	5	4	3	3	3.4
CO3	3	4	3	2	3	3	4	4	3	3	3	4	3	3.2
CO4	4	4	2	2	2	4	4	3	4	3	4	4	3	3.2
CO5	3	3	2	3	3	4	3	4	3	3	4	3	3	3.2
Mean overall score														3.4

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I METABOLISM [20 hrs]

Glycolysis – Aerobic & Anaerobic – key enzymes and energetic, TCA –key enzymes and energetics – HMP shunt. Gluconeogensis. Catabolism of amino acids: Deamination & transamination reactions. Urea cycle.

UNIT II ENZYMES [15 hrs]

Definition, Classification of Enzymes, Mechanism of Enzyme action – Lock & key & induced fit model. Specificity,Factors affecting enzyme activity – pH, temperature & substrate concentration. MM Equation. Allosteric enzymes, Enzyme Inhibition – Irreversible – Reversible-competitive, uncompetitive, non competitive (Kinetics not required).

UNIT III METABOLIC DISORDERS [15 hrs]

Jaundice- Classification – Biochemical findings. DM – Classification – Complications – Diagnosis – Treatment. Gout obesity – definition, causes, symptoms & prevention.

UNIT IV DISORDERS OF AMINO ACID METABOLISM [10 hrs]

Inborn errors of metabolism: Albinism, Phenylketonuria, Alkaptonuria, Maple's syrup and Hartnup's disease.

UNIT V CLINICAL BIOCHEMISTRY [15 hrs]

Enzymes– isoenzymes-functional and non functional enzymes-diagnostic enzymes associated with liver disorder and myocardial infarction.

Blood glucose, urea, uric acid, TG, serum alkaline phosphatase, calcium, total protein, electrolytes-significance and normal levels.

TEXT BOOKS:

1. Deb, A.C (2004). Fundamentals of Biochemistry. 8th Edition, New Central Book Agency,
2. Jain, J.L & Jain, (2005) Fundamentals of Biochemistry. Sixth Edition,S.Chand& Company, New Delhi.

REFERENCES:

1. Nelson, D. L. & Cox, M. M. Lehninger Principles of Biochemistry. Freeman, 5th edn, 2008.
2. Robert Murray, Bender, (2012) Harper's Illustrated Biochemistry.McGraw Hill
3. U.Sathayanarayana,(2006). Biochemistry. 3rd Edition by Books and Allied (P) Ltd., India
4. Thomas.M.Devlin,1997,"Textbook of Biochemistry with clinical correlations",4th Edition,US, Wiley-Liss
5. Ramakrishanan S, Prasannan K.G. and Rajan R,1980, " Textbook of Medical Biochemistry",3rdEdition,Chennai, Orient Longman
6. Bhagavan.N.V (2004),"Medical Biochemistry",(4thEd) Noida, Academic press

II B.Sc PHYSICS	BIOPHYSICS (75 hrs) For the students admitted from the year 2019	19ABC401
SEMESTER-IV		HRS/WK-5
ALLIED-3		CREDIT-4

Learning objectives:

- To provide information about biochemically important aspects of the chemistry of carbohydrates, proteins and nucleic acids using appropriate examples.
- To understand the mechanism of membrane conduction with respect to nerve and muscle.
- To learn the radiation techniques in biology and its instrumentation
- To learn the principle and applications of certain common instruments- FTIR,XRD,UV-Vis and Fluorescence spectra.

Course Outcomes

CO1: To acquire knowledge about the structure and properties of biomolecules.
CO2: To understand about the structure, types and properties of nucleic acids
CO3: To know the mechanism how the muscle contraction and nerve conduction occurs
CO4: Able to demonstrate their skills in basic conceptsin types of radiation, detection and its measurement using radioisotope techniques.
CO5: To learn the principle and applications of certain common instruments- FTIR, XRD, UV-Vis and Fluorescence spectra.

SEMESTER II	SUB CODE: NEW CODE					BIOPHYSICS								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	4	4	4	3	4	4	3	3	4	4	4	4	3.8
CO2	4	3	3	3	4	3	4	4	3	3	4	3	5	3.5
CO3	3	4	4	2	3	4	4	4	4	4	3	4	4	3.6
CO4	4	4	4	2	4	3	3	3	4	4	3	4	4	3.5
CO5	3	3	3	3	3	3	3	4	3	4	4	3	4	3.3
Mean overall score														3.5

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I CARBOHYDRATES & AMINO ACIDS [15 hrs]

Carbohydrates- definition, classification and general properties. Classification of amino acids based on structure, Classification of proteins, Zwitter ion, Structure of proteins (primary, secondary, tertiary and quaternary). Different types of bonds that stabilize the protein. Denaturation and renaturation of proteins.

UNIT II NUCLEIC ACIDS [15 hrs]

Fundamental units of nucleic acids – purine. pyrimidine, nucleosides and nucleotides. DNA-double helical structure, Watson Crick model and base pairing. Nucleic acid-denaturation and annealing of DNA, DNA- carrier of genetic information by an experimental proof- RNA- Types - central dogma (DNA –RNA-Protein)

UNIT III MEMBRANE BIOPHYSICS [15 hrs]

Nerve cell-structure, bioelectrical and biochemical conduction of nerve impulses, Membrane potential, Resting potential, action potential-bioelectrical phenomenon of ECG and EEG-Molecular basis of muscle contraction

UNIT IV RADIATION BIOPHYSICS [15 hrs]

Radioactive isotopes, types of radioactive decay, units of radioactivity, Biological effects of radiation –Applications of radioisotopes in biology (tracing metabolic pathways, isotope dilution techniques radio dating and RIA) – Detection and measurement of radioactivity-GM counter and scintillation counter, Autoradiography.

UNIT V BIOINSTRUMENTATION [15 hrs]

Principle and biological application of UV-VIS Spectrophotometry, Spectrofluorimetry, X-ray Diffraction, Flame photometer and FTIR.

TEXTBOOKS:

1. P.Narayanan ,"Essentials of Biophysics",2nd ed , New Age Publishers, New Delhi
2. Deb, A.C (2004). Fundamentals of Biochemistry. 8th Edition, New Central Book Agency,
3. Jain, J.L & Jain, (2005) Fundamentals of Biochemistry. Sixth Edition,S.Chand& Company, New Delhi.

REFERENCES:

1. M.A.Subramanian, "Biophysics- Principles And Techniques",MJP publishers, Chennai
2. M.V.Volbenshtein , "Biophysics", MIR publishers, Moscow ,1983
3. William huges , "Aspects of biophysics",John Wiley and sons,N.Y,1979

YEAR-II	BIOINSTRUMENTATION (45hrs)	AOBI301
SEMESTER-III		HRS/WK-3
		CREDIT-2

FOR II-YE

AR MICROBIOLOGY

Objective:

- To develop analytical insight of the students to prepare them for under graduates
- To enhance their ability to solve and analyse the techniques and instruments used in life science.
- To provide the students with a strong foundation in handling the laboratory equipments.

Course Outcomes:

CO1: To Acquire the knowledge about the units of measurement of solutes in solution and principle, instrumentation & applications different kinds of electrophoretic techniques.
CO2: To gain knowledge about the principles of pH measurement and the acid-base, buffers and biological buffers concepts and systems and determination of pH using electrodes.
CO3: To gain knowledge about the working principle, instrumentation, & applications of various types of chromatography.
CO4: To Acquire the knowledge about the working principle, instrumentation, & applications of various types of chromatography.
CO5: Understand the principles of centrifugation and different types of centrifuge and rotors. To gain knowledge about the principles of centrifugation and different types of centrifuge and rotors.

SEMESTER II	SUB CODE: NEW CODE					BIOINSTRUMENTATION								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	4	3	4	4	3	4	3	4	4	4	3	4	3.8
CO2	4	3	4	3	5	4	5	4	3	5	3	3	4	3.8
CO3	4	4	3	4	3	4	4	2	3	4	4	4	3	3.6
CO4	3	3	2	3	4	3	3	3	4	4	3	3	4	3.2
CO5	4	4	3	4	4	4	4	3	4	5	4	2	3	3.7
Mean overall score														3.6

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

Unit I Electrophoresis

Units of measurement; units of measurement of solutes in solution, eg. Normality,Molality Percentage solution. Examples for this concept. Electrophoresis – Factors affecting migration rate –TiseliusMoving Boundary Electrophoresis, Paper electrophoresis, SDS – PAGE.

Unit II Buffers and Electrodes

pH, pOH, Buffer, mechanism of buffer action – first line and second line of defence, buffers in body fluids – buffer capacity. Measurement of pH using indicator – Glass electrode and its applications.

Unit III Chromatography I

General principles of chromatography – Partition and Adsorption. Principles operational procedure and applications of Paper Chromatography, Column Chromatography – Thin Layer Chromatography.

Unit IV Chromatography II

Procedure and Applications of – Molecular sieve chromatography, Gas Liquid Chromatography, HPLC.

Unit V Centrifugation

Centrifugation technique; Basic principles – Rotors – Types of Rotors. Preparative and Analytical Ultra Centrifugation techniques,Sedimentation Rate, Svedberg UnitDifferential, Density Gradient, Isopycnic& Rate Zonal Centrifugation.

TEXTBOOKS:

4. P.Narayanan ,"Essentials of Biophysics",2nded , New Age Publishers, New Delhi
5. Deb, A.C (2004). Fundamentals of Biochemistry. 8th Edition, New Central Book Agency,
6. Jain, J.L & Jain, (2005) Fundamentals of Biochemistry. Sixth Edition,S.Chand& Company, New Delhi.

REFERENCES:

4. M.A.Subramanian, “Biophysics- Principles And Techniques”,MJP publishers, Chennai
5. M.V.Volbenshtein , “Biophysics”, MIR publishers, Moscow ,1983
6. William huges , “Aspects of biophysics”,John Wiley and sons,N.Y,1979
7. L.E.Ackermann, “Biophysical Science”, L.B.E.Eillis And Williams ,1979
8. Wilson, K. & Walker, J. Principles and Techniques of Biochemistry and Molecular Biology. CUP, 7th edn, 2010

II B.Sc ZOOLOGY	ALLIED BIOCHEMISTRY (75 hrs) For the students admitted in the year 2019	19ABC303
SEMESTER-III		HRS/WK-5
ALLIED-1		CREDIT-3

Learning objectives:

To learn and understand the structure, properties and functions of Biomolecules like carbohydrate, proteins, lipids and nucleic acids.

Course Outcomes:

CO1: To gain the knowledge about the classification, structure, properties and functions of carbohydrates.

CO2: Able to understand the classification, structure, properties and importance of amino acids.

CO3: To understand and gain knowledge about the classification of proteins, levels of structural organization of proteins and its properties.

CO4: To gain insights about the types, structure and properties of nucleic acids.

CO5: To acquire knowledge about the classification, structure and properties of different types of lipids.

SEMESTER II	SUB CODE: NEW CODE					ALLIED BIOCHEMISTRY								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	5	2	2	2	4	2	2	3	3	3	5	3	3.2
CO2	4	3	2	2	2	4	4	3	3	3	3	5	3	3.2
CO3	3	3	2	3	2	3	5	3	3	4	4	5	3	3.3
CO4	4	4	4	3	2	3	5	5	5	5	5	5	5	4.2
CO5	3	3	2	2	2	4	5	5	4	3	5	5	3	3.5
Mean overall score														3.5

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Assciation	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I CHEMISTRY OF CARBOHYDRATES [20 hrs]

Carbohydrates-Definition, structure : linear and ring forms (Haworth formula), classification of carbohydrates; Monosaccharides (Glucose , Fructose), Disaccharides (Lactose and Sucrose), Physical properties – Mutarotation. chemical properties-oxidation, reduction and osazone formation. Polysaccharides: starch and cellulose- structure and functions**.**

UNIT II AMINOACIDS [15 hrs]

Aminoacids- structure and classification based on structure. Standard and non standard amino acids, essential and non essential amino acid. Physical properties: Acid base properties; isoelectric points and zwitter ions. General reactions of amino acids – Edman's reaction, Sanger's reaction, reaction with Dansyl chloride, Van Slyke reaction and Ninhydrin reaction.

UNIT III CHEMISTRY OF PROTEINS [10 hrs]

Classification of proteins based on size, chemical composition and functions , structure of proteins- peptide bond, primary, secondary, tertiary and quaternary structure of proteins, forces that determine folding and conformation and structural organization, Physical properties: salting in and salting out and denaturation.

UNIT IV CHEMISTRY OF NUCLEIC ACIDS [15 hrs]

Nucleotides and Nucleosides, phosphodiester linkage; Nucleic acid types –DNA and RNA; structure- double helical structure of DNA; Denaturation , Tm and hyperchromicity structure of RNA; tRNA, mRNA and rRNA.

UNIT V CHEMISTRY OF LIPIDS [15 hrs]

Introduction, definition and classification of lipids- simple, compound (phospholipids) and derived lipids (cholesterol).Classification and nomenclature of fatty acids – saturated fatty acid and unsaturated fatty acid. Physical property- emulsification. Chemical properties- saponification number, Rancidity, acid number, Iodine number and Reichert – Meissl number.

TEXTBOOKS :

1. Deb, A.C (2004). Fundamentals of Biochemistry. 8th Edition, New Central Book Agency,

2. Jain, J.L & Jain, (2005) Fundamentals of Biochemistry. Sixth Edition,S.Chand& Company, New Delhi.

REFERENCES:

1. .Nelson, D. L. & Cox, M. M. Lehninger Principles of Biochemistry. Freeman, 5th edn, 2008.
3. Robert Murray, Bender, (2012) Harper's Illustrated Biochemistry.McGraw Hill
4. U.Sathayanarayana,(2006). Biochemistry. 3rd Edition by Books and Allied (P) Ltd., India.
5. Mallikarjuna Rao N,2002, " Medical Biochemistry",2nd Edition, New Delhi,New Age International Publishers

PRACTICAL SYLLABUS

(Students Admitted From the Year 2018)

II B.Sc ZOOLOGY	**ALLIED BIOCHEMISTRY PRACTICALS For the students admitted in the year 2019**	**19ABP303**
SEMESTER-III		**HRS/WK-3**
ALLIED-3		**CREDIT-2**

QUALITATIVE ANALYSIS

1. Qualitative analysis of Carbohydrates (Glucose, Fructose ,Sucrose,Lactose , Maltose, Starch).
2. Qualitative analysis of Aminoacids(Arginine, Tryptophan, Tyrosine, Histidine).

VOLUMETRIC ANALYSIS

1.Estimation of Ascorbic acid using dicholorophenol indophenol dye as link solution

2. Estimation of Glycine by Sorrenson formal titration

3. Estimation of Glucose by Benedict's method

I B.ScMICROBIOLOGY	ALLIED BIOCHEMISTRY PRACTICAL-1 For the students admitted in the year 2019	19ABP101
SEMESTER-I		HRS/WK-3
ALLIED-1		CREDIT-2

QUALITATIVE ANALYSIS

1. Qualitative analysis of Carbohydrates (Glucose, Fructose ,Sucrose,Lactose , Maltose, Starch).
2. Qualitative analysis of Aminoacids(Arginine, Tryptophan, Tyrosine, Histidine).

PREPARATION

1. Preparation of starch from potatoes
2. Preparation of casein from milk
3. Preparation of albumin from egg

I B.Sc MICROBIOLOGY	ALLIED BIOCHEMISTRY PRACTICAL-2 For the students admitted in the year 2019	19ABP201
SEMESTER-II		HRS/WK-3
ALLIED-2		CREDIT-2

I VOLUMETRIC/COLORIMETERANALYSIS

1.Estimation of Ascorbic acid using dicholorophenol indophenol dye as link solution

2. Estimation of Glycine by Sorrenson formal titration

3. Estimation of Glucose by Benedict's method.
4. Estimation of protein by lowry method
5. Estimation of iron

II HEMATOLOGY

1. Blood grouping
2. ESR
3. RBC & WBC Count
4. Bleeding and clotting time.
5. Estimation of Hemoglobin

III Urine analysis

SKILL PAPER

II –Year	**FIRST AID** **From the year 2019 onwards**	**19AOFA31** **19AOFA41**
SEMESTER-III &IV		**HRS/WK-3**
Skill Elective		**CREDIT-2**

Learning objectives:

- To inculcate the students for handling the medical emergencies.
- At the end of the course the candidate will be able to manage a casualty who is injured at work, or suffers from a serious illness, while waiting for more qualified medical help to arrive.

Course Outcomes

CO1: To understand basic concept of first aid, wounds, hemorrhages and also demonstrate skill needed to assess the ill or injuries.

CO:2 To demonstrate skill to assess and manage respiratory emergencies, DM and also gain knowledge about liver and kidney emergencies.

CO3: To acquire in depth knowledge about various types of poisoning, bites and also learn causes, symptom and treatment for heart attack

CO4: To gain knowledge about causes, symptom and treatment for head ache, ear ache, tooth ache common cold, diarrhea, dysentery and constipation

CO5: To understand importance of fat, carbohydrate, protein, vitamins and its physiological function.

SEMESTER II	SUB CODE: NEW CODE					FIRST AID								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	3	4	3	5	5	4	5	3	4	4	5	5	4.2
CO2	3	4	3	3	4	5	5	3	4	5	5	4	4	4
CO3	3	4	4	3	5	3	5	5	5	5	4	3	5	4.1
CO4	5	3	4	4	5	4	5	3	4	3	4	4	3	3.9
CO5	5	4	4	4	5	5	3	3	4	4	4	3	5	4.0
Mean overall score														4.0

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I PRINCIPLES OF FIRST AID

Definition of first aid, objects of first aid,principles of first aid-Responsibilities-golden rules of first aid - kit for first aider. Diagnosis –blood pressure-bleeding or hemorrhage-types of hemorrhage- Wounds-types-open and closed wounds-emergency care for general wounds-wound with foreign body-special wounds-wounds to the palm of the hand, abdominal wounds. Bandages- general rules of applying bandages and its types.

UNIT II MEDICAL EMERGENCIES

Choking-symptoms –signs and treatment –methods of back slap-adults –infants and children-asphyxia –causes-symptoms and signs and treatment- drowning -effects-symptoms and signs and treatment-suffocation – suffocation by poisonous gases. Diabetic emergencies – Hyperglycemia, Hypoglycemia-symptoms, signs and treatment, Liver emergency, Kidney Emergency.Smoking-hazards & prevention, alcoholic hallucinations & management.

UNIT III INJURIES AND ANAPHYLACTIC SHOCK

Poisoning –Routes of poisoning, Effects of poisoning-treatment and measures, Stroke-Heart Attack-coronary obstruction and cardiac arrest- signs and symptoms –Treatment, insect bites- snake bites-dog bites-symptoms and treatment.Injuries-head injuries-burns and scalds-chemical burns-electric burns-radiation burns-and cold burns-sign-symptoms and treatment.

UNIT IVCOMMON AILMENTS

Headache, tooth ache and ear ache: causes, signs, symptoms and treatment. Common cold, cough, Diarrhoea and dysentery: causes, symptoms, signs and treatment. Constipation and travel sickness: signs, symptoms and treatment

UNIT V FOOD AND NUTRITION

Importance of carbohydrates-proteins-fats –their physiological function –Vitamins –fat soluble –water soluble-daily requirements –functions and deficiency

References

1. Sathya Narayanan U,1999, “Biochemistry”, (2nd Edition),kolkata,Allied Publishers

2. Manual of First aid –L.C.Gupta Abhitab-2004, jaypee brothers, medical publishers (p)ltd,newdelhi,India.

3.Dr. M. Swaminathan,1987, "Food and Nutrition Vol I&II", Second edition,Bangalore,

Bappco Publishers

SHORT TERM COURSE ON WATER QUALITY ANALYSIS

No of weeks: 2 Duration: 30Hrs

Learning Objectives:

To impart practical skill in water quality testing and provide them opportunity to be employable in future

Syllabus

Introduction – Water quality, soft water, hard water differences and applications (3 Hrs)

TDS and turbidity (3Hrs)

Determination of total hardness (Temporary and permanent hardness) in water samples (3Hrs)

Alkalinity and pH of the water sample (3Hrs)

Chemical oxygen demand (3Hrs)

Estimation of chloride (3Hrs)

Estimation of nitrate (3Hrs)

Estimation of sulfate (3Hrs)

Estimation of fluoride (3Hrs)

Elements in water (any three- iron, copper and Magnesium)

Microbial studies in water – Pathogenic organisms and determination methods (2Hrs)

Evaluation (3Hr)

References

1.Water Quality Analysis Laboratory Methods, National Environmental Engineering Research Institute (NEERI), Nagpur Council of Scientific & Industrial Research, New Delhi, Govt. of India

2. Methods to Identify and Detect Microbial Contaminants in Drinking Water-Identifying Future Drinking Water Contaminants -The National Academies Press files

Total Dissolved Residue (Total Dissolved Solids, TDS) in Aqueous Matrices Environmental Express 2345A Charleston Regional Parkway Charleston, SC 29492 800-343-5319