**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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| **TANSCHE REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION** |
| **Programme** | **M.Sc., Medical Biochemistry**  |
| **Programme Code** |  |
| **Duration** | **PG - Two Years** |
| **Programme Outcomes (Pos)** | **PO1: Problem Solving Skill**Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.**PO2: Decision Making Skill**Foster analytical and critical thinking abilities for data-based decision-making.**PO3: Ethical Value**Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.**PO4: Communication Skill**Ability to develop communication, managerial and interpersonal skills.**PO5: Individual and Team Leadership Skill**Capability to lead themselves and the team to achieve organizational goals.**PO6: Employability Skill**Inculcate contemporary business practices to enhance employability skills in the competitive environment.**PO7: Entrepreneurial Skill**Equip with skills and competencies to become an entrepreneur.**PO8: Contribution to Society** Succeed in career endeavors and contribute significantly to society.**PO 9 Multicultural competence** Possess knowledge of the values and beliefs of multiple cultures and a global perspective.**PO 10: Moral and ethical awareness/reasoning**Ability to embrace moral/ethical values in conducting one’s life.  |
| **Programme Specific Outcomes****(PSOs)** | **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.**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.**PSO3 – Research and Development**Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.**PSO4 – Contribution to Business World**To produce employable, ethical and innovative professionals to sustain in the dynamic business world.**PSO 5 – Contribution to the Society**To contribute to the development of the society by collaborating with stakeholders for mutual benefit. |

**Template for P.G., Programmes**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Semester–I** | **Credit** | **Hours** | **Semester-II** | **Credit** | **Hours** | **Semester-III** | **Credit** | **Hours** | **Semester–IV** | **Credit** | **Hours** |
| 1.1. Core-I  | 5 | 7 | 2.1. Core-IV  | 5 | 6 | 3.1. Core-VII | 5 | 6 | 4.1. Core-XI  | 5 | 6 |
| 1.2 Core-II  | 5 | 7 | 2.2 Core-V  | 5 | 6 | 3.2 Core-VII  | 5 | 6 | 4.2 Core-XII | 5 | 6 |
| 1.3 Core – III  | 4 | 6 | 2.3 Core – VI | 4 | 6 | 3.3 Core – IX | 5 | 6 | 4.3 Project with viva voce | 7 | 10 |
| 1.4 Discipline Centric Elective -I | 3 | 5 | 2.4 Discipline Centric Elective – III | 3 | 4 | 3.4 Core – X  | 4 | 6 | 4.4Elective - VI (Industry / Entrepreneurship) 20% Theory80% Practical  | 3 | 4 |
| 1.5 Generic Elective-II:  | 3 | 5 | 2.5 Generic Elective -IV:  | 3 | 4 | 3.5 Discipline Centric Elective - V  | 3 | 3 | 4.5 Skill Enhancement course / Professional Competency Skill  | 2 | 4 |
|  |  |  | 2.6 NME I | 2 | 4 | 3.6 NME II | 2 | 3 | 4.6 Extension Activity | 1 |  |
|  |  |  |  |  |  | 3.7 Internship/ Industrial Activity | 2 | - |  |  |  |
|  | **20** | **30** |  | **22** | **30** |  | **26** | **30** |  | **23** | **30** |
| **Total Credit Points -91** |

**Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credits and Hours Distribution System**

**for all Post – Graduate Courses including Lab Hours**

**First Year – Semester – I**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credits** | **No. of Hours** |
|  | Core – I | 5 | 7 |
| Core – II | 5 | 7 |
| Core – III | 4 | 6 |
| Elective – I | 3 | 5 |
| Elective – II | 3 | 5 |
|  |  | **20** | **30** |

**Semester-II**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credits** | **No. of Hours** |
|  | Core – IV | 5 | 6 |
| Core – V | 5 | 6 |
| Core – VI | 4 | 6 |
| Elective – III | 3 | 4 |
| Elective – IV | 3 | 4 |
| Skill Enhancement Course [SEC] - I | 2 | 4 |
|  |  | **22** | **30** |

**Second Year – Semester – III**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credits** | **No. of Hours** |
|  | Core – VII | 5 | 6 |
| Core – VIII | 5 | 6 |
| Core – IX | 5 | 6 |
| Core (Industry Module) – X | 4 | 6 |
| Elective – V | 3 | 3 |
| Skill Enhancement Course - II | 2 | 3 |
|  | Internship / Industrial Activity [Credits] | 2 | - |
|  |  | **26** | **30** |

**Semester-IV**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credits** | **No. of Hours** |
|  | Core – XI | 5 | 6 |
| Core – XII | 5 | 6 |
| Project with VIVA VOCE | 7 | 10 |
| Elective – VI (Industry Entrepreneurship)  | 3 | 4 |
| Skill Enhancement Course – III / Professional Competency Skill | 2 | 4 |
| Extension Activity | 1 | - |
|  |  | **23** | **30** |

**Total 91 Credits for PG Courses**

|  |
| --- |
| **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)** | * Thelowestlevelofquestionsrequirestudentstorecallinformationfromthecoursecontent
* Knowledgequestionsusuallyrequirestudentstoidentifyinformationinthetextbook.
 |
| **Understanding (K2)**  | * Understandingoffactsandideasbycomprehendingorganizing,comparing,translating,interpolatingandinterpretingintheirownwords.
* Thequestionsgobeyondsimplerecallandrequirestudentstocombinedatatogether
 |
| **Application (K3)** | * Studentshavetosolveproblemsbyusing/applyingaconceptlearnedintheclassroom.
* Studentsmust usetheir knowledgetodetermineaexactresponse.
 |
| **Analyze (K4)**  | * Analyzingthequestionisonethatasksthestudentstobreakdownsomethingintoitscomponentparts.
* Analyzingrequiresstudentstoidentifyreasonscausesormotivesandreachconclusionsorgeneralizations.
 |
| **Evaluate (K5)** | * Evaluationrequiresanindividualtomakejudgmentonsomething.
* Questionstobeaskedtojudgethevalueofanidea,acharacter,aworkofart,orasolutiontoaproblem.
* Studentsareengagedindecision-makingandproblem–solving.
* Evaluationquestionsdonothavesinglerightanswers.
 |
| **Create (K6)** | * Thequestionsofthiscategorychallengestudentstogetengagedincreativeandoriginalthinking.
* Developingoriginalideasandproblemsolvingskills
 |

**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

**SEMESTER - I**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course status** | **Course Title** | **Credits** | **Hours** |
| Core-1 | Chemistry of Bio-molecules | 5 | 7 |
| Core -2 | Biochemical Techniques | 5 | 7 |
| Core-3 | Lab Course-I & Lab Course-ii | 4 | 6 |
| Elective - I  | Human Anatomy and Physiology | 3 | 5 |
| Elective - II | Cellular Biochemistry | 3 | 5 |
|  | **Total**  | **20** | **30** |

**SEMESTER - II**

|  |  |  |  |
| --- | --- | --- | --- |
| Core 4 | Bioenergitics and Intermediary Metabolism | 5 | 6 |
| Core 5  | Clinical Enzymology | 5 | 6 |
| Core 6 | Lab Course-III & Lab Course-IV | 4 | 6 |
| Elective 3  | Medical Microbiology | 3 | 4 |
| Elective 4  | Advanced Endocrinology | 3 | 4 |
| NME | Skill Enhancement Course [SEC] - I | 2 | 4 |
|  | **Total**  | **22** | **30** |

**SEMESTER - III**

|  |  |  |  |
| --- | --- | --- | --- |
| Core 7  | Pharmaceutical Bio-Chemistry and Toxicology | 5 | 6 |
| Core 8  | Clinical and Nutritional Biochemistry | 5 | 6 |
| Core 9 | Lab Course-v | 5 | 6 |
| Core 10 | Lab Course-vi  | 4 | 6 |
| Elective 5 | Immunology | 3 | 3 |
| Skill Enhancement Course - II |  | 2 | 3 |
| Internship / Industrial Activity |  | 2 | - |
|  | **Total** | **26** | **30** |

**SEMESTER - IV**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course status** | **Course Title** | **Credits** | **Hours** |
| Core 11 | Biomedical Instrumentation | 5 | 6 |
| Core 12 | Biostatistics & Medical Bioinformatics | 5 | 6 |
| Project  | Project Work with *Viva voce*  | 7 | 10 |
| Elective 6 | Molecular Biology and Biotechnology | 3 | 4 |
| Skill Enhancement Course – III |  Professional Competency Skill | 2 | 4 |
| Extension Activity |  | 1 | - |
|  | Total | **23** | **30** |

**Total Credits - 91**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Typeofpaper** | **Titleofthesubject** |
| 1. | Core I | CHEMISTRYOFBIOMOLECULES |
| 2. | CoreII | BIOCHEMICALTECHNIQUES |
| 3. | CoreIII | CELLULARBIOCHEMISTRY |
| 4. | ElectiveI | HUMANANATOMYANDPHYSIOLOGY |
| 5. | CorePracticalI | LABCOURSE-I |
| 6. | CorePracticalII | LABCOURSE-II |
| 7. | CoreIV | BIOENERGITICS ANDINTERMEDIARYMETABOLISM |
| 8. | CoreV | CLINICALENZYMOLOGY |
| 9. | CoreVI | ADVANCED ENDOCRINOLOGY |
| 10. | ElectiveII | MEDICALMICROBIOLOGY |
| 11. | CommonPaper | HUMANRIGHTS |
| 12. | CorePracticalIII | LABCOURSE-III |
| 13. | CorePracticalIV | LABCOURSE-IV |
| 14. | CoreVII | IMMUNOLOGY |
| 15. | CoreVIII | PHARMACEUTICALBIO--CHEMISTRYANDTOXICOLOGY |
| 16. | CoreIX | CLINICALANDNUTRITIONALBIOCHEMISTRY |

|  |  |  |
| --- | --- | --- |
| 17. | ElectiveIII | BIOSTATISTICS &MEDICALBIOINFORMATICS |
| 18. | EDC | CHOICEOFPAPERSELECTEDBY THE COLLEGE ORDEPARTMENT |
| 19. | CorePracticalV | LABCOURSE-V |
| 20. | CorePracticalVI | LABCOURSE-VI |
| 21. | CoreX | BIOMEDICALINSTRUMNTATION |
| 22. | ElectiveIV | MOLECULARBIOLOGYANDBIOTECHNOLOGY |
| 23. | Project |  |

### M.Sc. MEDICAL BIOCHEMISTRY

### SEMESTERI

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

**OBJECTIVE**

### TostudythestructureandfunctionsofmacromoleculesUNIT–I

Carbohydrates: Definition, Biological importance of Carbohydrates. Stereoisomerism andOptical isomerism of sugars (Fischer and Haworth Projection formulae).Cyclic structure,Epimers,AnomersandMutarotation.Monosaccharides–Classification,StructureandBiologicalimportance 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,DextrinandInulin.Heteropolysaccharides;Structure,OccurrenceandBiologicalfunctionsof-Hyaluronicacid,ChondroitinsulfateandHeparin.Artificialsweeteners–Saccharinand Monellin.

### UNIT–II

Amino acids: Definition, Amino acids as ampholytes. Structure and classification of aminoacids,Chemicalreactionofaminoacids.EssentialandNonessentialaminoacids.

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

Protein structure: Levels of structure in Protein Architecture, Primary structure of proteins(Eg.Insulin),Secondarystructureofproteins–helixandpleatedsheets(eg.Collagen),Tertiarystructureofproteins(Eg.Myoglobin),Quaternarystructureofproteins(Eg.Hemoglobin) otherForces and weakbondsstabilizingthe Proteinstructure.

### UNIT–III

Lipids:Definition,ClassificationandBiologicalroleoflipids

Simplelipids-PropertiesandCharacterizationoffats–Hydrolysis,Saponification,Halogenation, Acetyl number, Rancidity of fats, Reichert-Meissel number. ompound lipids -Structure and function of phospholipids (Lecithin, SphingomyelinCephalin, PhosphatidylInositol and Phosphatidylserine) and Glycolipids (Gangliosides and Cerebrosides). Derivedlipids-Classification,structureandpropertiesofsaturatedandunsaturatedfattyacids;EssentialandNonessentialfattyacids.

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

NucleicacidsStructureofPurinesandPyrimidines;Unusualbases(5-Bromouracil,Pseudouridine, Inosine, Dihydroxyuridine, Methylcytosine); Nucleosides and nucleotides –structureandfunctions.Chemicalandenzymaticsequencingmethods.

DNA – Watson & Crick Model, A, B and Z forms of DNA.Properties of DNA - byoyantdensity,viscosity,chromiceffect,Tm,denaturation,renaturation,hybridizationandCotanalysis.Chemicalproperties

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

### UNIT– V

Vitamins and Minerals : Classification of Vitamins - Fat soluble and water soluble. Dietarysource, structures, RDA, functions and deficiency states. Macro and micro elements – Dietarysource,structures,RDA,functionsanddeficiencyofIron,calcium,phosphorus,magnesium,iodine,Zincandcopper.

### REFERENCEBOOKS

1. Lehninger's Principles of Biochemistry ,Nelson, David l. and Cox, M.M.,2000MacmillanNY
2. FundamentalsOfBiochemistry,DonaldVoet,JudithG.VoetandCharlotteWPratt,1999,John Wiley&Sons,NY
3. Biochemistry.lubertstryer,3rdEdn.,1994.WHfreemanandco,Sanfrancisco.
4. Biochemistry4thedition,byZubayGL,1988 WM C BrownPublishers.
5. PrinciplesofBiochemistry,Garrette&Grisham,1994,Saunderscollegepublishing
6. OutlinesofBiochemistry,EricE.Conn,P.K.Stumpf,G.BrueinsandRayH.Doi,,1987,John Wiley&Sons,NY
7. Textbookofbiochemistry,ThomasMDevlin,A1987,4theditionJohnWiley,Incpublication,NewYork.

### CourseOutcome:

1. Toexplainaboutthestructure,propertiesand functionsofpolysaccharides
2. Illustrateonstructure,propertiesandfunctionsoflipids,interactionsoflipidsinbiologicalmembrane.
3. Determinetheclassification,propertiesandsignificanceofproteins
4. ExplainabouttheDNApropertiesandfunctions,biologicalimportanceofhistone

proteins

1. To determine the significance of vitamins and its antioxidant activity, minerals ofbiologicalsignificance

### M.Sc. MEDICAL BIOCHEMISTRYSEMESTERI

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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,radioactivityetc.,.Learningthesetechniqueswillbeveryusefulforoperatinginstrumentsandbecome thebasic knowledgeintheirfuture

### UNITI

pHscale:buffersolution,pHelectrode,Clarke'sOxygenelectrodeandtheir applications.

Microscopy: Principles and applications of light, phase contrast, fluorescence, scanning andtransmissionelectronmicroscopy.:Principles,preparationofspecimensforTEMandSEM.

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

### UNIT–II

Chromatography:Principles,Instrumentationandapplicationsofpaperchromatography,exclusionchromatography,columnchromatography,Chromatofocussingaffinitychromatography and adsorption chromatography: Gel preparation, principle and applicationion–exchangechromatography–Types ofresins,apparatuspreparationandapplication

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

### UNIT–III

Electrophoresis: Principles, Instrumentation and applications of paper electrophoresis, agargel, starch gel, PAGE, Capillary electrphoresis PFGE, high and low voltage electrophoresis,Isoelectricfocussing,Tachophoresis,.

Centrifugation:Principles,lawsofsedimentation.PreparativeandAnalyticalCentrifugation

* DifferentialcentrifugationandDensitygradientcentrifugation.AnalyticalUltracentrifuges.
* Instrumentationandapplication;Sedimentationequilibriummethods.Analysisofsubcellularfractions.Criteria ofpurityofmacromolecules.

### UNIT–IV

Spectroscopy: Basic laws of light absorption, optical rotatory dispersion. Basic principles,instrumentationandapplicationsCirculardichroismand X-raydiffraction.

Basic principles, instrumentation and applications of UV and visible light spectrophotometry,spectrofluorimetry, Atomic Flame Photometry, Plasma Emission Spectroscopy, Infra–redspectrophotometry,Massspectrometry,Tandemmassspectroscopy,ESR,NMR,

### UNIT-V

Tracer techniques: Radioactive isotopes and half life of isotopes, Principles and applicationsof tracer techniques in biology and medical sciences, measurement of alpha, beta and gammaradiations. Radiation dosimeter, Autoradiography; Principle, Biological applications. GeigerMuller CounterandLiquidScintillationcounter.

### REFERENCES:

1. Principles and techniques of practical Biochemistry, Keith Wilson and John Walker,1995.Cambridge UniversityPress.
2. AnIntroductiontoSpectroscopyforBiochemist,Brown.SBAcademicPress.
3. IntroductiontoCentrifugation,FordT.CandGrahamJ.N.,BioscientificPublishersLtd,Oxford.
4. BiophysicalchemistryPrinciplesandTechniques-AvinashUpadhyayeandNirmalendheNath,2001.HimalayaPublishers.
5. ABiologist GuidetoPrinciplesandTechniquesofBiochemistry,KeithWilsonandKennethGoulding,Edward Arnoldpublishers.
6. ToolsofBiochemistryDavidCooper.
7. ComputationalBiochemistryC.StanTsai.

### CourseOutcomes:

1. Understandtheworkingprinciples,constructionandapplicationsof electrochemicaltechniquesrelatedto variousaspectsofbiologicalsciences.
2. Describethetechniquesandapplicationsofchromatographyforbiologicalsampleseparation.
3. Recognizehowthecentrifugationplaysaroleinseparationofsamplewithdifferentmolecular weight.
4. Haveaclearpictureofradioisotopes,radioactivity,decaypatterns,tracertechniquesanduseofisotopes inbiologicalstudies.
5. Study the principles, mechanism and applications of various Electrophoretic techniques inresearchandindustriallevel.
6. Understand the law of absorption spectrum, principle and mechanism of UV visiblespectrophotometry, ESR, NMR, IR, spectrofluorimetry, turbidimetry, nephelometry andluminometry,therebylearnits applicationsinresearchlevel.

### M.Sc. MEDICAL BIOCHEMISTRY

### SEMESTERI

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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 roleof cell adhesion molecules and ECM components. Understand what happens during the cellcycleandcelldeathandexplainaboutmembranetransportsandcheckpoints inthecellcycle.

### Unit I

Origin of single cell – theories and concepts. Cell cycle: Prokaryotic andeukaryotic cellcycle, cell growth and extracellular signal molecular basis of cell cycle regulation, cell cyclecheck points, cyclin and cyclin dependent kinases, Apoptosis: Survival and death facts celldeath receptors,cell–cellinteractionsin cellrescueanddeath,erythropoietinin RBCdevelopment. Molecular apoptotic events in C. elegans and mammals, bcl family of proteins,caspases,significanceofapoptosis

### UNIT-II

Cell environment: Extracellular matrix, glycocalyx, basal lamina, components of ECM–fibronectin, laminin, collagen, heparin sulphate, proteoglycans, role of ECM in cell growthand survival. Cytoskeletons: Microtubules and Microfilaments, G and F actin, dynamics ofactinassemblyandpolymerization,myosinandmolecularmotors.microvilliandpseudopodialextension.Intermediatefilaments: types andfunctions.

Kinetochore architecture and spindle assembly focal adhesion points,. Major types of celladhesionmolecules(CAMs)–Cadherin,Integrins,SelectinsandsuperfamilyImmunoglobulin

### UNIT-III

Cell– cell communication: Autocrine, paracrine, endocrine, juxtacrine communication. Nitricoxide and paracrine factors involved in communication EGF's Hedgehog family, Wnt family,TGF,betasuperfamily,BMPfamily,signaltransductionpathways:Gprotein,cAMPpathway, IP3 pathway, RTK pathway, MAP kinase pathway. Major classes of cell junctions-anchoring,Gap, tightjunctions

### UNITIV

Composition of Cell membrane: Lipid Bilayer, Peripheral and Integral proteins. Fluid mosaicmodel.Membranetransporttypes:Uniport,Synport,Antiport.Activetransport:P-

types[Na+K+ATPases,F-Type ATPases(ATPsynthetases),Ionophores,Ion channels andligand/voltagegatedchannels

Protein sorting: Golgi and endoplasmic reticulum and lysosome complex in protein targeting,signal recognition particles – chaperons and protein folding. GPI anchoring, targeting ofproteins to mitochondria, protein glycosylation and post translational modification, vesiculartransportandsecretorypathways.

### UNITV

CancerBiology:Etiologicalfactors,primary,secondarytumorsbenignandmalignanttumors.Oncogene:protooncogenesandviraloncogenes,oncogeneactivation,tumorsuppressor genes, DNA tumorviruses, tumor specific antigens and tumor evasion. Metastasis:Moleculareventsinmigration,extravasation,chemokines,roleofECMinmetastasis.Angiogenesis: angiogenetic and antiangiogenetic factors, vasculogenesis. Types of cancercellsandmorphologicalalterations.

### REFERENCEBOOKS

1. Molecular CellBiology, 4thedn. (2000) byLodishH,BaltimoreandothersW.H.Freemanandcompany,NY
2. Molecular Biology of cells, B. Alberts, Alexander Johnson, ,Julian Lewis, Martin Raff,Keith Roberts,PeterWalter,5thEdn.2008.G.S. GarlandSciences,Taylor&FrancisGroup,Newyork
3. CellBiologybyDavidESadava,2004, PanimaBookPublishingCorporation,NewDelhi
4. CellandMolecularBiologybyEDPDeRobertisandEMFDeRobertis
5. PrinciplesofCellBiologybyKleinSmithandMKish
6. CellandMolecular Biology3rdEdn.GeraldKarp,JohnWiley&SonsInc.

### CourseOutcome:

1. Know about tissue types, organization and classes of cell junctions and describe the roleofcelladhesionmolecules and ECM components.
2. Understandwhathappensduringthecellcycleandcelldeathandexplainaboutmembranetransports andcheckpointsin thecellcycle.
3. Tounderstandthebasicstructures,propertiesandorganisationofeukaryoticandprokaryoticchromosomes.
4. PertainonOverviewofcellcycle, cellgrowth,tumors,cancersandisolationtechniques
5. Describeoncarcinoigenesis

### M.Sc. MEDICAL BIOCHEMISTRYSEMESTERI

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CourseName:HumanAnatomyandPhysiology** | **Hours** | **L** | **T** | **P** | **Credit** |
|  | **3** | **1** | **0** | **4** |
| **TotalMarks: Internal –25 External–75** | **PaperType:ElectiveI** |

**COURSEOBJECTIVES:**

### TostudythemechanismofhumanbodysystemsandmodeofactionofHormones

**UNITI**

### HUMANANATOMY:

Overview of Anatomy – Medical and Anatomical terminology – Sections of the body –AnatomicalVariations–Organizationofthebodycells,Tissues.

Introduction to Systemic Anatomy – Types of bone – Joints – Classification of joints –innervations of joints – Muscle tissue and muscular system – Types of Muscles AnatomicalstructureofLiver,Kidneyandstomach

### UNITII

**Cardiovascularsystem:**

**Blood and Body fluids**: Composition and function, Red blood cells, Hemoglobin, whiteblood cells and platelets. Blood coagulation, blood groups and blood transfusion.Formationandfunctions oflymph.Bodybuffers.

**Cardiac output** - Definitions, factors affecting, physiological variations, regulation of heartrate.Coronarycirculation.**Pulse**- Jugularpulse,radialpulseand tripleresponse.

**Heartsounds**-Cause,characteristicsandsignificances.Cardiacrhythmandtachycardia

### UNITIII

**Respiratory system:** Diffusion of gases in lungs, transport of oxygen from lungs to tissuesvia blood, factors influencing the transport of oxygen. Transport of CO2 from tissues to lungsthroughblood,factors influencingthetransportofCO2.

**ExcretorySystem:**Mechanismofformationofurine,compositionofurine, Micturition.

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

### UNITIV

**Digestive system:** Secretion of digestive juices, digestion and assimilation of Carbohydrates,ProteinsFats andvitamins.Gastrointestinal hormones.

**Nervous system:** Structure of neuron, resting potential and action potential, Propagation ofnerve–impulses,Structureofsynapse,synaptictransmission(electricalandchemicaltheory).StructureofNeuromuscularjunctionandmechanismofneuromusculartransmission,Secondmessengers,Neuro transmitters.

### UNITV

**Reproductivesystems**

Functionofreproductivesystem.Malereproductivesystem-functionsoftestis,spermatogenesissiteandstagefactorsinfluencingsemen,Endocrinefunctionsoftestis,Androgens-Testosterone -structureandfunctions.

**Female Reproductive system** - Ovulation, Menstrual cycle, physiological changes duringpregnancy-Actions ofoestrogen,progesterone,functionsofplacenta.

**Lactation** -Compositionofmilkandfactorscontrollinglactation

### REFERENCEBOOKS

1. Human Physiology–VolumeI&II, Chatterjee,C.C-11thedition,1992.
2. TextbookMedicinalChemistry,Chatterjee.C.
3. Textbookofhumanphysiology, SaradhaSubramaniam
4. TextbookofMedicalphysiology,Guyton,2001,10thEdn.,W.B.Saunders
5. AgarwalphysiologicalT.B.ofBiochemistry,AgarwalG.R&AgarwalB.P.Chemistry.
6. Harper'sBiochemistry,Murray.R.G.etal.,2009,24thedition.
7. Lecturenotesonhumanphysiology,VolII,M.M.Muthiah1991
8. Concisehumanphysiology,Sukkar,M.Y.MunshidandArdawi
9. ReviewofMedicalPhysiologyGaanong.W.F

### CourseOutcomes:

1. Tounderstandthefundamentalmechanismsofbodyfluidsandbloodcells.
2. Illustratethecirculatorysystemincludesheartstructure,cardiaccyclesandcardiacfactors and respiratory system includes anatomy, physiology, gas exchange and explaintheroleoflungsinacidbasebalance.
3. Learn about the anatomy of digestive system and secretions, composition and functions ofgastricand biliarysystemtherebylearn howtodigest thebiomolecules inintestine.
4. Describethestructureandfunctionsofkidneyand muscle.Explain mechanismandtheoriesofmusclecontraction.
5. Recognizetheroleofcentralnervoussysteminhumanbody.Studythefunctional units,chemicalcompositionandmetabolismof brain.

### M.Sc. MEDICAL BIOCHEMISTRY

### SEMESTER -I

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CourseName: LabCourseI** | **Hours** | **L** | **T** | **P** | **Credit** |
|  | **0** | **0** | **5** | **4** |
| **TotalMarks: Internal –25 External–75** | **PaperType: PracticalI** |

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.1996.5thPrintNewAgeInternationalLtd.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 andDietaryfibre,Moisture,Nitrogen,Ashcalcium,phosphorus,iron,carotene,thiamine,riboflavin,fat,protein
2. Estimationofamino acids
3. Separation of amino acids and sugars by paper chromatography (Ascending, Descending,andCircular)
4. SeparationofProteinHb,CytochromeCbyMolecularsievechromatography
5. SeparationofaminoacidsbyPaperElectrophoresis
6. SeparationofSerumProteinbySDSPAGE
7. SeparationofDNAbyAGE

### REFERENCEBOOKS

1. Laboratorytechniques inBiochemistryandMolecularBiology,Work andWork.
2. A Biologist's Guide to principles and of practical Biochemistry K. Wilson and GouldingW.H,1986. ELBSEdn.,
3. ModernExperimentalBiochemistry,BoyerR.3rdEdn.BenjaminCummingsPublications
4. LaboratoryManual in Biochemistry. JayaramanJ. 1996. 5thPrintNewAgeInternationalLtd.Publishers,New Delhi.
5. Biochemical methods. Sadasivam. S. and ManickamA.,1991, 2nd edn. NewAge InternationalLtd.Publishers,NewDelhi

### 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 anddegradationofbiomolecules andenergygeneration

### UNITI

**Bioenergetics:**Energy transformation,Lawsofthermodynamics,Gibbsenergy,Freeenergy changes and redox potential, ATP as Energy Currency of cells , High and low energycompounds – Electron transport chain ,Oxidative phosphorylation , Inhibitors and UncouplersofETC,shuttlesystems.

### UNITII

**CarbohydrateMetabolism**

Introductiontometabolismofcells,glycolysisanditsregulation,citricacidcycle,itsfunctioninenergygenerationandregulationofTCAcycle,Gluconeogenesisanditsregulation, Metabolism of glycogen and its regulation. Hexose MonophosphatePathway,Uronicacidpathway,Coricycle,Metabolismofotherhexoses–Fructose,Galactose.HormonalinfluenceandregulationofCarbohydratemetabolism.

### UNITIII

**LipidMetabolism:**

BiosynthesisofFattyacid-Palmiticacid,Stearicacid,Oleicacid,linoleicacidandArachidonic acid, Oxidation of saturated and unsaturated fatty acids. Oxidation of fatty acids-alpha ,beta and omega oxidation in even and odd numbered fatty acids.MetabolismofTriacyl glycerol, phospholipids and sphingolipids.Cholesterol biosynthesis and regulation.Catabolism transport and excretion of cholesterol, lipoprotein metabolism.Ketone bodiesformationandutilization.

### UNITIV

**AminoacidMetabolism**

BiosynthesisandDegradationofTryptophan,Phenylalanine,Lysine,Methionineand

Glutamine.Transamination, oxidative and non-oxidative deamination, decarboxylation- ureacycle and its regulation.Integration of metabolic Pathways.Interrelationship of carbohydratesproteins and fat metabolism.Interconversion of major food stuffs. Metabolic profile of theprincipalorgans andtheirrelationships.

### UNITV

**NucleotideMetabolism**

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

Pyrimidine nucleotides Metabolism: de novo synthesis, salvage pathway and degradation ofpyrimidinenucleotides.RegulationofPurineandPyrimidinenucleotidemetabolism.SynthesistRNA,rRNAandmRNAwithregulation.

### REFERENCEBOOKS

1. Lehninger's Principles of Biochemistry, Nelson, David l. and Cox, 2000M.M.Macmillan/ worth,.NY
2. Fundamentals Of Biochemistry, Donald Voet, Judith G.Voet and Charlotte W Pratt, 1999,John Wiley&Sons,NY
3. OutlinesofBiochemistry,EricE.Conn,P.K.Stumpf,G.BrueinsandRayH.Doi,1987.John Wiley&Sons,NY
4. Biochemistry, Lubertstryer,1994.3rdEdn.,WHfreemanandco,Sanfrancisco.
5. Textbookofbiochemistry,ThomasMDevlin,19974thedition,AJohnWiley,In
6. Biochemistry,ZubayGL,1988.4theditionWMCBrownPublishers.
7. PrinciplesofBiochemistry,Garrette&Grisham,1994.SaunderscollegePublishing
8. Harper'sBiochemistry, R.K. Murrayandothers, 25thed2009. Appleton and Lange, Stanford
9. RegulationinMetabolism,E.A.Newshome,C. Start, JohnWiley&Sons.

**CourseOutcomes:**

1. Understandtheenergytransformation andchemicallogicofmetabolicpathwaysinlivingorganism.
2. Knowindetailaboutenzymes,redoxcarriers,ETCandoxidativephosphorylationmachinery.
3. Recognisecarbohydratemetabolismanditsvariousbiochemicalprocessesresponsible fortheformation,breakdownandinterconversionofcarbohydratesinlivingorganisms.
4. Describe whathappensinthelipidmetabolism,fattyacidoxidation,cholesterolsynthesisanddegradationas wellasinketogenesisandplasmalipoproteins.
5. Describewhathappensduringprotein,nucleicacidandporphyrinmetabolism

### M.Sc. MEDICAL BIOCHEMISTRY

### SEMESTER -I

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CourseName:ClinicalEnzymology** | **Hours** | **L** | **T** | **P** | **Credit** |
|  | **3** | **1** | **0** | **4** |
| **TotalMarks: Internal –25 External–75** | **PaperType:CoreV** |

**COURSEOBJECTIVES**

This paper aims to provide a basic understanding of biological catalysis, Mechanism of actionof enzymes, structure and function relationship, Understanding the enzyme kinetics and roleofcoenzymes/co-factorsandanoverviewofIndustrialapplicationofenzymes

### UNITI

IUB system of classification and nomenclature, Enzyme units , Active site, Enzyme Kinetics-Activationenergy,DerivationofMichaelisMentenequation,Factorsaffectingenzymeactivity, Enzyme assay, Coenzymes, Isoenzymes and mutlienzyme complex, Mechanism andregulationofenzymeaction-Allostericandfeedback regulation.

### UNITII

Princi**plesofDiagnosticenzymology**–Laboratoryinvestigationofserumandurinaryenzymes,Intracellular localization of enzymes,Diagnostic and Prognosticimportance ofplasma and non plasma specific enzymes. Cytosolic enzymes – SGPT,ALP and MyocardialisoenzymesLDH,CPK–theirsource,properties,function,normalvalue,diagnosticimportance.Significanceofenzymesin bone disorderandmusclewasting

### UNITIII

**Clinical significance of Enzymes** -Transaminases, Creatine Kinase, Lactate Dehydrogenase,Alkaline phosphatase, Acid phosphatase, Aldolases, Amylases, Elastase, Gamma glutamylTransferase,5'- Nucleotidase,CholineEsterases,Hexokinase,LipoproteinLipase.

### UNITIV

**Enzymes in Inborn error of metabolism** – Phenylketonuria, Alkaptonuria, Tyrosinosis,Albinism,Hartnup'sdisease,Galactoemia,Taysacch'sdisease,NiemannPick'sdisease,Hunter Syndrome,LeshNyhanSyndrome.

### UNITV

Enzymes in Medicineand diagnosis. Normal andAbnormalvalueofdiagnostic markerenzymes,Enzymesindetoxicationofdrugmetabolism,Enzymesindiagnosis:Cerebrospinal

fluid,AmnioticfluidandBiopsysamples.Antioxidantenzymes–SOD,Catalase,GPXandGR.Therapeuticenzymes:Thrombolyticenzyme, woundhealer,erythropoiesisstimulator

### REFERENCEBOOKS

1. EnzymesByDixon,E.CWebb,CJRThorneandK.F. Tipton,Longmans,London.
2. FundamentalsofEnzymology,NicholasC.Price,andLewisStevans,1998.2nded., .
3. UnderstandingEnzymes,TrevorPalmer,1991.3rdEdn.,EllisHorwoodLimited.
4. ProteinBiotechnology,GaryWalshandDenisHeadon, 1994.JohnWileyandSons,
5. ProteinBiochemistryandBiotechnology,GaryWalsh,2002,JohnWileyandSonsLtd.
6. EnzymekineticsandMechanism –PaulF.Cook

### Courseoutcomes

**Afterthecompletion ofthiscourse,thestudentwillbeableto**

1. Distinguishthefundamentalsofenzymeproperties,nomenclatures,characteristicsandComparemethods forproduction,purification,characterizationofenzymes
2. Tounderstandthediagnosticimportanceofenzymesandtheirsignificances.
3. Knowabouttheclinicalsignificanceoftheenzymes
4. Describetheenzymesinvolvedintheinbornerrorofmetabolism
5. TounderstandtheimportanceofEnzymesin Medicineanddiagnosis

### 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**

* Tostudyabout thefunctions,mechanismofaction,diagnosisandinvestigationsofhormones

### UNIT– I

Hormones - Introduction, classification, hormonal effects and regulation – basic conceptsChemicalpropertiesofhormones:Peptidehormones,Steroidhormone,Neurohormone.Concept of Receptors – Cell surface and intracellular (cytoplasmic and nuclear) receptors, Gprotein coupled receptors, Pharmacological receptors – Neurotransmitter receptors. Secondmessengersystem–Ca2+ cAMP,cGMP,DAG,andIP3.

### UNIT– II

Chemical nature and mechanism of action of steroid hormones and glycoprotein hormones ontarget tissues. Hypothalamus, Pituitary- Posterior and Anterior, Thyroid, parathyroid, AdrenalandPinealglands: Secretions,Structure,physiologyandMechanismofaction.

### UNIT-III

Secretions,Structure,physiologicalfunctionandMechanismofactionofPancreatichormones–Insulin,glucagon,Gastrointestinalhormones–Gastrin,secretinandsomatostatin,Sexhormones- testosterone,progesteroneandoestrogen.

### UNIT-IV

Secretions,Structure,physiologicalfunction,Mechanismofaction,Dysfunctionandpathophysiologyofhypothalamus–Posteriorandanteriorhypophysealcomplex.Dysfunction and pathophysiology of thyroid, parathyroid, pancreas, adrenals, gonads andgastrointestinalhormones.

### UNIT-V

Endocrinesystem:LaboratorydiagnosisandinvestigationsrelatedtothedisordersofHypothalamus-Hypophysealcomplex.ELISA,[Alltypes] PCRTechniqueswithreferenceto

hormonesestimationinbiologicalsample:Insulin,T3andT4.TSH.FSH,LHGH,EGN,PGN.

### REFERENCEBOOKS

1. Endocrinology,MacE.Hadley,2006,4TH.Edition.PrenticeHallInternationalInc
2. TextbookofMedicalPhysiology, GuytonandHall,2000.10thEdition,SaundersPublishingCo.
3. PrinciplesofBiochemistry,EmilSmith, HandlerAbraham,1983.7thEdn.,White,McgrawHillInternationalbook company.
4. Williams textbook of Endocrinology, P.Reed Larson, HenryM. Korenberg, ShlomMelmedandKennethS.Polonsky,2003,10thEdition,SaunderPhiladelphia,USA.
5. HarpersBiochemistry,Murray*etal.*,2003.2nd Edition,McGrawHillPublications, USA.

### Courseoutcome

1. Determinetheclassificationandmechanismofactionofhormones.
2. Explainaboutthechemistry,synthesisandsignificanceofhypothalamic,pituitaryandthyroidhormones.
3. Analyzeaboutthepancreatichormones, gastrointestinalandsexhormones
4. Predictthedysfunctionofhypothalamus,parathyroid,pancreas,adrenals,gonadsandgastrointestinalhormones.
5. Report onlaboratorydiagnosisandinvestigationsofhormones

### 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. Gainknowledgeaboutthemedicalapplications ofmicroorganisms.

### UNITI

Classificationofmedicallyimportantbacteria,fungi,parasitesandviruses.Infection–types

* Source–Methodsoftransmissionofinfections.Hostparasiterelationship.Bacterialvirulencefactors.Stainingandbiochemicalidentificationofbacteria.Groundrulesforcollection,transportandprocessingofclinicalspecimensformicrobiologicaldiagnosis

### UNIT-II

**MedicalBacteriology**

Morphology, cultural characters, antigenic characters, pathogenicity, laboratory diagnosis,treatment and control of diseases caused by Staphylococcus aureus, Streptococcus pyogenes,Streptococcuspneumoniae,Neisseriameningitidis,Neisseriagonorrhoeae,Clostridia,Salmonellatyphi,Shigelladysenteriae,Vibriocholerae,Mycobacteriumtuberculosis,Antibacterialantibiotics–modeofaction

### UNIT-III

**MedicalMycology**

Morphology, culture properties, pathogenicity, laboratory diagnosis, treatment and control ofsuperficialmycosis–TineaNigraandPiedra.Cutaneousmycosis–Dermatophytes.Subcutaneousmycosis–Mycetoma.Systemicmycosis –Histoplasma.Opportunisticmycosis

* Candida. Antifungalagents andmechanismofaction ininhibitionoffungalgrowth.

### UNIT–IV

**MedicalParasitology**

Morphology,lifecycle,pathogenicity,labdiagnosistreatmentandcontrolmeasuresofIntestinalamoebae–Entamoebahistolytica.Intestinalandgenitalflagellates–Giardiaintestinalis and Trichomonasvaginalis. Blood flagellates – Trypanosoma. Haemosporina –Plasmodium.Coccidian–Toxoplasmagondii.Helminthicparasites–Cestodes–Taenia

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

### UNIT– V

**MedicalVirology**

Morphology,cultivation,replication,pathogenicity,laboratorydiagnosistreatmentandcontrolmeasuresof diseasescausedbyPoxvirus,Herpesvirus,Hepatitis(A,B andC)Orthomyxo virus – Inluenza virus. Picarno virus – Polio.Paramyxo virus – Parainfluenzavirus, Mumps, Measles, .Rhubella virus, HIV, Arboviruses.Oncogenicviruses.Emergingviruses.Antiviralagentsandmechanismofaction.

### REFERENCEBOOKS

1. PrinciplesofBacteriology, VirologyandImmunity.TopleyandWilson, 1995. 9thedition,VolI,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

1. Text book of Microbiology. AnatnthaNarayananandPaniker's2013. 9thEdition. UniversitiesPress,(India)PrivateLimited,Hyderabad.
2. AtextbookofMedicalMycology,JegadishChander,1996.Interprint.NewDelhi
3. Text book of Medical Parasitology Protozoology and Helminthology Text and colourAtlas.SubashChandraParija2013.4thEdition.AllIndiaPublishersandDistributers,NewDelhi.
4. MedicalMicrobiologyandImmunology.WarrenLivingstoneandErnestJawetz2000.6thEdition.McGrawHillcompanies.Inc.

**CourseOutcomes:**

1. Understandtheclassificationandcontrollingofmicrobesandstudyisolationofmicrobesandmaintenance.
2. Describeimportantcharacteristicofmicroorganisms,therebyidentifydifferenttypeofmicroorganisms.
3. Studyaboutvarioustypesofmicroorganisms involvedin infectionoffoodproducts.
4. Recognisethesourcesandtransmissionofinfectionsandhowthefactorsinvolvingininfection.
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** |

1. **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

### 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.Publishers,NewDelhi
2. Biochemicalmethods,S.SadasivamandA.Manickam, 1991.2ndEdn.,NewAgeInternationalLtd.Publishers,NewDelhi.
3. TextbookofPracticalBiochemistry, DavidT.Plummer,2010.3rdEdn.,BookVistas,NewDelhi
4. Enzymestructureandmechanism,AlnFersht,1997,Reading,USA
5. ModernExperimentalBiochemistry,RodneyF.Boyer,2000.3rdEdn.BenjaminCummingsPublications.

### 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.

1. Myer'sandKoshy'sManualofdiagnosticproceduresinmedicalmicrobiologyandImmunology/serology. Publishedby Departmentof Clinical Microbiology. CMC andHospital,Vellore,TamilNadu
2. ExperimentsinMicrobiology, Plant pathologyandBiotechnology, AnejaKR2005. 4th

edition.NewageInternationalpublishers,Chennai.

1. Experiments in Microbiology. Rajan S and Selvi Christy 2015. Anjana Book House,Publishersanddistributors,Chennai,TamilNadu

### 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:**

Tostudytheimmuneresponsesofhumanbodyagainstantigen,immunologicaltechniquesandvaccinesynthesis.

### UNITI

Overview of the immune system: Non – specific and specific components of immunity. Cells,primaryandsecondaryorgansofimmunesystem.Hematopoiesis.Antigens–Immunogenicity, haptens, adjuvants, epitopes - T cell and B cell epitopes.Immunoglobulins-Structure, classes, biological activities, antigenic determinants, Ig superfamily, organizationandexpressionofIggenes,abzymes.

### UNITII

T cell and B cell receptors, Interaction of T cells and B cells. T cell and B cell maturation,activation,differentiationandproliferation.Effectormechanism-Macrophageactivation,cytokine mediated immunity. Clonal selection theory, Immunoglobulin rearrangements, Classswitching.Complementsystemandregulation.CytokinesandCell–mediatedeffectorresponses.

### UNITIII

Organization and functions of MHC, structure of MHC molecules, Antigen processing andpresentation.ClassesofMHCmolecules.Hypersensitivereactions[alltypes].Immuneresponsetoinfectiousdiseases.Transplantationtypes,MHCantigensintransplantation,Mechanism of graft rejection and Immunosuppressive therapy. Autoimmunity and Immuno-deficiencydiseases;types,mechanismofHIVorganizationandpathogenesis

### UNIT-IV

Oncogenes, tumour antigens and cancer induction, metastasis, immune response to tumour,cancerimmunotherapy.Immunization – Active and passive Immunization, types of vaccineandvaccinetechnology;Peptidevaccine,toxoids,Recombinantvectorvaccine,DNAvaccine,Syntheticpeptidevaccine.Hybridomatechniques-HATmedia,Productionofmonoclonal and polyclonal antibodies. Gene transfer into mammalian cells – cultured cellsandmouseembryos

### UNIT-V

Experimental animal models – Inbred strains, Adaptive - transfer systems, Haemolyticplaqueassay, 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 andapplications.Immuno-fluorescence,Avidin-biotinmediatedassay,Flowcytometry.

### REFERENCEBOOKS

1. KubyImmunology,ThomasJ. Kindt,RichardAGoldsby,2013.7thEdn.,Publisher WH Freeman&Co
2. Roitt'sEssentialImmunology-IvanRoitt,PeterDelves,etal.,2011,12thEdition,Wiley– BlackwellScience.
3. Immunology,AnIntroduction:IanR.Tizard,1995.SaundersPublishers.
4. TheImmuneSystem,PeterParham,2014.PublisherGarlandpublishing
5. CellularandMolecularImmunology.Abbasetal.,2011.Elsevier

### Outcomes:

1. Understandthehumoralandcellmediatedimmunity.
2. Knowtheprimaryand secondarylymphoid organ.
3. Describethetheoriesofantibodyformationandfactorsinfluencingantibodyproduction.
4. Tolearnthetypesoftransplantationandunderstandhowitsmalfunctionlinkedwithautoimmunediseaseandhypersensitivity.
5. Understandtheactiveandpassiveimmunizationandlearnhowtomakerecombinantvectorvaccines.
6. Clearknowledgeabouttheagglutinationandprecipitationtechniquesinvolvedinresearchlevel.

### 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:**

Thiscoursedealswiththestudyoffundamentalconceptsofpharmacologyaboutthephysisochemicalpropertiesof the drug,theirorigin,classification and nomenclature of drugs,how do they act,etc.,It also enables the students to gain the complete knowledge about drugdesigningandalsoknow abouttheprinciples oftoxicology.

### UNITI

Biopharmaceutical propertiesof drugs:Mechanismof drugabsorption–physiochemicalfactors versus drug absorption. Drug dissociation versus drug absorption.Isomerism andpharmacologicalactivity.Structuralfeaturesandpharmacologicalactivity;geometricisomerism,configurationinfluenceonpharmacologicactivity.Effectofconformationalisomerismonbiologicalactivityofdrugs.

### UNITII

Theoretical aspectsofdrugdesigning.Molecularmodelling:Principles of computationalchemistry,molecularmechanics,chemicalmethods.Hardwareconsiderations,Softwareconsiderations.Receptors and drug action, Affinity – Role of chemical bonding. Dose –Response relationships, Receptor location, Receptor and the biological response. Receptorsubtypes.Dynamicnatureofreceptors.Nonsteroidalanti–inflammatorydrugs.Drugsaffectingsugarmetabolism.Drugs ofclinicalsignificance.

### UNITIII

Drug metabolism: First phasemetabolism – Elimination pathway – Entero - hepatic cyclingof drugs. Drug biotransformation pathway – phase I – Hepatic cytochrome P450enzymesystem;CytochromeP450cycle–inductionandinhibition.–OxidationcatalysedbycytochromeP450isoforms–Alltypesofhydroxylation,Deamination–Dealkylation–Dehalogenation. Oxidations: Microsomal & Non – microsomal oxidations. Miscellaneousreductions.

### UNITIV

Drug conjugation pathways- Phase – II: Hyaluronic acid conjugation – sulfate conjugation –conjugationwithaminoacids;Acetylation,Glutathioneconjugation,cyanideconjugation.

Extra hepatic metabolism – Toxicity from oxidative metabolism. Drug interactions – Amestest.Metabolicpathwaysofcommondrugs.Lovastatin,Acetaminophen,Ciprofloxacin,Caffeine,Theophylline,Nicotine,Ibuprofen,Tamoxifen.Generaltoxicology:Basicprinciples of diagnosis. Mechanism of toxic effect, Toxicokinetics.Response of respiratorysystem,reproductivesystem,liverandkidneytotoxicagents.Toxiceffectsofmetals,solventsandenvironmentalpollutants.

### UNITV

Toxicology:Principlesoftoxicologyandtreatmentofpoisoning.Heavymetalsandantagonists.Non-metallic environmental toxicants. Methods involved in the development ofnew drugs. Preclinical toxicological studies.Determination of LD 50 and ED50.Acute, sub-acuteandchronictoxicitystudies.Antidotesinthemanagementofpoisoning.Appliedanalyticaltoxicologyandtoxicovigilance.

### REFERENCEBOOKS

1. Text Book of Biochemistry, B.Harrow and A.Mazur, 1996, 9th Edition, W.B.SaundersCo.,Philadelphia.
2. AnIntroductiontoPracticalBiochemistry,D.T.Plumer,1988.3rdEdition,TataMcGrawHill,NewDelhi.
3. PharmacologyandPharmacotherapeutics,Satoskar,R.Setal.,2015.24th Edition, PopularPrakasham,Bombay.
4. AppliedBiopharmaceuticsandPharmacokinetics,Shargel,L.etal.,2015.7thEdition,McGraw-HillMedical.

### CourseOutcome:

* Studentswhocompletethiscoursewillbeableto:
* Understandclearlyaboutthebasicconceptsofpharmacology
* Have a thoroughknowledge about the mechanismofdrug action, Drug interaction,Receptors.
* Knowthe aspectsofNewdiscoveryofdrugsanddrugdesigning.
* Recognizetheprinciplesoftoxicology, Antidotesandthe managementofpoisoning.

### M.Sc. MEDICAL BIOCHEMISTRY

### SEMESTER -III

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Name: Clinical and NutritionalBiochemistry** | **Hours** | **L** | **T** | **P** | **Credit** |
|  | **3** | **1** | **0** | **4** |
| **TotalMarks: Internal –25 External–75** | **PaperType:CoreIX** |

**OBJECTIVES:**

* Theaimofthestudyofthispaperisclinicalapproachofbloodandurinesamplesandtheir complications.
* Togaintheknowledgeaboutneutraceuticals

### UNITI

UsesofBiochemicaldatainclinicalmedicine-specificusesofbiochemicaltestsinmanagementandprognosis-screening.Acquisition&Interpretationofbiochemicaldata-Factorsaffectingtestresults-Pre-analyticalfactors-Biologicalfactors–Endogenous&Exogenous–Accuracy–PrecisionandAnalyticalgoal.

Qualityoflaboratorymedicine-Qualitymanagementsystems,Personnelinformationsystems-clinicaleffectiveness.Clinicalqualityindicators-effectiveness,demandmanagement. Selection of methods for common analysis in serum/plasma – total proteins,glucose,urea,creatinine

Specimen:Wholeblood,plasma,serum,CSFandgastricfluidcollectionmethodsandpreservation

### UNITII

Disorders of glucose metabolism: Role of hormones in regulation of plasma glucose level,renalthresholdvalue,HyperglycemiaandDiabetesmellitus:Diagnosis,prognosisandmanagement,hypoglycemia.Glycogenstoragediseases, Fructosuria,Lactoseintolerance.

Disordersoflipidmetabolism:Familialhypercholesterolemia,hypoandhypercholesterolemia,Fattyliver,Hyperandhypolipoproteinemia,hypertriglyceridemia,Atherosclerosis and Myocardial Infarction – Biochemical changes, Diagnosis, prognosis andmanagement.

Disorders of Nitrogenmetabolism:Excretion of nitrogenous waste products,porphyrias,Hemoglobinopathies,Uricaciduria- Pathogenesis,diagnosisandmanagement.

### UNITIII

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 andtubularfunctiontests.Pathogenesis,Biochemicalchanges,diagnosisandprognosis:Nephroticsyndrome,Glomerularnephritis,kidneyfailure,Urolithiasisandnephrolithiasis.

Gastric functional tests: Fluid composition, pathology, diagnosis and management of Ulcer[all types] and gastritis.Tumor markers and molecular significances; Oncofetal protein, Oralcarcinoma,mammarycarcinoma,livercarcinoma,Kidneycancer,leukemia-AcuteandChronic LymphoidLeukemiaandMyeloidLeukemia

### UNITIV

Composition of human body.Energy content of foods. Measurement of energy expenditure:direct& indirect calorimetry. Basal metabolic rate (BMR) and specificdynamicaction(SDA) and factors affecting BMR.Thermogeniceffects of foods. Energy requirements ofmanandwomanandfactors affectingenergyrequirements.

Nutritional disorders and management – Malnutrition, Kwashiorkor, Marasmus and nitrogenimbalance.Obesityandsecondarycausesofobesity,appetiteandeatingdisorders.Physicochemicalproperties andphysiologicalfunctionsofdietaryfibres.

### UNITV

Functional Foods and Nutraceuticals - Introduction - Defining the concept – Cereals andpulses and functional food. Teleology of Nutraceuticals – Primary and secondary metabolitesin plants. General Teleology – a) Carotenoids b) Conjugated linolenic acid c) Flavonoids d)SulphurcontainingAminoAcidDerivativese)Omega3fattyacidsf)PUFAg)Terpenoids.

DietarySupplements–roleofnutraceuticalsinthemanagementofInbornerrorsofmetabolism, obesity, neurological disorder, diabetes mellitus, hypertension, Cardiac vasculardisease,vitaminADeficiency.

### REFERNCEBOOKS

1. PracticalClinicalBiochemistry,HaroldVarley,2006.4thand 6theditions, CBSpublishers
2. ClinicalChemistryindiagnosisandtreatment,Mayne,1999,ELBS,
3. ClinicalBiochemistry-Metabolicandclinicalaspects,WilliamJ.Marshall,MartaLapsley,AndrewP.Day,RuthM. Ayling,2014.ChurchillLivingstone,Elsevier.
4. FoodScience,SrilakshmiB,2002,5thedition,NewAgeInternationalPvtLtd.
5. ModernNutritioninhealthanddisease,RobertSGoodhart,2012,11thedition,LippincottWilliams andWilkins.
6. Foodfactsandprinciples,NShakuntala,OManay,2001,NewAgeInternationalPvtLtd.
7. ClinicalChemistryindiagnosisandtreatment, Mayne,1999,ELBS
8. Clinical Biochemistry- Metabolic and clinical aspects, William J.Marshall, MartaLapsley,AndrewP.Day,RuthM. Ayling,2014. Churchill Livingstone,Elsevier.
9. FoodScience,B.Srilakshmi,2003.3rdEdn.NewAgeInternational
10. ModernNutritioninhealthanddisease,RobertSGoodhartandMauriceE.Shils,1974.5thEdn.Lea&FebigerUS
11. Foodfactsandprinciples,SakuntalaN.ManayandM.Shadaksharaswamy;2009.3rdEditionNewAgeInternational

### CourseOutcomes:

1. Understandthecollectionandanalysisofbloodandurinesamples.
2. Understandtheroleofcarbohydratesandlipidmetabolisminvariousdiagnosticandtherapeutic approaches.
3. Haveaclearknowledgeaboutinbornerrorandhereditarydefectsinaminoacidsmetabolism.
4. Knowaboutthegastricfunctiontestfordiagnosisandtherapeuticcomplications.
5. Tolearnthedifferentiatebloodteststhatareusedtoevaluaterenalfunction testandliverfunctions.
6. KnowindetailaboutthedisordersofmineralmetabolismandErythrocytemetabolisms
7. Toknowaboutthe energycontent offoodand Nutritionalprofileofprincipalfoods
8. LeanaboutDietaryrequirementsand Measurementofenergyexpenditure
9. TolearnabouttheDietaryproteinandProteinenergymalnutritiondisorders
10. TolearnaboutDisordersrelatedtothedeficiencyofminerals

### 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:**

* TostudydifferentlevelsofBioinformaticstoolsandapplications.Togainknowledgeaboutnanoparticles andtheirapplicationsinscience.
* To studythispaperwecanunderstoodmethodswhich isusedtoimplementinResearch.

### UNITI

Organizing a statistical survey, Planning and executing the survey.Source of data - Primaryandsecondarydatacollection.Classificationandtabulationofdata.Diagrammaticandgraphicpresentationofdata.

### UNITII

Measureofcentraltendency-arithmeticmean,median,mode,quartiles,decilesandpercentiles.Measureofvariation-range,quartiledeviation,meandeviation,standarddeviation, Coefficient of variation. Correlation analysis - Scatter diagram, Karl's Pearson'scoefficientofcorrelationand Spearman's rankmethod.Regressionanalysis.

### UNITIII

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-squaretest and goodness of fit.Analysis of variance - one way and two way classification. Duncan'sMultipleRangetest.

### UNITIV

AimsandtasksofBioinformatics-applicationsofBioinformatics-challengesandopportunities - internet basics – HTML - introduction to NCBI data model - Various fileformatsforbiologicalsequences.Primarysequencedatabases-Compositesequencedatabases - Secondary databases - Nucleic acid sequence databases - Protein sequence databases - Structural databases –- Protein structure visualization tools (RasMol, Swiss PDBViewer).

SequenceanalysisofBiologicaldata-SignificanceofSequencealignment-Pairwisesequencealignmentmethods-Multiplesequencealignmentmethods–Tools andapplication

ofmultiplesequencealignment.

### UNITV

Definition of genome and genomics.Types of gene map-genetic, cytogenetic and physical.Molecular markers for mapping - RFLPs, microsatellites and SNPs. Assembling a physicalmapofthegenome-chromosomewalkingandjumping.Genomeprojects:E.coli,D.melanogaster,A.thalianaandmouse.Thehumangenomeproject:goals,mappingstrategies, markers, sequencing technologies, results of final sequence, potential benefits andrisks,ethical,legalandsocialissues (ELSI).

### REFERENCEBOOKS

1. Biostatisticsanalysis,Zar,J.H,1984.PrenticeHall,NewJersey
2. Statisticalmethodsforbiologists,Palanichamy.SandManoharan.M.,1990.
3. Statisticalmethods,S.PGupta.2011.41stEdn.Chand&Co.
4. Biostatistics–Afoundationforanalysisinhealthscience,WayneW,DanielandChadL.Cross,10thEdn.JohnWley&SonsInc.
5. Biochemical calculationand biostatistics, Dr. E.Padmini, 2010.2ndEdn. Wiley India Pvt.Limited
6. Bioinformatics-Concepts,Skills,andApplications, S.C. RastogiNamitaMendirattaandParagRastogi,2003CBSPublishing.
7. Bioinformatics-ApracticalguidetoanalysisofGenes& ProteinsAndreasDBaxevanisandBFFrancis,2000.John Wiley.
8. IntroductiontoBioinformatics,TKAttwood,DJParryandSmith,2005.,1stEdition,11th

ReprintPearsonEducation.ss

1. Bioinformatics,CSVMurthy,20031stEdition.HimalayaPublishingHouse,
2. BasicBioinformatics,S.IgnacimuthuandS.J.Narosa,1995.PublishingHouse.
3. AnIntroductiontoComputationalBiochemistry,C.S.Tsai,2002.Wiley&Liss,NewYork.

### CourseOutcomes:

1. Oncompletionofthiscourse,studentsareabletounderstandaboutbiostatistics,bioethics, IPRandlegalprotection, patentfillingandinfringementandbiosafety.
2. Understandthesample,populationandstatisticalinference.
3. Gainknowledgeaboutconcept,philosophicalconsiderationandepistemologyofscience,ethicalterms,principlesandtheoriesofbioethics
4. Understand the basic concepts of bio-informatics databases and tools on internet. Learnhow toapply computationalfacility indifferentfieldsof life sciences,physicalandchemicalsciences.
5. Haveacleardetailabout differentproteinstructureanditspredicting method.
6. TolearnhowcanutilisetheBLASTandFASTAanalysisforbiologicalsequence.
7. Recognise how can visual the structures and classification of proteins by visualizationtoolsandlearntoutilisethistoolsforalignmentand analysis.
8. Understand the drug designing through computer basedmodification programs usingsyntheticornaturalsource

### 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:**

Tostudythe basicconceptsoftechniquesinisolation,identificationand estimationofclinicalsamples.

### Haematology

1. EnumerationofRBC and WBC
2. Differentialcount
3. EstimationofHaemoglobin
	1. Colorimetricmethod
	2. Sahli'smethod
4. DeterminationofBleedingTimeandClottingtime
5. ESR,HaematocritandPCV

### Blood/SerumAnalysis

1. Estimationoftotalbloodsugar,GTT,GlyHb
2. EstimationofTotalproteinbyLowry'smethod
3. DeterminationofA:GratiobyBiuretmethod
4. EstimationofUreaDAMmethod
5. EstimationofCreatineandCreatinine- Alkalinepicratemethod
6. EstimationofCholesterol, TG,HDL,LDLandVLDL
7. EstimationofBilirubin[TB, DB&IB]
8. EstimationofVitaminAand C
9. DeterminationofLDHand CPKactivity
10. DeterminationofAST&ALTactivity
11. EstimationofCuandFe

### UrineAnalysis

1. EstimationofUrea,Uricacid,CreatineandCreatinine
2. EstimationofTitrable acidity
3. EstimationofPhosphate
4. EstimationofNa&K,Ca
5. EstimationofChloride- Vanslyke'smethod

### REFERENCEBOOKS

1. Laboratory Manual in Biochemistry, J. Jayaraman, 1996. 5th PrintNewAgeInternationalLtd.Publishers,New Delhi.
2. Biochemical methods. Sadasivam. S. andManickamA. 1991, 2nd edn. NewAgeInternationalLtd.Publishers,New Delhi.
3. Text bookofPracticalBiochemistry, David T.Plummer, 2010. 3rdEdn., Book Vistas, NewDelhi
4. ModernExperimentalBiochemistry, IIIEdn.BoyerR.BenjaminCummingsPublications
5. Practical Clinical Biochemistry- Vol I Harold Varely, Alan H. Gowenlock, MauriceBell,1980,5thEdnHeinmannMedicalLondon
6. HaroldVarley -PracticalClinicalBiochemistry,Vol II HaroldVarely,Alan H.Gowenlock,MauriceBell,1980,5thWillinsonHeinmannMedical
7. Laboratory Manual in Biochemistry Pattabiraman, T.N., 2015.4thEdn. All India Publishers.
8. HandBookofEmergencyLabTests,WorthlyL.I.G.1996. ChurchillLivingstone

### 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:**

Tostudythebasicconceptsoftechniquesinalutination,precipitationandimmuneresponses

### Agglutination

* 1. BloodGroupingandRhTyping
	2. RAtest
	3. CRPtest
	4. PregnancyTest

### Precipitation

1. Immunodiffusion– ManciniandOuchterlonymethod
2. ImmunoElectrophoresis
3. RocketImmunoElectrophoresis
4. CounterCurrentImmunoElectrophoresis
5. Immunoprecipitationtest

### Enzymeimmuneassay

1.ELISA

### HybridizationTechnique

1.WesternBlotting

### 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 operatinginstruments and becomethe basic knowledgeintheirfuture.

### UNIT-I

Classification of biomedical equipments- Diagnostic,therapeuticandclinicallaboratoryequipments, bielectric signals and their recording. Electrodes for ECG, EMG and EEG andtheircharacteristics,bioelectrode-types,electrode-tissueinterface,contactimpedance.

Transducers for biomedical application.Types, properties, characteristics and selection oftransducersforbiologicalinstrumentation.

### UNIT-II

Biosensors – Principle and mechanism of calorimetric, potentiometric, immuno and opticalbiosensors.Autoanalyser - types and application. Automatic tissue processing and applicationofmicrotome.Principleandclinicalapplicationofpulseoximeterandsphygmomanometer.

### UNIT-III

Principle and applications - X-ray machine, radiography, fluoroscopy, conventional X-rayimaging, angiography, Computer tomography and linear tomography.Ultrasonic imagingsystem.Physics of ultrasonic waves,medical ultrasound, differentmode of operation ofultrasound – A scan and B scan, application of ultra sound scan, CT scan, MRI scan andechocardiography.

### UNIT-IV

Introduction, characteristics, diagnostics and therapeutic application and advantage of pulsedrubylaser,ND-YAGlaser,CO2laser, argonlaserandheliumneon laser.

Introduction, types, merits, demerits, limitations, diagnostic and therapeutic application ofendoscope,laparoscopeandcardioscope.

### UNIT-V

Therapeuticinstruments-Introduction,types,lifetime,classification,powersourceand

electrodes of cardiac pacemaker and defibrillators. Application of surgical diathermyequipmentandhemedialysisinmedicine.

Computerapplicationinmedicine-computerizedcatheterizationlaboratory,computerizedpatientmonitoring system.

### REFERENCEBOOKS:

1. Handbook ofmedical instruments, R.SKhandpur,2003.2nd Edn.TataMcGraw-Hill PublishingCompany.
2. Biomedicalinstrumentation,LeslieCromwell,FredJ.Weibell,ErichA.Pfeiffer,1980.2nd

Edn.Prentice-Hall,

1. MedicalInstrumentation,JohnG.Webster,2003,JohnWiley&Sons.
2. Principles of applied Biomedical instrumentation by L.A. GoddesandL.E. Baker, 1989.3rdEdn.JohnWileyIndiaPvt.Ltd.
3. IntroductiontoBiomedicalEquipmentTechnology,CarrJ.andJ,BrownJ.M,2009.4thEdn..Pearson.
4. MedicalelectronicsandInstrumentationbySanjayGupta.

### CourseOutcomes:

1. construction and applications of electrochemical techniques related to various aspects ofbiologicalsciences.
2. Describethetechniquesandapplicationsofchromatographyforbiologicalsampleseparation.
3. Recognizehowthecentrifugationplaysaroleinseparationofsamplewithdifferentmolecular weight.
4. Have a clear picture of radioisotopes, radioactivity, decay patterns, tracer techniques anduseofisotopes inbiologicalstudies.
5. Studytheprinciples,mechanismandapplicationsof variousElectrophoretictechniquesinresearchandindustriallevel
6. Understandthelaw of absorption spectrum,principle andmechanismof UV visiblespectrophotometry, ESR, NMR, IR, spectrofluorimetry, turbidimetry, nephelometry andluminometry,therebylearnits applicationsinresearchlevel.

### 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:**

* + TodescribethegeneralprinciplesofgeneorganizationandexpressioninbothProkaryotesand eukaryoticorganism.
	+ Toexplainvariouslevelofgeneregulationanditsfunctions.

### UNITI

Molecular structure of Genes and chromosomes.Organisation of genes in Prokaryotes andEukaryotes.ProkaryoticandEukaryoticTranscriptionunits-StructureofDNA-semiconservativemodelofreplication-experimentalevidences.

ReplicationofDNA;Enzymes, replicationineukaryotes;circularand helicalDNAregulation

* regulationofreplication.DNAdamageandrepair.

### UNIT-II

Transcription – structure and functions of RNA polymerase – initiation, elongation, andtermination of transcription. Post transcriptional modifications. Transcription in Eukaryotes.VariousclassesofRNA–mRNA,tRNA,snRNA,andhnRNA

### UNIT-III

Geneticcode–salientfeatures,decipheration,Wobblehypothesis,naturalvariationingenetic code. Translation: Prokaryotic and Eukaryotic Translation; Initiation, elongation andtermination–Inhibitorsoftranslation–Posttranslationalmodificationsandproteinsorting.

### UNIT-IV

Animal cell culture: Culture media – role of carbon dioxide, serum, growth factors, glutaminein cell culture. Types of cell culture – primary and established culture, organ culture, tissueculture.Disaggregationoftissueandprimarycellculture,cellseparation,cryopreservation..

### UNIT-V

Transgenicanimalsandplants–monoclonalandpolyclonalantibodies–vaccinesanddiagnosis–ediblevaccines–humulins-interferons

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

### REFERENCEBOOKS

1. MolecularCloning:ALaboratoryManual,J.SambrootE.F.FritschandT.Maniatis,2000.ColdSpring HarbeLaboratoryPress New York,
2. GeneVIIBenjamin 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.andPasternakJ.J. 2010,4thEdn. ASMPress, USA.
8. DNAMolecularBiotechnology,2003.GlickB.R.andPasternakJ.J.
9. Cloning1and2,GloverD.M.andHamesB.D. 1995IRLPress.
10. RecombinantDNA,J.Watson,19922ndedition,W.H,FreemanandCo.,NY.
11. Essential MolecularBiology APracticalapproach,T.A.Brown, 2007. 2ndedition, IRL Press,Oxford.
12. GeneCloning,Anintroduction,T.A.Brown1995,3rdEdn.ChapmanandHall.

### Courseoutcome:

1. Tounderstandthebasicstructures,propertiesandorganisationofeukaryoticandprokaryoticchromosomes.
2. To emphasize the molecular mechanism of DNA replication and recombination involvedineukaryotesandprokaryotes.
3. Deeplyunderstandthetranscriptionprocess inprokaryotesandeukaryotes.
4. To knows about the translation and post translational modification in prokaryotes andeukaryotes.
5. Learn the changes and consequences in chromosome structure and its related disorders,therebyknowhowtheDNArepairmechanismbyanticancertherapeuticsinvolvedagainstDNAmutationanduncontrolled cellgrowth
6. Knowthetransgenicplantsanditsapplications&risks.Alsounderstandthegeneticmodificationin food industryanditsapplications,controversiesoverrisks.
7. Knowtheplantmolecularbiologytechniquesanditsapplications

### M.Sc. MEDICAL BIOCHEMISTRY

### EXTRADISCIPLINARYCOURSEI

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CourseName:Biochemistryin Health** | **Hours** | **L** | **T** | **P** | **Credit** |
|  | **3** | **1** | **0** | **4** |
| **TotalMarks: Internal –25 External–75** | **PaperType:EDCI** |

**UNITI**

Carbohydrate - Source of carbohydrates, significance of carbohydrates in cellular activitiesand organism life system. Mucopolysaccharidosis, Lactose and Fructose intolerance.Normallevelofsugar,alterations;Diabetesmellitus,typesanditscomplications.ControlandManagementofdiabetesmellitus.

### 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 MarasmusProteinquality'Inbornerrorofaminoacidmetabolism.

### UNIT-III

Fatty acids - source of fats and importance of fats and lipids in living organism and. Role ofLDL,VLDL,HDLandchylomicronsinhumanbody.Normallevelsofcholesterolhypercholesterolemia and role of cholesterol in Blood pressure. Atherosclerosis and Heartattack'Preventionand controlofheartrelateddiseases

### UNIT–IV

Water structure, physical and chemical properties.Vitamins- water soluble and fat solublevitamins;Sources,chemicalcomposition,Biologicalfunctionandproperty,Deficiencydiseasesinhuman.

### UNIT-V

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

### REFERENCEBOOKS

1. TextbookofMedicalPhysiology -A.C.Guyton,8thEdn.1991,W.B.Saunders,Harcourt BraceCompany,Bangalore.
2. TextbookofMedicalBiochemistry2002.M.N.ChatterjeaandRanaShinde,5thEdn. JayPeePublications,NewDelhi
3. TextbookofMedicalBiochemistry2008.M.N.ChatterjeaandRanaShinde,7thEdn. JayPeePublications,NewDelhi
4. FundamentalsofBiochemistry,Dr.A.C.Deb2006,NewCentralBookAgency(P)Ltd.Kolkota.
5. EssentialsofBiochemistrySathyanarayanan.U.2002,Booksandallied(P) Ltd.
6. Fundamentals of Biochemistry for Medical Students by Ambika shanmugam2006.Publishedbyauthor;WestCITNagar,Chennai-35
7. EssentialsofMedical Physiology, K.SembilingamandPremaSembulingam, 2010. 5th

Edn.JaypeeBros,medicalPublishers(P)Ltd.Chennai.

1. Text BookofBiochemistry,S.Nagini,2002.ScitechPublications(P)Ltd.,Chennai

### M.Sc. MEDICAL BIOCHEMISTRY

### EXTRADISCIPLINARYCOURSE-II

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

**UNITI**

Digestive system: outline of digestive system. Buccal, gastric and Intestinal digestion.Roleofliver indigestion.Intestinal-Absorptionandassimilation-hormonalinfluenceindigestion.

Excretorysystem;Structureofkidneyandultra-structureofnephron.Formationandcompositionofurine.Outline ofexcretorysystem-'Micturition'.

### UNIT-II

Respiratory and Circulatory system: Types of respiration. - Outline of respiratory system'respiratory pigments, Transport of 02 and CO2. Factors affecting oxygen dissociation curveandcarbondioxide dissociationcurve.Chlorideshift.

Circulatoryorgans,compositionofblood,systemic,pulmonarycirculation,Heartbeat,cardiac cycle, origin and conduction of heart beat, Regulation of heart beat, human heart'coronarycirculation,ischemicheartdisease,ECG,Bloodpressureand cardiac output.

### UNIT-III

Nervous andMuscularsystem:outline of nervoussystem,structure ofneuron,typesofneuron, neurotransmitters. Condition of nerve impulse transmission, synaptic transmission.Muscle –Types of muscle- Role of Actin and Myosin.-Action Potential. Neuro muscularjunction.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 plantfoods, sources, composition, role of dietary fiber and resistant starch in nutrition, effect ofover consumptionoffiber.

### UNIT-V

NutritionalconsequencesandDietaryAllowancesNutritivevalueofprotein'Proteincalorie

malnutrition in children. protein and energy/ requirements Nitrogen balance and imbalance.Deficiency Disease of Vitamins and Minerals (Iron, sodium, potassium, fluoride, magnesiumand calcium.)Infant nutrition, nutrition for preschool children, school children, adolescents,pregnantandlactatingmothers.Industrialworkers.GeriatricnutritionandLathyrism.Obesity:Aetiology andoccurrence,physiologicalregulationoffoodsintakeassessment,complication,treatmentand preventionofobesity.Therapeuticdiets.

### REFERENCEBOOKS

1. FoodScience,NormanN.Potter, 1986.3rdedn..SpringerScienceLLC,NY.
2. Text book of Medical Physiology, Arthur C Guyton, 1976. 5thEdn. W. B. Saunderspublications,Tokyo.
3. Text Book of Medical Biochemistry ,M.N, ChatterjeaandRanaShindhe2002. 5th

EditionChatterjee.JayPeepublications,NewDelhi.

1. Foodfactsandprinciples, 1987.ShakuntalaManay, John WleyandSons.
2. ModernnutritioninHealthanddisease,RobertS.Goodhart,Maurice,E.Shils,1980.MichaelG.Wohl,RobertS.Goodhartand MauriceE.Shils (Editor).
3. ReviewofMedicalPhysiologybyGanong.W.F.2016,25thEdition,A&LLangeseries.
4. ConciseHumanPhysiology,Sukkar.M.Y,EI-Munshid.H.AandArdawi.M.S.M.2000,John WileyandSons.
5. Humannutritionanddietetics,s.DavidsonandJ.R.Passmore.ELBS,Zurich.
6. Nutritioninhealthanddisease,Whol&Gccdhar-t.
7. HumannutritionanddieteticsI.S.Garral,W.P.T.JameslLPsCo3

### M.Sc. MEDICAL BIOCHEMISTRY

### EXTRADISCIPLINARYCOURSE-III

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| --- | --- | --- | --- | --- | --- |
| **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 Hospitalmanagement .Job opportunities in Hospital management. Important hospital managementInstitutesinIndiaandWorldHospitalmanagement.ConceptofModernHospital&privatization in Health Sector, Public Sector Hospitals and Level of care f offered, facilities,EffectsofGlobalizationinHealthcare,ConceptofCorporateHospitalindevelopingcountries,.

### UNIT-II

Infrastructure and lay out of an ideal corporate hospital, -l Functioning of modern hospitals &changingneedofpatientsHospitalityinHospitalCare,-Invasiveandnon-invasivediagnosticfacilitiesinmodernhospitalCareofferedinSpecialtyandSuperspecialtyHospitals. Hospital management system: Benefits of Hospital management systems, ModulesofHospitalmanagementsystem.InterfacingofanalyzerPathologylabmanagement.Radiology,BloodBank,Pharmacologymanagementsoftware's.

### UNIT-III

HistoryofMedicalTranscription:DrawbacksofMRPsystem,AdventofMedicalTranscription.Webfriendlyoperatingsystem.Marketinformationoncompanies.WhatMedical Transcription does? Benefits in a nut shell. Planning on Medical Transcription set upInductionandorientation.

### UNIT-IV

ImpactofMedicalTranscription: MedicalTranscriptionimpactonitsstockholders

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

### UNIT-V

MedicalTranscriptionimplementation:MedicalReengineering,Choosingappropriatetranscription,CustomisetosuitthechangesMedicalTranscription:BestpracticesCosts,

Failure,Gapanalysis.Implementation,LifecycleMedicalTranscription-Troubleandtheirsolutions.

### REFERENCEBOOKS

1. HospitalManagementmoduleII- 2001,NIHFW,NewDelhi
2. HospitalAdministration.G.D.Kunders.2004.
3. HospitalandHealthServicesandAdministration,SyedAminTabish,2001.OxfordUniversityPress.