

M.Sc.,
MEDICAL BIOCHEMISTRY

SYLLABUS

FROM THE ACADEMIC YEAR
2023 - 2024

TAMIL NADU STATE COUNCIL FOR HIGHER EDUCATION
CHENNAI – 600 005.

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TANSICHE REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION	
Programme	M.Sc., Medical Biochemistry
Programme Code	
Duration	PG - Two Years
Programme Outcomes (Pos)	<p>PO1: Problem Solving Skill Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.</p> <p>PO2: Decision Making Skill Foster analytical and critical thinking abilities for data-based decision-making.</p> <p>PO3: Ethical Value Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.</p> <p>PO4: Communication Skill Ability to develop communication, managerial and interpersonal skills.</p> <p>PO5: Individual and Team Leadership Skill Capability to lead themselves and the team to achieve organizational goals.</p> <p>PO6: Employability Skill Inculcate contemporary business practices to enhance employability skills in the competitive environment.</p> <p>PO7: Entrepreneurial Skill Equip with skills and competencies to become an entrepreneur.</p> <p>PO8: Contribution to Society Succeed in career endeavors and contribute significantly to society.</p> <p>PO 9 Multicultural competence Possess knowledge of the values and beliefs of multiple cultures and a global perspective.</p> <p>PO 10: Moral and ethical awareness/reasoning Ability to embrace moral/ethical values in conducting one's life.</p>
Programme Specific Outcomes (PSOs)	<p>PSO1 – Placement To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.</p> <p>PSO 2 - Entrepreneur To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.</p> <p>PSO3 – Research and Development</p>

	<p>Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.</p> <p>PSO4 – Contribution to Business World To produce employable, ethical and innovative professionals to sustain in the dynamic business world.</p> <p>PSO 5 – Contribution to the Society To contribute to the development of the society by collaborating with stakeholders for mutual benefit.</p>
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Credit Distribution for PG Programme

Semester-I	Credit	Semester-II	Credit	Semester-III	Credit	Semester-IV	Credit
1.1. Core-I	4	2.1. Core-IV	4	3.1. Core-VII	4	4.1. Core-X	4
1.2 Core-II	4	2.2 Core-V	4	3.2 Core-VII	4	4.2 Core-XI	4
1.3 Core – III	4	2.3 Core – VI	4	3.3 Core – IX	4	4.3 Core – XII	4
1.4 Elective (Generic / Discipline Centric)- I	3	2.4 Elective (Generic / Discipline Centric) – III	3	3.4 Elective (Generic / Discipline Centric) – V	3	4.4 Elective (Generic / Discipline Centric) – VI	3
1.5 Elective (Generic / Discipline Centric)-II	3	2.5 Elective (Generic / Discipline Centric)-IV	3	3.5 Core Industry Module	3	4.5 Project with Viva-Voce	3
1.6 Ability Enhancement Course- Soft Skill -1	2	2.6 Ability Enhancement Course - Soft Skill -2	2	3.6 Ability Enhancement Course- Soft Skill -3	2	4.6 Ability Enhancement Course- Soft Skill -4	2
Skill Enhancement Course SEC 1	2	2.7 Skill Enhancement Course SEC 2	2	3.7 Skill Enhancement Course – Term Paper and Seminar Presentation SEC 3	2	4.7 Skill Enhancement Course - Professional Competency Skill	2
				3.8 Internship/ Industrial Activity	2	4.8 Extension Activity	1
	22		22		24		23
	Total Credit Points						91

Core- Papers	12 x 4 = 48
Elective (Generic / Discipline Centric)	8 x 3 = 24
Ability Enhancement Course- Soft Skill -	8 x 2 = 16
Internship/ Industrial Activity	1 x 2 = 2
Extension Activity	1 x 1 = 1
Total Credits	91

Component wise Credit Distribution

Credits	Sem I	Sem II	Sem III	Sem IV	Total
Part A	18	18	18	18	72
Part B					
(i)Discipline- Centric/Generic Skill	2	2	2	2	8
(ii)Soft Skill	2	2	2	2	10
(iii)Summer Internship/Industrial Training			2		
Part C				1	1
Total	22	22	24	23	91

METHODS OF EVALUATION		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments / Snap Test / Quiz	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
Total		100 Marks
METHODS OF ASSESSMENT		
Remembering (K1)	<ul style="list-style-type: none"> • The lowest level of questions require students to recall information from the course content • Knowledge questions usually require students to identify information in the textbook. 	
Understanding (K2)	<ul style="list-style-type: none"> • Understanding of facts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words. • The questions go beyond simple recall and require students to combine data together 	
Application (K3)	<ul style="list-style-type: none"> • Students have to solve problems by using / applying a concept learned in the classroom. • Students must use their knowledge to determine an exact response. 	
Analyze (K4)	<ul style="list-style-type: none"> • Analyzing the question is one that asks the students to break down something into its component parts. • Analyzing requires students to identify reasons causes or motives and reach conclusions or generalizations. 	
Evaluate (K5)	<ul style="list-style-type: none"> • Evaluation requires an individual to make judgment on something. • Questions to be asked to judge the value of an idea, a character, a work of art, or a solution to a problem. • Students are engaged in decision-making and problem – solving. • Evaluation questions do not have single right answers. 	
Create (K6)	<ul style="list-style-type: none"> • The questions of this category challenge students to get engaged in creative and original thinking. • Developing original ideas and problem solving skills 	

**PROGRAMME OUTCOMES (PO) - PROGRAMME SPECIFIC OUTCOMES
(PSO) MAPPING**

PROGRAMME SPECIFIC OUTCOMES (PSO)					
	PO1	PO2	PO3	PO4	PO5
PSO1	3	3	3	3	3
PSO2	3	3	3	3	3
PSO3	3	3	3	3	3
PSO4	3	3	3	3	3
PSO5	3	3	3	3	3

Level of Correlation between PO's and PSO's

(Suggested by UGC as per Six Sigma Tool – Cause and Effect Matrix)

Assign the value

1 – Low

2 – Medium

3 – High

0 – No Correlation

M.Sc., MEDICAL BIOCHEMISTRY

S.No.	Subject	Subject Title	Instruction Hrs/Week	Exam Hours	University Examination			Credits
					Internal (25%)	External (75%)	Total	
I SEMESTER								
1	Core I	CHEMISTRY OF BIOMOLECULES	5	3	25	75	100	4
2	Core II	BIOCHEMICAL TECHNIQUES	5	3	25	75	100	4
3	Core III	CELLULAR BIOCHEMISTRY	5	3	25	75	100	4
4	Elective I	HUMAN ANATOMY AND PHYSIOLOGY	5	3	25	75	100	4
5	Core Practical I	LAB COURSE-I	5	6	40	60	100	4
6	Core Practical II	LAB COURSE-II	5	6	40	60	100	4
II SEMESTER								
1	Core IV	BIOENERGETICS AND INTERMEDIARY METABOLISM	5	3	25	75	100	4
2	Core V	CLINICAL ENZYMOLOGY	4	3	25	75	100	4
3	Core VI	ADVANCED ENDOCRINOLOGY	5	3	25	75	100	4
4	Elective II	MEDICAL MICROBIOLOGY	4	3	25	75	100	4
5	Common Paper	HUMAN RIGHTS	2	3	25	75	100	
6	Core Practical III	LAB COURSE-III	5	6	40	60	100	3
7	Core Practical IV	LAB COURSE-IV	5	6	40	60	100	3

S.No.	Subject	Subject Title	Instruction	Exam Hours	University Examination			Credits
					Internal	External	Total	
III SEMESTER								
1	Core VII	IMMUNOLOGY	4	3	25	75	100	5
2.	Core VIII	PHARMACEUTICAL BIO-CHEMISTRY AND TOXICOLOGY	4	3	25	75	100	5
3.	Core IX	CLINICAL AND NUTRITIONAL BIOCHEMISTRY	4	3	25	75	100	5
4.	Elective III	BIOSTATISTICS & MEDICAL BIOINFORMATICS	4	3	25	75	100	4
5.	EDC	CHOICE OF PAPER SELECTED BY THE COLLEGE OR DEPARTMENT	4	3	25	75	100	4
6.	Core Practical V	LAB COURSE-V	5	6	40	60	100	3
7.	Core Practical VI	LAB COURSE-VI	5	6	40	60	100	3
IV SEMESTER								
1	Core X	BIOMEDICAL INSTRUMENTATION	5	3	25	75	100	5
2.	Elective IV	MOLECULAR BIOLOGY AND BIOTECHNOLOGY	4	3	25	75	100	4
3.	Project				40	60	100	6
Total Credits								91

S.No	Type of paper	Title of the subject
1.	Core I	CHEMISTRY OF BIOMOLECULES
2.	Core II	BIOCHEMICAL TECHNIQUES
3.	Core III	CELLULAR BIOCHEMISTRY
4.	Elective I	HUMAN ANATOMY AND PHYSIOLOGY
5.	Core Practical I	LAB COURSE-I
6.	Core Practical II	LAB COURSE-II
7.	Core IV	BIOENERGETICS AND INTERMEDIARY METABOLISM
8.	Core V	CLINICAL ENZYMOLOGY
9.	Core VI	ADVANCED ENDOCRINOLOGY
10.	Elective II	MEDICAL MICROBIOLOGY
11.	Common Paper	HUMAN RIGHTS
12.	Core Practical III	LAB COURSE-III
13.	Core Practical IV	LAB COURSE-IV
14.	Core VII	IMMUNOLOGY
15.	Core VIII	PHARMACEUTICAL BIO-CHEMISTRY AND TOXICOLOGY
16.	Core IX	CLINICAL AND NUTRITIONAL BIOCHEMISTRY

17.	ElectiveIII	BIostatistics &MEDICALBIOINFORM ATICS
18.	EDC	CHOICEOF PAPERSELECTED BY THE COLLEGE ORDEPARTMENT
19.	Core Practical V	LABCOURSE-V
20.	CorePra cticalVI	LABCOURSE-VI
21.	CoreX	BIOMEDICALINSTRUMNTATION
22.	ElectiveIV	MOLECULARBIOLOGY ANDBIOTECHNOLOGY
23.	Project	

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER I**

CourseName:ChemistryofBiomolecules	Hours	L	T	P	Credit
Coursecode:		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType:CoreI				

OBJECTIVE

❖ **To study the structure and functions of macromolecules UN**

IT-I

Carbohydrates: Definition, Biological importance of Carbohydrates. Stereoisomerism and Optical isomerism of sugars (Fischer and Haworth Projection formulae). Cyclic structure, Epimers, Anomers and Mutarotation. Monosaccharides – Classification, Structure and Biological importance of Hexose sugars; Reactions of sugars. Disaccharides - Structure, Occurrence and Biological importance of Sucrose, Lactose and Maltose. Polysaccharides: Homopolysaccharides; Structure, Occurrence and Biological functions : Starch, Glycogen, Cellulose. Chitin, Dextrin and Inulin. Heteropolysaccharides; Structure, Occurrence and Biological functions of -Hyaluronic acid, Chondroitin sulfate and Heparin. Artificial sweeteners – Saccharin and Monellin.

UNIT-II

Amino acids: Definition, Amino acids as ampholytes. Structure and classification of amino acids, Chemical reaction of amino acids. Essential and Nonessential amino acids.

Peptide bond: Structure and significance of peptide bond, amino acid sequencing (Sanger's and Edman methods).

Protein structure: Levels of structure in Protein Architecture, Primary structure of proteins (Eg. Insulin), Secondary structure of proteins – helix and pleated sheets (eg. Collagen), Tertiary structure of proteins (Eg. Myoglobin), Quaternary structure of proteins (Eg. Hemoglobin) other Forces and weak bonds stabilizing the Protein structure.

UNIT-III

Lipids: Definition, Classification and Biological role of lipids

Simple lipids - Properties and Characterization of fats – Hydrolysis, Saponification, Halogenation, Acetyl number, Rancidity of fats, Reichert-Meissel number. Compound lipids - Structure and function of phospholipids (Lecithin, Sphingomyelin, Cephalin, Phosphatidylinositol and Phosphatidylserine) and Glycolipids (Gangliosides and Cerebrosides). Derived lipids - Classification, structure and properties of saturated and unsaturated fatty acids; Essential and Nonessential fatty acids.

Sterols –Structure, Function and Properties of Cholesterol, Bile acids [no structure] , and lipoproteins biological production and significance. Eicosanoids, Prostaglandins, Thromboxanes, Leukotrienes,

Nucleic acids Structure of Purines and Pyrimidines; Unusual bases (5-Bromouracil, Pseudouridine, Inosine, Dihydroxyuridine, Methylcytosine); Nucleosides and nucleotides – structure and functions. Chemical and enzymatic sequencing methods.

DNA – Watson & Crick Model, A, B and Z forms of DNA. Properties of DNA - buoyant density, viscosity, chromic effect, T_m , denaturation, renaturation, hybridization and Cot analysis. Chemical properties

Major classes of RNA – mRNA, rRNA, tRNA, snRNA, hnRNA – structure and biological functions.

UNIT– V

Vitamins and Minerals : Classification of Vitamins - Fat soluble and water soluble. Dietary source, structures, RDA, functions and deficiency states. Macro and micro elements – Dietary source, structures, RDA, functions and deficiency of Iron, calcium, phosphorus, magnesium, iodine, Zinc and copper.

REFERENCE BOOKS

1. Lehninger's Principles of Biochemistry, Nelson, David I. and Cox, M.M., 2000 Macmillan NY
2. Fundamentals of Biochemistry, Donald Voet, Judith G. Voet and Charlotte W Pratt, 1999, John Wiley & Sons, NY
3. Biochemistry. Lubert Stryer, 3rd Edn., 1994. W H Freeman and Co, San Francisco.
4. Biochemistry 4th edition, by Zubay GL, 1988 W M C Brown Publishers.
5. Principles of Biochemistry, Garrette & Grisham, 1994, Saunders college publishing
6. Outlines of Biochemistry, Eric E. Conn, P.K. Stumpf, G. Brueins and Ray H. Doi., 1987, John Wiley & Sons, NY
7. Textbook of biochemistry, Thomas M Devlin, A 1987, 4th edition John Wiley, Inc publication, New York.

Course Outcome:

1. To explain about the structure, properties and functions of polysaccharides
2. Illustrate on structure, properties and functions of lipids, interactions of lipids in biological membrane.
3. Determine the classification, properties and significance of proteins
4. Explain about the DNA properties and functions, biological importance of histone

proteins

5. To determine the significance of vitamins and its antioxidant activity, minerals of biological significance

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER I**

CourseName:BiochemicalTechniques	Hours	L	T	P	Credit
Coursecode:		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType: CoreII				

COURSEOBJECTIVES:

This course focus on the biochemical techniques includes spectrophotometry, centrifugation, electrophoresis, radioactivity etc.,. Learning these techniques will be very useful for operating instruments and become the basic knowledge in their future

UNIT I

pH scale: buffer solution, pH electrode, Clarke's Oxygen electrode and their applications.

Microscopy: Principles and applications of light, phase contrast, fluorescence, scanning and transmission electron microscopy.: Principles, preparation of specimens for TEM and SEM.

Organ and tissue slice technique, cell disruption and homogenization technique, Microtomy – Staining and fixation. Cell sorting and cell counting of various tissue culture collections. Cryopreservation and manometric techniques.

UNIT–II

Chromatography: Principles, Instrumentation and applications of paper chromatography, exclusion chromatography, column chromatography, Chromatofocussing affinity chromatography and adsorption chromatography: Gel preparation, principle and application ion–exchange chromatography–Types of resins, apparatus preparation and application

Liquid chromatography: Principle, Instrumentation and applications of GLC, LC, LPLC and HPLC.

UNIT–III

Electrophoresis: Principles, Instrumentation and applications of paper electrophoresis, agar gel, starch gel, PAGE, Capillary electrophoresis PFGE, high and low voltage electrophoresis, Isoelectric focussing, Tachophoresis,.

Centrifugation: Principles, laws of sedimentation. Preparative and Analytical Centrifugation – Differential centrifugation and Density gradient centrifugation. Analytical Ultracentrifuges. – Instrumentation and application; Sedimentation equilibrium methods. Analysis of subcellular fractions. Criteria of purity of macromolecules.

UNIT-IV

Spectroscopy: Basic laws of light absorption, optical rotatory dispersion. Basic principles, instrumentation and applications Circular dichroism and X-ray diffraction.

Basic principles, instrumentation and applications of UV and visible light spectrophotometry, spectrofluorimetry, Atomic Flame Photometry, Plasma Emission Spectroscopy, Infra-red spectrophotometry, Mass spectrometry, Tandem mass spectrometry, ESR, NMR,

UNIT-V

Tracer techniques: Radioactive isotopes and half life of isotopes, Principles and applications of tracer techniques in biology and medical sciences, measurement of alpha, beta and gamma radiations. Radiation dosimeter, Autoradiography; Principle, Biological applications. Geiger Muller Counter and Liquid Scintillation counter.

REFERENCES:

1. Principles and techniques of practical Biochemistry, Keith Wilson and John Walker, 1995. Cambridge University Press.
2. An Introduction to Spectroscopy for Biochemists, Brown. SBA Academic Press.
3. Introduction to Centrifugation, Ford T. C. and Graham J. N., Bioscientific Publishers Ltd, Oxford.
4. Biophysical Chemistry Principles and Techniques - Avinash Upadhyay and Nirmalendranath, 2001. Himalaya Publishers.
5. A Biologist's Guide to Principles and Techniques of Biochemistry, Keith Wilson and Kenneth Goulding, Edward Arnold publishers.
6. Tools of Biochemistry David Cooper.
7. Computational Biochemistry C. Stan Tsai.

Course Outcomes:

1. Understand the working principles, construction and applications of electrochemical techniques related to various aspects of biological sciences.
2. Describe the techniques and applications of chromatography for biological sample separation.
3. Recognize how centrifugation plays a role in separation of samples with different molecular weights.
4. Have a clear picture of radioisotopes, radioactivity, decay patterns, tracer techniques and use of isotopes in biological studies.

5. Study the principles, mechanism and applications of various Electrophoretic techniques in research and industrial level.
6. Understand the law of absorption spectrum, principle and mechanism of UV visible spectrophotometry, ESR, NMR, IR, spectrofluorimetry, turbidimetry, nephelometry and luminometry, thereby learn its applications in research level.

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER I**

CourseName:CellularBiochemistry	Hours	L	T	P	Credit
		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType:CoeIII				

COURSEOBJECTIVES:

To Know about tissue types, organization and classes of cell junctions and describe the role of cell adhesion molecules and ECM components. Understand what happens during the cell cycle and cell death and explain about membrane transports and checkpoints in the cell cycle.

Unit I

Origin of single cell – theories and concepts. Cell cycle: Prokaryotic and eukaryotic cell cycle, cell growth and extracellular signal molecular basis of cell cycle regulation, cell cycle checkpoints, cyclin and cyclin dependent kinases, Apoptosis: Survival and death factors cell death receptors, cell-cell interactions in cell rescue and death, erythropoietin in RBC development. Molecular apoptotic events in *C. elegans* and mammals, bcl family of proteins, caspases, significance of apoptosis

UNIT-II

Cell environment: Extracellular matrix, glycocalyx, basal lamina, components of ECM – fibronectin, laminin, collagen, heparin sulphate, proteoglycans, role of ECM in cell growth and survival. Cytoskeletons: Microtubules and Microfilaments, G and F actin, dynamics of actin assembly and polymerization, myosin and molecular motors. microvilli and pseudopodia extension. Intermediate filaments: types and functions.

Kinetochores architecture and spindle assembly focal adhesion points,. Major types of cell adhesion molecules (CAMs) – Cadherin, Integrins, Selectins and superfamily Immunoglobulin

UNIT-III

Cell-cell communication: Autocrine, paracrine, endocrine, juxtacrine communication. Nitric oxide and paracrine factors involved in communication EGF's Hedgehog family, Wnt family, TGF β superfamily, BMP family, signal transduction pathways: G protein, cAMP pathway, IP $_3$ pathway, RTK pathway, MAP kinase pathway. Major classes of cell junctions – anchoring, Gap, tight junctions

UNITIV

Composition of Cell membrane: Lipid Bilayer, Peripheral and Integral proteins. Fluid mosaic model. Membrane transport types: Uniport, Symport, Antiport. Active transport: P-

types [Na⁺K⁺ATPases, F-Type ATPases (ATP synthetases), Ionophores, Ion channels and ligand/voltage gated channels]

Protein sorting: Golgi and endoplasmic reticulum and lysosome complex in protein targeting, signal recognition particles – chaperons and protein folding. GPI anchoring, targeting of proteins to mitochondria, protein glycosylation and post translational modification, vesicular transport and secretory pathways.

UNIT V

Cancer Biology: Etiological factors, primary, secondary tumors benign and malignant tumors. Onco gene: proto oncogenes and viral oncogenes, oncogene activation, tumor suppressor genes, DNA tumor viruses, tumor specific antigens and tumor evasion. Metastasis: Molecular events in migration, extravasation, chemokines, role of ECM in metastasis. Angiogenesis: angiogenic and antiangiogenic factors, vasculogenesis. Types of cancer cells and morphological alterations.

REFERENCE BOOKS

1. Molecular Cell Biology, 4th edn. (2000) by Lodish H, Baltimore and others W.H. Freeman and company, NY
2. Molecular Biology of cells, B. Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter, 5th Edn. 2008. G.S. Garland Sciences, Taylor & Francis Group, New York
3. Cell Biology by David E Sadava, 2004, Panima Book Publishing Corporation, New Delhi
4. Cell and Molecular Biology by EDP De Robertis and EMF De Robertis
5. Principles of Cell Biology by Klein Smith and MKish
6. Cell and Molecular Biology 3rd Edn. Gerald Karp, John Wiley & Sons Inc.

Course Outcome:

1. Know about tissue types, organization and classes of cell junctions and describe the role of cell adhesion molecules and ECM components.
2. Understand what happens during the cell cycle and cell death and explain about membrane transports and checkpoints in the cell cycle.
3. To understand the basic structures, properties and organisation of eukaryotic and prokaryotic chromosomes.
4. Pertain on Overview of cell cycle, cell growth, tumors, cancers and isolation techniques
5. Describe oncarcinogenesis

M.Sc. MEDICAL**BIOCHEMISTRY SEME****STERI**

CourseName: Human Anatomy and Physiology	Hours	L	T	P	Credit
		3	1	0	4
Total Marks: Internal –25 External –75	Paper Type: Elective I				

COURSE OBJECTIVES:

To study the mechanism of human body systems and mode of action of Hormones

UNIT I**HUMAN ANATOMY:**

Overview of Anatomy – Medical and Anatomical terminology – Sections of the body – Anatomical Variations – Organization of the body cells, Tissues.

Introduction to Systemic Anatomy – Types of bone – Joints – Classification of joints – innervations of joints – Muscle tissue and muscular system – Types of Muscles
Anatomical structure of Liver, Kidney and stomach

UNIT II**Cardiovascular system:**

Blood and Body fluids: Composition and function, Red blood cells, Hemoglobin, white blood cells and platelets. Blood coagulation, blood groups and blood transfusion. Formation and functions of lymph. Body buffers.

Cardiac output - Definitions, factors affecting, physiological variations, regulation of heart rate. Coronary circulation. **Pulse** - Jugular pulse, radial pulse and tripler response.

Heart sounds - Cause, characteristics and significances. Cardiac rhythm and tachycardia

UNIT III

Respiratory system: Diffusion of gases in lungs, transport of oxygen from lungs to tissues via blood, factors influencing the transport of oxygen. Transport of CO₂ from tissues to lung through blood, factors influencing the transport of CO₂.

Excretory System: Mechanism of formation of urine, composition of urine, Micturition.

Renal regulation of acid balance, Mechanism of tubular reabsorption and excretion of urine. Influence of hormone in kidney function.

UNIT IV

Digestive system: Secretion of digestive juices, digestion and assimilation of Carbohydrates, Proteins, Fats and vitamins. Gastrointestinal hormones.

Nervous system: Structure of neuron, resting potential and action potential, Propagation of nerve impulses, Structure of synapse, synaptic transmission (electrical and chemical theory). Structure of neuromuscular junction and mechanism of neuromuscular transmission, Second messengers, Neurotransmitters.

UNIT V

Reproductive systems

Function of reproductive system. Male reproductive system - functions of testis, spermatogenesis site and stage factors influencing semen, Endocrine functions of testis, Androgens - Testosterone - structure and functions.

Female Reproductive system - Ovulation, Menstrual cycle, physiological changes during pregnancy - Actions of oestrogen, progesterone, functions of placenta.

Lactation - Composition of milk and factors controlling lactation

REFERENCE BOOKS

1. Human Physiology - Volume I & II, Chatterjee, C.C - 11th edition, 1992.
2. Textbook Medicinal Chemistry, Chatterjee, C.
3. Textbook of human physiology, Saradha Subramaniam
4. Textbook of Medical physiology, Guyton, 2001, 10th Edn., W.B. Saunders
5. Agarwal physiological T.B. of Biochemistry, Agarwal G.R & Agarwal B.P. Chemistry.
6. Harper's Biochemistry, Murray, R.G. et al., 2009, 24th edition.
7. Lecture notes on human physiology, Vol III, M.M. Muthiah 1991
8. Concise human physiology, Sukkar, M.Y. Munshid and Ardawi
9. Review of Medical Physiology Gaanong, W.F

Course Outcomes:

1. To understand the fundamental mechanisms of body fluids and blood cells.
2. Illustrate the circulatory system includes heart structure, cardiac cycles and cardiac factors and respiratory system includes anatomy, physiology, gas exchange and explain the role of lungs in acid base balance.

3. Learn about the anatomy of digestive system and secretions, composition and functions of gastric and biliary system thereby learn how to digest the biomolecules in intestine.
4. Describe the structure and functions of kidney and muscle. Explain mechanism and theories of muscle contraction.
5. Recognize the role of central nervous system in human body. Study the functional units, chemical composition and metabolism of brain.

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -I**

CourseName: LabCourseI	Hours	L	T	P	Credit
		0	0	5	4
TotalMarks: Internal –25 External–75	PaperType: Practicall				

1. Microscopy
2. StainingTechniques[Morphologicalobservationonly]
3. Microtomy
4. HistochemicalTechniques
5. MitosisandMeiosis
6. CellFractionation
7. GeneralReactionsofCarbohydrates,Lipids,AminoacidsandProteins
8. IodineValue,AcidValueandSaponificationValue
9. EstimationofVitaminAand Vitamin C
10. PreparationofCholesterolfromBrain

REFERENCEBOOKS

1. Laboratorytechniques inBiochemistryandMolecularBiology,Work andWork.
2. ABiologist'sGuidetoprinciplesandofpracticalBiochemistryK.WilsonandGouldingW.H,1986. ELBSEdn.,
3. ModernExperimentalBiochemistry,BoyerR.3rdEdn.BenjaminCummingsPublications
4. LaboratoryManualinBiochemistry.JayaramanJ.1996.5thPrintNewAgeInternational Ltd.Publishers,NewDelhi.
5. Biochemical methods. Sadasivam. S. and ManickamA.,1991, 2nd edn. NewAge InternationalLtd.Publishers,NewDelhi

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -I**

CourseName:LabCourseII	Hours	L	T	P	Credit
		0	0	5	4
TotalMarks: Internal –25 External–75	PaperType:PracticalII				

1. Analyse the following contents in the selected food sample Calories, Crude fibre and Dietary fibre, Moisture, Nitrogen, Ash calcium, phosphorus, iron, carotene, thiamine, riboflavin, fat, protein
2. Estimation of amino acids
3. Separation of amino acids and sugars by paper chromatography (Ascending, Descending, and Circular)
4. Separation of Protein Hb, Cytochrome C by Molecular sieve chromatography
5. Separation of amino acids by Paper Electrophoresis
6. Separation of Serum Protein by SDS PAGE
7. Separation of DNA by AGE

REFERENCE BOOKS

1. Laboratory techniques in Biochemistry and Molecular Biology, Work and Work.
2. A Biologist's Guide to principles and of practical Biochemistry K. Wilson and Goulding W.H, 1986. ELBSEdn.,
3. Modern Experimental Biochemistry, Boyer R. 3rd Edn. Benjamin Cummings Publications
4. Laboratory Manual in Biochemistry. Jayaraman J. 1996. 5th Print New Age International Ltd. Publishers, New Delhi.
5. Biochemical methods. Sadasivam. S. and Manickam A., 1991, 2nd edn. New Age International Ltd. Publishers, New Delhi

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -II**

CourseName:BioenergeticsandIntermediarymetabolism	Hours	L	T	P	Credit
		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType:CoreIV				

COURSEOBJECTIVES:

The Course aims to understand the major metabolic pathways involved in synthesis and degradation of biomolecules and energy generation

UNIT I

Bioenergetics: Energy transformation, Laws of thermodynamics, Gibbs energy, Free energy changes and redox potential, ATP as Energy Currency of cells, High and low energy compounds – Electron transport chain, Oxidative phosphorylation, Inhibitors and Uncouplers of ETC, shuttle systems.

UNIT II**Carbohydrate Metabolism**

Introduction to metabolism of cells, glycolysis and its regulation, citric acid cycle, its function in energy generation and regulation of TCA cycle, Gluconeogenesis and its regulation, Metabolism of glycogen and its regulation. Hexose Monophosphate Pathway, Uronic acid pathway, Cori cycle, Metabolism of other hexoses – Fructose, Galactose. Hormonal influence and regulation of Carbohydrate metabolism.

UNIT III**Lipid Metabolism:**

Biosynthesis of Fatty acid - Palmitic acid, Stearic acid, Oleic acid, linoleic acid and Arachidonic acid, Oxidation of saturated and unsaturated fatty acids. Oxidation of fatty acids - alpha, beta and omega oxidation in even and odd numbered fatty acids. Metabolism of Triacyl glycerol, phospholipids and sphingolipids. Cholesterol biosynthesis and regulation. Catabolism transport and excretion of cholesterol, lipoprotein metabolism. Ketone bodies formation and utilization.

UNIT IV**Amino acid Metabolism**

Biosynthesis and Degradation of Tryptophan, Phenylalanine, Lysine, Methionine and

Glutamine. Transamination, oxidative and non-oxidative deamination, decarboxylation-urea cycle and its regulation. Integration of metabolic Pathways. Interrelationship of carbohydrates, proteins and fat metabolism. Interconversion of major food stuffs. Metabolic profile of the principal organs and their relationships.

UNITY

Nucleotide Metabolism

Purine nucleotides Metabolism: de novo synthesis, salvage pathway and catabolism with energetics.

Pyrimidine nucleotides Metabolism: de novo synthesis, salvage pathway and degradation of pyrimidine nucleotides. Regulation of Purine and Pyrimidine nucleotide metabolism. Synthesis of RNA, rRNA and mRNA with regulation.

REFERENCE BOOKS

1. Lehninger's Principles of Biochemistry, Nelson, David L. and Cox, 2000. M.M. Macmillan/ Worth, NY
2. Fundamentals Of Biochemistry, Donald Voet, Judith G. Voet and Charlotte W Pratt, 1999, John Wiley & Sons, NY
3. Outlines of Biochemistry, Eric E. Conn, P.K. Stumpf, G. Brueins and Ray H. Doi, 1987. John Wiley & Sons, NY
4. Biochemistry, Lubert Stryer, 1994. 3rd Edn., W.H. Freeman and Co, San Francisco.
5. Textbook of biochemistry, Thomas M Devlin, 1997. 4th edition, A John Wiley, In
6. Biochemistry, Zubay GL, 1988. 4th edition WMC Brown Publishers.
7. Principles of Biochemistry, Garrette & Grisham, 1994. Saunders college Publishing
8. Harper's Biochemistry, R.K. Murray and others, 25th ed 2009. Appleton and Lange, Stanford
9. Regulation in Metabolism, E.A. Newshome, C. Start, John Wiley & Sons.

Course Outcomes:

1. Understand the energy transformation and chemical logic of metabolic pathways in living organisms.
2. Know in detail about enzymes, redox carriers, ETC and oxidative phosphorylation machinery.
3. Recognise carbohydrate metabolism and its various biochemical processes responsible for the formation, breakdown and interconversion of carbohydrates in living organisms.

4. Describe what happens in the lipid metabolism, fatty acid oxidation, cholesterol synthesis and degradation as well as in ketogenesis and plasma lipoproteins.
5. Describe what happens during protein, nucleic acid and porphyrin metabolism

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -I**

CourseName: Clinical Enzymology	Hours	L	T	P	Credit
		3	1	0	4
Total Marks: Internal –25 External–75	Paper Type: Core V				

COURSE OBJECTIVES

This paper aims to provide a basic understanding of biological catalysis, Mechanism of action of enzymes, structure and function relationship, Understanding the enzyme kinetics and role of coenzymes/co-factors and an overview of Industrial application of enzymes

UNIT I

IUB system of classification and nomenclature, Enzyme units, Active site, Enzyme Kinetics- Activation energy, Derivation of Michaelis-Menten equation, Factors affecting enzyme activity, Enzyme assay, Coenzymes, Isoenzymes and multienzyme complex, Mechanism and regulation of enzyme action- Allosteric and feedback regulation.

UNIT II**Principles of Diagnostic Enzymology –**

Laboratory investigation of serum and urinary enzymes, Intracellular localization of enzymes, Diagnostic and Prognostic importance of plasma and non plasma specific enzymes. Cytosolic enzymes – SGPT, ALP and Myocardial isoenzymes LDH, CPK – their source, properties, function, normal value, diagnostic importance. Significance of enzymes in bone disorder and muscle wasting

UNIT III

Clinical significance of Enzymes - Transaminases, Creatine Kinase, Lactate Dehydrogenase, Alkaline phosphatase, Acid phosphatase, Aldolases, Amylases, Elastase, Gamma glutamyl Transferase, 5'-Nucleotidase, Choline Esterases, Hexokinase, Lipoprotein Lipase.

UNIT IV

Enzymes in Inborn error of metabolism – Phenylketonuria, Alkaptonuria, Tyrosinosis, Albinism, Hartnup's disease, Galactosemia, Tay-Sachs' disease, Niemann-Pick's disease, Hunter Syndrome, Lesh-Nyhan Syndrome.

UNIT V

Enzymes in Medicine and diagnosis. Normal and Abnormal value of diagnostic marker enzymes, Enzymes in detoxication of drug metabolism, Enzymes in diagnosis: Cerebrospina

fluid, Amniotic fluid and Biopsy samples. Antioxidant enzymes – SOD, Catalase, GPX and GR. Therapeutic enzymes: Thrombolytic enzyme, wound healer, erythropoiesis stimulator

REFERENCE BOOKS

1. Enzymes By Dixon, E. C Webb, C. J. R Thorne and K. F. Tipton, Longmans, London.
2. Fundamentals of Enzymology, Nicholas C. Price, and Lewis Stevens, 1998. 2nd ed., .
3. Understanding Enzymes, Trevor Palmer, 1991. 3rd Edn., Ellis Horwood Limited.
4. Protein Biotechnology, Gary Walsh and Denis Headon, 1994. John Wiley and Sons,
5. Protein Biochemistry and Biotechnology, Gary Walsh, 2002, John Wiley and Sons Ltd.
6. Enzyme kinetics and Mechanism – Paul F. Cook

Course outcomes

After the completion of this course, the student will be able to

1. Distinguish the fundamentals of enzyme properties, nomenclatures, characteristics and Compare methods for production, purification, characterization of enzymes
2. To understand the diagnostic importance of enzymes and their significances.
3. Know about the clinical significance of the enzymes
4. Describe the enzymes involved in the inborn error of metabolism
5. To understand the importance of Enzymes in Medicine and diagnosis

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -II**

CourseName:AdvancedEndocrinology	Hours	L	T	P	Credit
		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType:CoreVI				

OBJECTIVE

- ❖ To study about the functions, mechanism of action, diagnosis and investigations of hormones

UNIT– I

Hormones - Introduction, classification, hormonal effects and regulation – basic concepts
 Chemical properties of hormones: Peptide hormones, Steroid hormone, Neurohormone.
 Concept of Receptors – Cell surface and intracellular (cytoplasmic and nuclear) receptors, G protein coupled receptors, Pharmacological receptors – Neurotransmitter receptors.
 Second messenger system – Ca^{2+} , cAMP, cGMP, DAG, and IP_3 .

UNIT– II

Chemical nature and mechanism of action of steroid hormones and glycoprotein hormones on target tissues. Hypothalamus, Pituitary- Posterior and Anterior, Thyroid, parathyroid, Adrenal and Pineal glands: Secretions, Structure, physiology and Mechanism of action.

UNIT-III

Secretions, Structure, physiological function and Mechanism of action of Pancreatic hormones – Insulin, glucagon, Gastrointestinal hormones – Gastrin, secretin and somatostatin, Sex hormones – testosterone, progesterone and oestrogen.

UNIT-IV

Secretions, Structure, physiological function, Mechanism of action, Dysfunction and pathophysiology of hypothalamus – Posterior and anterior hypophyseal complex. Dysfunction and pathophysiology of thyroid, parathyroid, pancreas, adrenals, gonads and gastrointestinal hormones.

UNIT-V

Endocrine system: Laboratory diagnosis and investigations related to the disorders of Hypothalamus - Hypophyseal complex. ELISA, [All types] PCR Techniques with reference to

hormones estimation in biological sample: Insulin, T3 and T4, TSH, FSH, LHGH, EGN, PGN.

REFERENCE BOOKS

1. Endocrinology, MacE. Hadley, 2006, 4TH. Edition. Prentice Hall International Inc
2. Textbook of Medical Physiology, Guyton and Hall, 2000. 10th Edition, Saunders Publishing Co.
3. Principles of Biochemistry, Emil Smith, Handler Abraham, 1983. 7th Edn., White, McGraw Hill International book company.
4. Williams textbook of Endocrinology, P. Reed Larson, Henry M. Korenberg, Shlom Melmed and Kenneth S. Polonsky, 2003, 10th Edition, Saunder Philadelphia, USA.
5. Harpers Biochemistry, Murray *et al.*, 2003. 2nd Edition, McGraw Hill Publications, USA.

Course outcome

1. Determine the classification and mechanism of action of hormones.
2. Explain about the chemistry, synthesis and significance of hypothalamic, pituitary and thyroid hormones.
3. Analyze about the pancreatic hormones, gastrointestinal and sex hormones
4. Predict the dysfunction of hypothalamus, parathyroid, pancreas, adrenals, gonads and gastrointestinal hormones.
5. Report on laboratory diagnosis and investigations of hormones

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -II**

CourseName:MedicalMicrobiology	Hours	L	T	P	Credit
		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType:ElectiveII				

COURSEOBJECTIVES:

The aim of the study is to get knowledge about microorganisms and their characters. Gain knowledge about the medical applications of microorganisms.

UNIT I

Classification of medically important bacteria, fungi, parasites and viruses. Infection – types

– Source –

Methods of transmission of infections. Host-parasite relationship. Bacterial virulence factors. Stain in gram and biochemical identification of bacteria. Ground rules for collection, transport and processing of clinical specimens for microbiological diagnosis

UNIT-II**Medical Bacteriology**

Morphology, cultural characters, antigenic characters, pathogenicity, laboratory diagnosis, treatment and control of diseases caused by *Staphylococcus aureus*, *Streptococcus pyogenes*, *Streptococcus pneumoniae*, *Neisseria meningitidis*, *Neisseria gonorrhoeae*, *Clostridia*, *Salmonella typhi*, *Shigella dysenteriae*, *Vibrio cholerae*, *Mycobacterium tuberculosis*, Antibacterial antibiotics – mode of action

UNIT-III**Medical Mycology**

Morphology, culture properties, pathogenicity, laboratory diagnosis, treatment and control of superficial mycosis – *Tinea nigra* and *Piedra*. Cutaneous mycosis –

Dermatophytes. Subcutaneous mycosis – *Mycetoma*. Systemic mycosis –

Histoplasma. Opportunistic mycosis

– *Candida*. Antifungal agents and mechanism of action in inhibition of fungal growth.

UNIT-IV**Medical Parasitology**

Morphology, life cycle, pathogenicity, lab diagnosis, treatment and control measures of Intestinal amoebae – *Entamoeba histolytica*. Intestinal and genital flagellates – *Giardia intestinalis* and *Trichomonas vaginalis*. Blood flagellates – *Trypanosoma*. Haemosporina – *Plasmodium*. Coccidian – *Toxoplasma gondii*. Helminthic parasites – Cestodes – *Taenia*

solium. Trematode – Fasciola hepatica. Nematodes – Ascarislumbricoides and Wuchereriabancrofti.

UNIT– V

MedicalVirology

Morphology,cultivation,replication,pathogenicity,laboratorydiagnosis,treatmentandcontrolmeasuresof diseasescausedby Poxvirus,Herpesvirus,Hepatitis(A,B andC)Orthomyxo virus – Influenza virus. Picarno virus – Polio.Paramyxo virus – Parainfluenzavirus, Mumps, Measles, .Rhubella virus, HIV, Arbo viruses.Oncogenic viruses.Emergingviruses.Antiviralagentsandmechanismofaction.

REFERENCEBOOKS

1. Principlesof Bacteriology, VirologyandImmunity.TopleyandWilson, 1995. 9thedition,Voll,EdwardArnold,London
2. Medical VirologyMorag C and Timbury, M.C 1994. 10thEdition. Churchill Livingston, London
3. Medical Microbiology, Greenwood, D., Slack, R.B. and Peutherer, JF. , 2002. 16th Edition.ChurchillLivingston,London
4. Text book of Microbiology. AnantNarayananandPaniker's2013. 9thEdition. UniversitiesPress,(India)PrivateLimited,Hyderabad.
5. AtextbookofMedicalMycology,JegadishChander,1996.Interprint.NewDelhi
6. Text book of Medical Parasitology Protozoology and Helminthology Text and colourAtlas.SubashChandraParija2013.4thEdition.AllIndiaPublishersandDistributers,New Delhi.
7. MedicalMicrobiologyandImmunology.WarrenLivingstoneandErnestJawetz2000.6thEdition. McGrawHillcompanies.Inc.

CourseOutcomes:

1. Understandtheclassificationandcontrollingofmicrobesandstudyisolationofmicrobesandmaintenance.
2. Describeimportantcharacteristicofmicroorganisms,therebyidentifydifferenttypeofmicroorganisms.
3. Studyaboutvarioustypesofmicroorganisms involvedin infectionoffoodproducts.
4. Recognisethesourcesandtransmissionofinfectionsandhowthefactorsinvolvinginfection.
5. Knowaboutthedifferenttypes ofmicroscopes anditsfunction.

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -III**

CourseName:Lab courseIII	Hours	L	T	P	Credit
		0	0	5	4
TotalMarks: Internal –25 External–75	PaperType: PracticalIII				

I. AssayofEnzymes

1. Isolation,purification,andkineticsofALPandACP inanimalsample
2. Determination of activity of enzymes: LDH, AST, ALT, CK, Phosphatase(Spectrophotometricmethod)andAntioxidant enzymes[CAT,SOD,GPx,GR].
3. SeparationofLDHisozymesinPAGEfromserum/Liver
4. KineticstudiesofAmylasesandAcidphosphatase

II. Endocrinefunctiontests

1. AssayofInsulin byELISA
2. EstimationofurinaryexcretionofVMA,5-HIAA,17 - ketosteroids, CatecholaminesandCortisol
3. Estimationofbilirubinsandhepato-biliaryfunctiontests
4. Thyroidfunctiontests –T3andT4Assay
5. Analysisofgastricjuice
6. EstimationofTSH,ProgesteroneandOestrogen.

REFERENCEBOOKS

1. LaboratoryManualinBiochemistry.J.Jayaraman,1996.5thPrint.NewAgeInternationalLtd.P ublishers,NewDelhi
2. Biochemicalmethods,S.SadasivamandA.Manickam, 1991.2ndEdn.,NewAgeInternationalLtd.Publishers,NewDelhi.
3. TextbookofPracticalBiochemistry, DavidT.Plummer,2010.3rdEdn.,BookVistas,NewDelhi

4. Enzyme structure and mechanism, AlnFersht, 1997, Reading, USA
5. Modern Experimental Biochemistry, Rodney F. Boyer, 2000. 3rd Edn. Benjamin Cummings Publications.

M.Sc. MEDICAL BIOCHEMISTRY

SEMESTER -III

REFERENCEBOOKS

1. MicrobiologylaboratoryManual., SundararajT.Mrs. AswathySunararaj, No5, 1stCross Street,Thirumalainagar,Perungudi,Chennai-96
2. Microbiology:Alaboratorymanual,JamesGCappuccinoandNatalieSherman2004. 6th edition,PublishedbyPearsonEducation.

3. Myer's and Koshy's Manual of diagnostic procedures in medical microbiology and Immunology/serology. Published by Department of Clinical Microbiology. CMC and Hospital, Vellore, Tamil Nadu
4. Experiments in Microbiology, Plant pathology and Biotechnology, Aneja KR 2005. 4th edition. New Age International publishers, Chennai.
5. Experiments in Microbiology. Rajan S and Selvi Christy 2015. Anjana Book House, Publishers and distributors, Chennai, Tamil Nadu

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -III**

CourseName:Immunology	Hours	L	T	P	Credit
		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType:CoreVII				

OBJECTIVES:

To study the immune responses of human body against antigen, immunological techniques and vaccine synthesis.

UNIT I

Overview of the immune system: Non – specific and specific components of immunity. Cells, primary and secondary organs of immune system. Hematopoiesis. Antigens – Immunogenicity, haptens, adjuvants, epitopes - T cell and B cell epitopes. Immunoglobulins- Structure, classes, biological activities, antigenic determinants, Ig superfamily, organization and expression of Ig genes, antibodies.

UNIT II

T cell and B cell receptors, Interaction of T cells and B cells. T cell and B cell maturation, activation, differentiation and proliferation. Effector mechanism- Macrophage activation, cytokine mediated immunity. Clonal selection theory, Immunoglobulin rearrangements, Class switching. Complement system and regulation. Cytokines and Cell-mediated effector responses.

UNIT III

Organization and functions of MHC, structure of MHC molecules, Antigen processing and presentation. Classes of MHC molecules. Hypersensitive reactions [all types]. Immune response to infectious diseases. Transplantation types, MHC antigens in transplantation, Mechanism of graft rejection and Immunosuppressive therapy. Autoimmunity and Immuno-deficiency diseases; types, mechanism of HIV organization and pathogenesis

UNIT-IV

Oncogenes, tumour antigens and cancer induction, metastasis, immune response to tumour, cancer immunotherapy. Immunization – Active and passive Immunization, types of vaccine and vaccine technology; Peptide vaccine, toxoids, Recombinant vector vaccine, DNA vaccine, Synthetic peptide vaccine. Hybridoma techniques- HAT media, Production of monoclonal and polyclonal antibodies. Gene transfer into mammalian cells – cultured cells and mouse embryos

UNIT-V

Experimental animal models – Inbred strains, Adaptive - transfer systems, Haemolytic plaque assay, SCID mice. Cell – culture systems - primary, cloned and hybrid lymphoid cell lines. Protein labelling techniques. Antigen - Antibody reactions – Agglutination and precipitation, Immuno-electrophoresis, Immuno - blotting technique, RIA, ELISA - principle, types and applications. Immuno-fluorescence, Avidin-biotin mediated assay, Flow cytometry.

REFERENCE BOOKS

1. Kuby Immunology, Thomas J. Kindt, Richard A Goldsby, 2013. 7th Edn., Publisher WH Freeman & Co
2. Roitt's Essential Immunology - Ivan Roitt, Peter Delves, et al., 2011, 12th Edition, Wiley – Blackwell Science.
3. Immunology, An Introduction: Ian R. Tizard, 1995. Saunders Publishers.
4. The Immune System, Peter Parham, 2014. Publisher Garland Publishing
5. Cellular and Molecular Immunology. Abbas et al., 2011. Elsevier

Outcomes:

1. Understand the humoral and cell mediated immunity.
2. Know the primary and secondary lymphoid organ.
3. Describe the theories of antibody formation and factors influencing antibody production.
4. To learn the types of transplantation and understand how its malfunction linked with autoimmune disease and hypersensitivity.
5. Understand the active and passive immunization and learn how to make recombinant vector vaccines.
6. Clear knowledge about the agglutination and precipitation techniques involved in research level.

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -III**

CourseName:PharmaceuticalBiochemistryandToxicology	Hours	L	T	P	Credit
		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType:CoreVIII				

COURSEOBJECTIVES:

This course deals with the study of fundamental concepts of pharmacology about the physicochemical properties of the drug, their origin, classification and nomenclature of drugs, how do they act, etc.. It also enables the students to gain the complete knowledge about drug designing and also know about the principles of toxicology.

UNIT I

Biopharmaceutical properties of drugs: Mechanism of drug absorption – physicochemical factors versus drug absorption. Drug dissociation versus drug absorption. Isomerism and pharmacological activity. Structural features and pharmacological activity; geometric isomerism, configuration influence on pharmacological activity. Effect of conformational isomerism on biological activity of drugs.

UNIT II

Theoretical aspects of drug designing. Molecular modelling: Principles of computational chemistry, molecular mechanics, chemical methods. Hardware considerations, Software considerations. Receptors and drug action, Affinity – Role of chemical bonding. Dose – Response relationships, Receptor location, Receptor and the biological response. Receptor subtypes. Dynamic nature of receptors. Nonsteroidal anti-inflammatory drugs. Drugs affecting sugar metabolism. Drugs of clinical significance.

UNIT III

Drug metabolism: First phase metabolism – Elimination pathway – Entero - hepatic cycling of drugs. Drug biotransformation pathway – phase I – Hepatic cytochrome P₄₅₀ enzyme system; Cytochrome P₄₅₀ cycle – induction and inhibition. – Oxidation catalysed by cytochrome P₄₅₀ isoforms – All types of hydroxylation, Deamination – Dealkylation – Dehalogenation. Oxidations: Microsomal & Non – microsomal oxidations. Miscellaneous reductions.

UNIT IV

Drug conjugation pathways- Phase – II: Hyaluronic acid conjugation – sulfate conjugation – conjugation with amino acids; Acetylation, Glutathione conjugation, cyanide conjugation.

Extra hepatic metabolism – Toxicity from oxidative metabolism. Drug interactions – Amestest. Metabolic pathways of common drugs. Lovastatin, Acetaminophen, Ciprofloxacin, Caffeine, Theophylline, Nicotine, Ibuprofen, Tamoxifen. General toxicology: Basic principles of diagnosis. Mechanism of toxic effect, Toxicokinetics. Response of respiratory system, reproductive system, liver and kidney to toxic agents. Toxic effects of metals, solvents and environmental pollutants.

UNIT V

Toxicology: Principles of toxicology and treatment of poisoning. Heavy metals and antagonists. Non-metallic environmental toxicants. Methods involved in the development of new drugs. Preclinical toxicological studies. Determination of LD₅₀ and ED₅₀. Acute, sub-acute and chronic toxicity studies. Antidotes in the management of poisoning. Applied analytical toxicology and toxicovigilance.

REFERENCE BOOKS

1. Text Book of Biochemistry, B. Harrow and A. Mazur, 1996, 9th Edition, W.B. Saunders Co., Philadelphia.
2. An Introduction to Practical Biochemistry, D. T. Plumer, 1988, 3rd Edition, Tata McGraw Hill, New Delhi.
3. Pharmacology and Pharmacotherapeutics, Satoskar, R. Setal., 2015, 24th Edition, Popular Prakasham, Bombay.
4. Applied Biopharmaceutics and Pharmacokinetics, Shargel, L. et al., 2015, 7th Edition, McGraw-Hill Medical.

Course Outcome:

- Students who complete this course will be able to:
- Understand clearly about the basic concepts of pharmacology
- Have a thorough knowledge about the mechanism of drug action, Drug interaction, Receptors.
- Know the aspects of New discovery of drugs and drug designing.
- Recognize the principles of toxicology, Antidotes and the management of poisoning.

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -III**

Course Name: Clinical and Nutritional Biochemistry	Hours	L	T	P	Credit
		3	1	0	4
Total Marks: Internal –25 External–75	Paper Type: Core IX				

OBJECTIVES:

- The aim of the study of this paper is clinical approach of blood and urine samples and their complications.
- To gain the knowledge about nutraceuticals

UNIT I

Uses of Biochemical data in clinical medicine - specific uses of biochemical tests in management and prognosis - screening. Acquisition & Interpretation of biochemical data - Factors affecting test results - Pre-analytical factors - Biological factors - Endogenous & Exogenous - Accuracy - Precision and Analytical goal.

Quality of laboratory medicine - Quality management systems, Personnel information systems - clinical effectiveness. Clinical quality indicators - effectiveness, demand management. Selection of methods for common analysis in serum/plasma - total proteins, glucose, urea, creatinine

Specimen: Whole blood, plasma, serum, CSF and gastric fluid collection methods and preservation

UNIT II

Disorders of glucose metabolism: Role of hormones in regulation of plasma glucose level, renal threshold value, Hyperglycemia and Diabetes mellitus: Diagnosis, prognosis and management, hypoglycemia. Glycogen storage diseases, Fructosuria, Lactose intolerance.

Disorders of lipid metabolism: Familial hypercholesterolemia, hypo and hypercholesterolemia, Fatty liver, Hyper and hypolipoproteinemia, hypertriglyceridemia, Atherosclerosis and Myocardial Infarction - Biochemical changes, Diagnosis, prognosis and management.

Disorders of Nitrogen metabolism: Excretion of nitrogenous waste products, porphyrias, Hemoglobinopathies, Uric aciduria - Pathogenesis, diagnosis and management.

UNIT III

Liver function tests: Based on abnormalities of bile pigment metabolism, changes in plasmaproteins, excretion, detoxification. Role of serum enzymes in diagnosis of liver diseases. Management of jaundice, hepatitis, cirrhosis, liver failure, hepatic coma and gall stones. Kidney function tests: Abnormal constituents of urine, biochemical findings, Glomerular and tubular function tests. Pathogenesis, Biochemical changes, diagnosis and prognosis: Nephrotic syndrome, Glomerular nephritis, kidney failure, Urolithiasis and nephrolithiasis.

Gastric functional tests: Fluid composition, pathology, diagnosis and management of Ulcer [all types] and gastritis. Tumor markers and molecular significances; Oncofetal protein, Oral carcinoma, mammary carcinoma, liver carcinoma, Kidney cancer, leukemia - Acute and Chronic Lymphoid Leukemia and Myeloid Leukemia

UNIT IV

Composition of human body. Energy content of foods. Measurement of energy expenditure: direct & indirect calorimetry. Basal metabolic rate (BMR) and specific dynamic action (SDA) and factors affecting BMR. Thermogenic effects of foods. Energy requirements of man and woman and factors affecting energy requirements.

Nutritional disorders and management – Malnutrition, Kwashiorkor, Marasmus and nitrogen imbalance. Obesity and secondary causes of obesity, appetite and eating disorders. Physicochemical properties and physiological functions of dietary fibres.

UNIT V

Functional Foods and Nutraceuticals - Introduction - Defining the concept – Cereals and pulses and functional food. Teleology of Nutraceuticals – Primary and secondary metabolites in plants. General Teleology – a) Carotenoids b) Conjugated linolenic acid c) Flavonoids d) Sulphur containing Amino Acid Derivatives e) Omega 3 fatty acids f) PUFA g) Terpenoids.

Dietary Supplements – role of nutraceuticals in the management of Inborn errors of metabolism, obesity, neurological disorder, diabetes mellitus, hypertension, Cardiac vascular disease, vitamin A deficiency.

REFERENCE BOOKS

1. Practical Clinical Biochemistry, Harold Varley, 2006. 4th and 6th editions, CBS publishers
2. Clinical Chemistry in diagnosis and treatment, Mayne, 1999, ELBS,
3. Clinical Biochemistry - Metabolic and clinical aspects, William J. Marshall, Marta Lapsley, Andrew P. Day, Ruth M. Ayling, 2014. Churchill Livingstone, Elsevier.
4. Food Science, Srilakshmi B, 2002, 5th edition, New Age International Pvt Ltd.
5. Modern Nutrition in health and disease, Robert S Goodhart, 2012, 11th edition, Lippincott Williams and Wilkins.
6. Food facts and principles, N Shakuntala, O Manay, 2001, New Age International Pvt Ltd.

7. Clinical Chemistry in diagnosis and treatment, Mayne, 1999, ELBS
8. Clinical Biochemistry- Metabolic and clinical aspects, William J. Marshall, Marta Lapsley, Andrew P. Day, Ruth M. Ayling, 2014. Churchill Livingstone, Elsevier.
9. Food Science, B. Srilakshmi, 2003. 3rd Edn. New Age International
10. Modern Nutrition in health and disease, Robert S Goodhart and Maurice E. Shils, 1974. 5th Edn. Lea & Febiger US
11. Food facts and principles, Sakuntala N. Manay and M. Shadaksharaswamy; 2009. 3rd Edition New Age International

Course Outcomes:

1. Understand the collection and analysis of blood and urine samples.
2. Understand the role of carbohydrates and lipid metabolism in various diagnostic and therapeutic approaches.
3. Have a clear knowledge about inborn error and hereditary defects in amino acid metabolism.
4. Know about the gastric function test for diagnosis and therapeutic complications.
5. To learn the differentiate blood tests that are used to evaluate renal function test and liver functions.
6. Know in detail about the disorders of mineral metabolism and Erythrocyte metabolism
7. To know about the energy content of food and Nutritional profile of principal foods
8. Learn about Dietary requirements and Measurement of energy expenditure
9. To learn about the Dietary protein and Protein energy malnutrition disorders
10. To learn about Disorders related to the deficiency of minerals

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -III**

CourseName: BiostatisticsandMedicalBioinformatics	Hours	L	T	P	Credit
		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType:ElectiveIII				

OBJECTIVES:

- To study different levels of Bioinformatic tools and applications. To gain knowledge about nano particles and their applications in science.
- To study this paper we can understand methods which is used to implement in Research.

UNIT I

Organizing a statistical survey, Planning and executing the survey. Source of data - Primary and secondary data collection. Classification and tabulation of data. Diagrammatic and graphic presentation of data.

UNIT II

Measure of central tendency - arithmetic mean, median, mode, quartiles, deciles and percentiles. Measure of variation - range, quartile deviation, mean deviation, standard deviation, Coefficient of variation. Correlation analysis - Scatter diagram, Karl's Pearson's coefficient of correlation and Spearman's rank method. Regression analysis.

UNIT III

Sampling distribution and test of significance – Concepts of sampling, Testing of hypothesis, errors in hypothesis testing, standard error and sampling distribution, sampling of variables (large samples and small samples.). Student's "t" distribution and its applications. Chi-square test and goodness of fit. Analysis of variance - one way and two way classification. Duncan's Multiple Range test.

UNIT IV

Aims and tasks of Bioinformatics - applications of Bioinformatics - challenges and opportunities - internet basics – HTML - introduction to NCBI data model - Various file formats for biological sequences. Primary sequence databases - Composite sequence databases - Secondary databases - Nucleic acid sequence databases - Protein sequence databases - Structural databases – Protein structure visualization tools (RasMol, Swiss PDB Viewer).

Sequence analysis of Biological data - Significance of Sequence alignment - Pairwise sequence alignment methods - Multiple sequence alignment methods - Tools and application

of multiple sequence alignment.

UNITY

Definition of genome and genomics. Types of gene map-genetic, cytogenetic and physical. Molecular markers for mapping - RFLPs, microsatellites and SNPs. Assembling a physical map of the genome - chromosomal walking and jumping. Genome projects: E. coli, D. melanogaster, A. thaliana and mouse. The human genome project: goals, mapping strategies, markers, sequencing technologies, results of final sequence, potential benefits and risks, ethical, legal and social issues (ELSI).

REFERENCE BOOKS

1. Biostatistics analysis, Zar, J.H, 1984. Prentice Hall, New Jersey
2. Statistical methods for biologists, Palanichamy. Sand Manoharan. M., 1990.
3. Statistical methods, S.P Gupta. 2011. 41st Edn. Chand & Co.
4. Biostatistics – A foundation for analysis in health science, Wayne W, Daniel and Chad L. Cross, 10th Edn. John Wiley & Sons Inc.
5. Biochemical calculation and biostatistics, Dr. E. Padmini, 2010. 2nd Edn. Wiley India Pvt. Limited
6. Bioinformatics - Concepts, Skills, and Applications, S.C. Rastogi, Namita Mendiratta and Parag Rastogi, 2003 CBS Publishing.
7. Bioinformatics - A practical guide to analysis of Genes & Proteins Andreas D Baxe vanis and B F Francis, 2000. John Wiley.
8. Introduction to Bioinformatics, T K Attwood, D J Parry and Smith, 2005., 1st Edition, 11th Reprint Pearson Education. ss
9. Bioinformatics, C SVMurthy, 2003 1st Edition. Himalaya Publishing House,
10. Basic Bioinformatics, S. Ignacimuthu and S. J. Narosa, 1995. Publishing House.
11. An Introduction to Computational Biochemistry, C.S. Tsai, 2002. Wiley & Liss, New York.

Course Outcomes:

1. On completion of this course, students are able to understand about biostatistics, bioethics, IPR and legal protection, patent filling and infringement and biosafety.
2. Understand the sample, population and statistical inference.
3. Gain knowledge about concept, philosophical consideration and epistemology of science, ethical terms, principles and theories of bioethics

4. Understand the basic concepts of bio-informatics databases and tools on internet. Learn how to apply computational facility in different fields of life sciences, physical and chemical sciences.
5. Have a clear detail about different protein structure and its predicting method.
6. To learn how can utilise the BLAST and FASTA analysis for biological sequence.
7. Recognise how can visual the structures and classification of proteins by visualization tools and learn to utilise these tools for alignment and analysis.
8. Understand the drug designing through computer based modification programs using synthetic or natural source

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -III**

CourseName: LabcourseV	Hours	L	T	P	Credit
		0	0	5	4
TotalMarks: Internal –25 External–75	PaperType: PracticalV				

COURSEOBJECTIVES:

To study the basic concepts of techniques in isolation, identification and estimation of clinical samples.

I Haematology

1. Enumeration of RBC and WBC
2. Differential count
3. Estimation of Haemoglobin
 - a) Colorimetric method
 - b) Sahli's method
4. Determination of Bleeding Time and Clotting time
5. ESR, Haematocrit and PCV

II Blood/Serum Analysis

1. Estimation of total blood sugar, GTT, GlyHb
2. Estimation of Total protein by Lowry's method
3. Determination of A:G ratio by Biuret method
4. Estimation of Urea by DAM method
5. Estimation of Creatinine and Creatinine- Alkaline picrate method
6. Estimation of Cholesterol, TG, HDL, LDL and VLDL
7. Estimation of Bilirubin [TB, DB & IB]
8. Estimation of Vitamin A and C
9. Determination of LDH and CPK activity

10. Determination of AST & ALT activity

11. Estimation of Cu and Fe

III Urine Analysis

1. Estimation of Urea, Uric acid, Creatinine and Creatinine

2. Estimation of Titrable acidity

3. Estimation of Phosphate

4. Estimation of Na & K, Ca

5. Estimation of Chloride - Vanslyke's method

REFERENCE BOOKS

1. Laboratory Manual in Biochemistry, J. Jayaraman, 1996. 5th Edition, New Age International Ltd. Publishers, New Delhi.
2. Biochemical methods. Sadasivam. S. and Manickam A. 1991, 2nd edn. New Age International Ltd. Publishers, New Delhi.
3. Text book of Practical Biochemistry, David T. Plummer, 2010. 3rd Edn., Book Vistas, New Delhi
4. Modern Experimental Biochemistry, III Edn. Boyer R. Benjamin Cummings Publications
5. Practical Clinical Biochemistry - Vol I Harold Varelly, Alan H. Gowenlock, Maurice Bell, 1980, 5th Edn Heinmann Medical London
6. Harold Varley - Practical Clinical Biochemistry, Vol II Harold Varelly, Alan H. Gowenlock, Maurice Bell, 1980, 5th Willinson Heinmann Medical
7. Laboratory Manual in Biochemistry Pattabiraman, T.N., 2015. 4th Edn. All India Publishers.
8. Handbook of Emergency Lab Tests, Worthy L.I.G. 1996. Churchill Livingstone

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -III**

CourseName: LabcourseVI	Hours	L	T	P	Credit
		0	0	5	4
TotalMarks: Internal –25 External–75	PaperType:PracticalVI				

COURSEOBJECTIVES:

To study the basic concepts of techniques in agglutination, precipitation and immuneresponses

I. Agglutination

1. Blood Grouping and Rh Typing
2. RA test
3. CRP test
4. Pregnancy Test

II. Precipitation

1. Immunodiffusion – Mancini and Ouchterlony method
2. Immuno Electrophoresis
3. Rocket Immuno Electrophoresis
4. Counter Current Immuno Electrophoresis
5. Immunoprecipitation test

III. Enzyme immune assay

1. ELISA

IV. Hybridization Technique

1. Western Blotting

REFERENCEBOOKS

1. PracticalimmunologyFrankLHayandOlywnMR 4thEdn.Westwood
2. PracticalManualofBiochemistryS.P.Singh,2013.CBS publishers
3. Laboratorytechniques inBiochemistryandMolecularBiology,Work andWork.
4. Bioinformatics–APracticalGuidetotheanalysisofgeneandproteins.

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER - VI**

CourseName:BiomedicalInstrumentation	Hours	L	T	P	Credit
		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType:CoreX				

COURSEOBJECTIVES:

This course focus on the biochemical techniques includes spectrophotometry, centrifugation, electrophoresis, radioactivity etc., Learning these techniques will be very useful for operating instruments and become the basic knowledge in their future.

UNIT-I

Classification of biomedical equipments- Diagnostic, therapeutic and clinical laboratory equipments, bioelectric signals and their recording. Electrodes for ECG, EMG and EEG and their characteristics, bioelectrode-types, electrode-tissue interface, contact impedance.

Transducers for biomedical application. Types, properties, characteristics and selection of transducers for biological instrumentation.

UNIT-II

Biosensors – Principle and mechanism of calorimetric, potentiometric, immuno and optical biosensors. Autoanalyser - types and application. Automatic tissue processing and application of microtome. Principle and clinical application of pulse oximeter and sphygmomanometer.

UNIT-III

Principle and applications - X-ray machine, radiography, fluoroscopy, conventional X-ray imaging, angiography, Computer tomography and linear tomography. Ultrasonic imaging system. Physics of ultrasonic waves, medical ultrasound, different mode of operation of ultrasound – A scan and B scan, application of ultrasound scan, CT scan, MRI scan and echocardiography.

UNIT-IV

Introduction, characteristics, diagnostics and therapeutic application and advantage of pulsed ruby laser, ND-YAG laser, CO₂ laser, argon laser and helium neon laser.

Introduction, types, merits, demerits, limitations, diagnostic and therapeutic application of endoscope, laparoscope and cardioscope.

UNIT-V

Therapeutic instruments- Introduction, types, lifetime, classification, power source and

electrodes of cardiac pacemaker and defibrillators. Application of surgical diathermy equipment and hemodialysis in medicine.

Computer application in medicine- computerized catheterization laboratory, computerized patient monitoring system.

REFERENCE BOOKS:

1. Handbook of medical instruments, R.S.Khandpur, 2003. 2nd Edn. Tata McGraw-Hill Publishing Company.
2. Biomedical instrumentation, Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, 1980. 2nd Edn. Prentice-Hall,
3. Medical Instrumentation, John G. Webster, 2003, John Wiley & Sons.
4. Principles of applied Biomedical instrumentation by L.A. Goddes and L.E. Baker, 1989. 3rd Edn. John Wiley India Pvt. Ltd.
5. Introduction to Biomedical Equipment Technology, Carr J. and J. Brown J.M, 2009. 4th Edn. Pears on.
6. Medical electronics and Instrumentation by Sanjay Gupta.

Course Outcomes:

1. construction and applications of electrochemical techniques related to various aspects of biological sciences.
2. Describe the techniques and applications of chromatography for biological sample separation.
3. Recognize how centrifugation plays a role in separation of sample with different molecular weight.
4. Have a clear picture of radioisotopes, radioactivity, decay patterns, tracer techniques and use of isotopes in biological studies.
5. Study the principles, mechanism and applications of various Electrophoretic techniques in research and industrial level
6. Understand the law of absorption spectrum, principle and mechanism of UV visible spectrophotometry, ESR, NMR, IR, spectrofluorimetry, turbidimetry, nephelometry and luminometry, thereby learn its applications in research level.

M.Sc. MEDICAL BIOCHEMISTRY**SEMESTER -IV**

CourseName:MolecularBiologyandBiotechnology	Hours	L	T	P	Credit
		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType: ElectiveIV				

CourseObjectives:

- To describe the general principles of gene organization and expression in both Prokaryotes and eukaryotic organism.
- To explain various levels of gene regulation and its functions.

UNIT I

Molecular structure of Genes and chromosomes. Organisation of genes in Prokaryotes and Eukaryotes. Prokaryotic and Eukaryotic Transcription units - Structure of DNA - semiconservative model of replication - experimental evidences.

Replication of DNA; Enzymes, replication in eukaryotes; circular and helical DNA regulation – regulation of replication. DNA damage and repair.

UNIT-II

Transcription – structure and functions of RNA polymerase – initiation, elongation, and termination of transcription. Post transcriptional modifications. Transcription in Eukaryotes. Various classes of RNA – mRNA, tRNA, snRNA, and hnRNA

UNIT-III

Genetic code – salient features, decipheration, Wobble hypothesis, natural variation in genetic code. Translation: Prokaryotic and Eukaryotic Translation; Initiation, elongation and termination – Inhibitors of translation – Posttranslational modifications and protein sorting.

UNIT-IV

Animal cell culture: Culture media – role of carbon dioxide, serum, growth factors, glutamine in cell culture. Types of cell culture – primary and established culture, organ culture, tissue culture. Disaggregation of tissue and primary cell culture, cell separation, cryopreservation..

UNIT-V

Transgenic animals and plants – monoclonal and polyclonal antibodies – vaccines and diagnosis – edible vaccines – humulins – interferons

Stemcells–History– types-culturingofstemcells–Embyonicstemcells, cordblood, adultstemcells-cloning-stemcellbanking–Stemcelltherapy-Ethics.

REFERENCEBOOKS

1. MolecularCloning:ALaboratoryManual,J.SambrookE.F.FritschandT.Maniatis,2000.ColdSpringHarborLaboratoryPress New York,
2. GeneVII Benjamin Lewin,2000.OxfordUniversityPress,London
3. CellandMolecular Biology,2000. 3rdedn.GeraldKarp,JohnWileyandSonsInc
4. MolecularCellBiology– Lodish,Baltimoreetal.,1995,ScientificAmericanBook,.
5. MolecularBiologyDavid FreifelderNaro1995.PublishingHouse,NewDelhi
6. MolecularBiologyWeaver RF,1999..McGrawHillInc.NY
7. Molecular Biotechnology. Glick B.R. andPasternak J.J. 2010,4thEdn. ASM Press, USA.
8. DNAMolecularBiotechnology,2003.GlickB.R.andPasternakJ.J.
9. Cloning1and2,GloverD.M.and HamesB.D. 1995IRLPRESS.
10. RecombinantDNA,J.Watson,19922ndedition,W.H,FreeemanandCo.,NY.
11. Essential MolecularBiology APracticalapproach,T.A. Brown, 2007. 2ndedition, IRL Press,Oxford.
12. GeneCloning,Anintroduction,T.A.Brown1995,3rdEdn.ChapmanandHall.

Courseoutcome:

1. To understand the basic structures, properties and organisation of eukaryotic and prokaryotic chromosomes.
2. To emphasize the molecular mechanism of DNA replication and recombination involved in eukaryotes and prokaryotes.
3. Deeply understand the transcription process in prokaryotes and eukaryotes.
4. To know about the translation and post translational modification in prokaryotes and eukaryotes.
5. Learn the changes and consequences in chromosome structure and its related disorders, thereby know how the DNA repair mechanism by anticancer therapeutics involved in DNA mutation and uncontrolled cell growth

6. Know the transgenic plants and its applications & risks. Also understand the genetic modification in food industry and its applications, controversies over risks.
7. Know the plant molecular biology techniques and its applications

M.Sc. MEDICAL BIOCHEMISTRY

EXTRADISCIPLINARY COURSE I

CourseName: Biochemistry in Health	Hours	L	T	P	Credit
		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType:EDCI				

UNIT-I

Carbohydrate - Source of carbohydrates, significance of carbohydrates in cellular activities and organism life system. Mucopolysaccharidosis, Lactose and Fructose intolerance. Normal levels of sugar, alterations; Diabetes mellitus, types and its complications. Control and Management of diabetes mellitus.

UNIT-II

Protein - Sources of proteins and amino acids. Importance of proteins in living organisms. Normal level of protein in human. Protein deficiency disease - Kwashiorkor and Marasmus. Protein quality. Inborn error of amino acid metabolism.

UNIT-III

Fatty acids - source of fats and importance of fats and lipids in living organism and. Role of LDL, VLDL, HDL and chylomicrons in human body. Normal levels of cholesterol hypercholesterolemia and role of cholesterol in Blood pressure. Atherosclerosis and Heart attack. Prevention and control of heart related diseases.

UNIT-IV

Water structure, physical and chemical properties. Vitamins - water soluble and fat soluble vitamins; Sources, chemical composition, Biological function and property, Deficiency diseases in human.

UNIT-V

Minerals Source and deficiency disorders of Macro-minerals; Sodium, Potassium, Calcium, Magnesium, Micro-minerals: Copper, phosphorus, Iron, Iodine, Zinc and Selenium in human. Prevention and control of Anemia.

REFERENCE BOOKS

1. Textbook of Medical Physiology - A.C. Guyton, 8th Edn. 1991, W.B. Saunders, Harcourt Brace Company, Bangalore.
2. Textbook of Medical Biochemistry 2002. M.N. Chatterjee and Rana Shinde, 5th Edn. Jaypee Publications, New Delhi

3. Textbook of Medical Biochemistry 2008. M.N. Chatterjea and Rana Shinde, 7th Edn. Jaypee Publications, New Delhi
4. Fundamentals of Biochemistry, Dr. A.C. Deb 2006, New Central Book Agency (P) Ltd. Kolkata.
5. Essentials of Biochemistry Sathyanarayanan. U. 2002, Books and Allied (P) Ltd.
6. Fundamentals of Biochemistry for Medical Students by Ambika shanmugam 2006. Published by author; West CIT Nagar, Chennai-35
7. Essentials of Medical Physiology, K. Sembilingam and Prema Sembulingam, 2010. 5th Edn. Jaypee Bros, medical Publishers (P) Ltd. Chennai.
8. Text Book of Biochemistry, S. Nagini, 2002. Scitech Publications (P) Ltd., Chennai

M.Sc. MEDICAL BIOCHEMISTRY**EXTRA DISCIPLINARY COURSE-II**

CourseName:HumanPhysiologyandNutrition	Hours	L	T	P	Credit
		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType:EDCII				

UNIT I

Digestive system: outline of digestive system. Buccal, gastric and Intestinal digestion. Role of liver indigestion. Intestinal-Absorption and assimilation-hormonal influence in digestion.

Excretory system; Structure of kidney and ultra-structure of nephron. Formation and composition of urine. Outline of excretory system- 'Micturition'.

UNIT-II

Respiratory and Circulatory system: Types of respiration. - Outline of respiratory system' respiratory pigments, Transport of O₂ and CO₂. Factors affecting oxygen dissociation curve and carbon dioxide dissociation curve. Chloride shift.

Circulatory organs, composition of blood, systemic, pulmonary circulation, Heart beat, cardiac cycle, origin and conduction of heart beat, Regulation of heart beat, human heart' coronary circulation, ischemic heart disease, ECG, Blood pressure and cardiac output.

UNIT-III

Nervous and Muscular system: outline of nervous system, structure of neuron, types of neuron, neurotransmitters. Condition of nerve impulse transmission, synaptic transmission. Muscle – Types of muscle- Role of Actin and Myosin.- Action Potential. Neuro muscular junction. Reflex action.

UNIT-IV

Introduction on Nutrition: Food factors for human being. Nutritional classification, foods, Energy – Energy value of food and its determination, energy expenditure – components – basal metabolism, physical activity and thermogenesis- foods' Basal metabolism: Definition, determination of basal metabolic rate (BMR). Standards of BMR factors affecting BMR, energy utilization in cells and energy balance. Dietary fiber- Definition, types of fiber in plant foods, sources, composition, role of dietary fiber and resistant starch in nutrition, effect of over consumption of fiber.

UNIT-V

Nutritional consequences and Dietary Allowances Nutritive value of protein' Protein calorie

malnutrition in children. protein and energy/ requirements Nitrogen balance and imbalance. Deficiency Disease of Vitamins and Minerals (Iron, sodium, potassium, fluoride, magnesium and calcium.) Infant nutrition, nutrition for preschool children, school children, adolescents, pregnant and lactating mothers. Industrial workers. Geriatric nutrition and Lathyrism. Obesity: Aetiology and occurrence, physiological regulation of food intake assessment, complication, treatment and prevention of obesity. Therapeutic diets.

REFERENCE BOOKS

1. Food Science, Norman N. Potter, 1986. 3rd edn.. Springer Science LLC, NY.
2. Text book of Medical Physiology, Arthur C Guyton, 1976. 5th Edn. W. B. Saunders publications, Tokyo.
3. Text Book of Medical Biochemistry, M.N, Chatterjee and Rana Shinde 2002. 5th Edition Chatterjee. Jaypee publications, New Delhi.
4. Food facts and principles, 1987. Shakuntala Manay, John Wiley and Sons.
5. Modern nutrition in health and disease, Robert S. Goodhart, Maurice E. Shils, 1980. Michael G. Wohl, Robert S. Goodhart and Maurice E. Shils (Editor).
6. Review of Medical Physiology by Ganong. W.F. 2016, 25th Edition, A & L Lange series.
7. Concise Human Physiology, Sukkar. M. Y, EI-Munshid. H. A and Ardawi. M. S. M. 2000, John Wiley and Sons.
8. Human nutrition and dietetics, s. Davidson and J. R. Passmore. ELBS, Zurich.
9. Nutrition in health and disease, Whol & Gccdhar-t.
10. Human nutrition and dietetics I. S. Garra, W. P. T. James LLPs Co 3

M.Sc. MEDICAL BIOCHEMISTRY**EXTRA DISCIPLINARY COURSE-III**

CourseName:HospitalManagementandMedicalCoding	Hours	L	T	P	Credit
		3	1	0	4
TotalMarks: Internal –25 External–75	PaperType:EDCIII				

UNIT-I

Introduction on Hospital management: Eligibility and personal skills required for Hospital management .Job opportunities in Hospital management. Important hospital management Institutes in India and World Hospital management. Concept of Modern Hospital & privatization in Health Sector, Public Sector Hospitals and Level of care offered, facilities, Effects of Globalization in Healthcare, Concept of Corporate Hospital in developing countries,.

UNIT-II

Infrastructure and lay out of an ideal corporate hospital, -1 Functioning of modern hospitals & changing need of patients Hospitality in Hospital Care, -Invasive and non-invasive diagnostic facilities in modern hospital Care offered in Specialty and Superspecialty Hospitals. Hospital management system: Benefits of Hospital management systems, Modules of Hospital management system. Interfacing of analyzer Pathology lab management. Radio logy, Blood Bank, Pharmacology management software's.

UNIT-III

History of Medical Transcription: Drawbacks of MRP system, Advent of Medical Transcription. We b friendly operating system. Market information on companies. What Medical Transcription does? Benefits in a nut shell. Planning on Medical Transcription set up Induction and orientation.

UNIT-IV

Impact of Medical Transcription: Medical Transcription impact on its stockholders

Impact during the implementation process. Impact on Departments, Organization as whole, Employment, Nature of job, Information access and Individual employees. Advantages incorporate entity, Disadvantages.

UNIT-V

Medical Transcription implementation: Medical Reengineering, Choosing appropriate transcription, Customise to suit the changes Medical Transcription: Best practices Costs,

Failure, Gap analysis. Implementation, Lifecycle Medical Transcription- Trouble and their solutions.

REFERENCE BOOKS

1. Hospital Management module II- 2001, NIHF, New Delhi
2. Hospital Administration. G.D. Kundu. 2004.
3. Hospital and Health Services and Administration, Syed Amin Tabish, 2001. Oxford University Press.