

DEPARTMENT OF BIOCHEMISTRY

PREAMBLE

UG: Programme Profile & the Syllabi of Courses Offered in the Semester III and IV along with III & IV

Evaluation Components (With Effect from 2021 - 2024 Batch onwards).

PG: Programme Profile & the Syllabi of Courses Offered in the Semester III and IV along with III & IV Evaluation Components (With Effect from 2021 - 2023 Batch onwards) are Presented in this Booklet.

PROGRAMME PROFILE OF B.Sc., BIOCHEMISTRY

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO No.	Upon completion of these courses the students would be able to
PSO-1	Recognize their Own Ability to improve their Competence in Using the Language through Professional English for Life Science Course.
PSO-2	Understand the Various Biological Components Present in Living Cells, Functions and their Clinical Significance.
PSO-3	Inculcate the Basic Concepts of Biochemistry Including an Understanding of the Fundamental Biochemical Principles and their Applications in a Systematic, Methodical and Scientific, Evidence - Based Process.
PSO-4	Develop Problem Solving and Analytical Skills through Case Studies, Research Projects, Experimentation, Internship, Experiential Learning and Hands-on- Experience.
PSO-5	Analyze the Applications of Biochemistry in the Fields of Clinical Biochemistry, Biochemical Techniques, Molecular Biology, Biotechnology, Microbiology Etc.,
PSO-6	Relate the Biochemistry Oriented Theoretical and Practical Knowledge in securing a Successful Career and Pursue Higher Studies.

Semester	Part	Category	Course Code	Course Title	Previous course code	Hours per week	Credit Min / Max
I	I	Language/ AECC-II / Tamil (2 Levels) Hindi / French	UTAL107/ UTAL108/ UHIL102/ UFRL102	Basic Tamil I/ Advanced Tamil I/ Hindi I /French I	UTAL105/ UTAL106/ UHIL101/ UFRL101	5	3/4
	II	Communicative English I / AECC-I (2 Levels)	UCEL101/ UCEL102	Communicative English I/ Effective Communicative English I	--	5	3/4
	III	Major Core I / DSC - I	UBCM108	Basics of Biochemistry	UBCM106	3	2
		Major Core II / DSC - II	UBCM107	Cellular Biology	UBCM105	6	6
		Core Practical I	UBCR103	Cellular Biology Practical	UBCR102	3	3
		Allied I / GE I	UCHA102	Allied Chemistry	UCHA101	3	2
		Allied Practical	UCHR103 / UCHR403	Allied Chemistry Practical	--	3	2
		PE - I	UPEM101	Professional English I	--	6	4
	IV	Value Education / SEC			--	2	1
TOTAL						36	26/28
II	I	Language/ AECC-II / Tamil (2 Levels) Hindi / French	UTAL207 / UTAL208 / UHIL202 / UFRL202	Basic Tamil II/ Advanced Tamil II/ Hindi II/ French II	UTAL205/ UTAL206/ UHIL201/ UFRL201	5	3/4
	II	Communicative English / AECC-II (2 Levels)	UCEL201 / UCEL202	Communicative English II/ Effective Communicative English II	--	5	3/4
	III	Major Core III/DSC - III	UBCM203	Biomolecules	UBCM202	6	6
		Core practical II	UBCR202	Qualitative analysis of Biomolecules Practical	--	5	5
		Allied II/ GE - II	UMBA202	Microbiology	UMBA201	3	2
		Allied II practical	UMBR202	Microbiology Practical	UMBR201	3	2
		PE - II	UPEM201	Professional English II	--	6	4
		Internship	UBCI201	Internship / Field Work / Field Project	-	30	- / 1
	IV	Non Major elective /SEC	--	--	--	3	2
	V	Extension activity/ Physical Education/NC C	--	--	--	-	1/2
TOTAL						36	28/32

III	I	Language/ AECC-II / Tamil (2 Levels) Hindi / French	UTAL307/ UTAL308/ UHIL302/ UFRL302	Basic Tamil III/ Advanced Tamil III/ Hindi III/ French III	UTAL305/ UTAL306/ UHIL301/ UFRL301	5	3/4
	II	Communicative English / AECC-I (2 Levels)	UENL309/ UENL310	General English I / Advanced English I	UENL307/ UENL308	5	3/4
	III	Major Core IV / DSC - IV	UBCM305	Biochemical Techniques	UBCM304	6	6
		Core Practical III	UBCR302	Biochemical Techniques practical I	UBCR301	3	3
		Allied III/ GE - III	UMAA305	Biostatistics	UMAA40 5	6	4
	IV	Online Course		NPTEL/Spoken Tutorial		3	1/2
		Value Education/ SEC				2	1
	TOTAL					30	21/24
IV	I	Language/ AECC-II / Tamil (2 Levels) Hindi / French	UTAL407/ UTAL408/ UHIL402/ UFRL402	Basic Tamil IV/ Advanced Tamil IV/ Hindi IV/ French IV	UTAL405/ UTAL406/ UHIL401/ UFRL401	5	3/4
	II	English / AECC-I (2 Levels)	UENL409/ UENL410	General English II / Advanced English II	UENL407/ UENL408	5	3/4
	III	Major Core V / DSC - V	UBCM404	Immunology	UBCO603 / UBCM403	5	4
		Major Core VI / DSC - VI	UIDM402	Pharmaceutical Chemistry	UIDM401	4	4
		Allied IV/ GE -IV	UBIA401	Basics of Bioinformatics	UBCM506	3	2
		Core practical IV	UBCR402	Biochemical Techniques Practical II	UBCR401	3	3
		Internship	UBCI401	Internship / Field Work / Field Project	-	30	- / 1
	IV	Non Major Elective			--	3	2
		Soft Skill/ SEC			--	2	1
	V	Extension Activity/ Physical Education/NCC			--	-	- /2
	TOTAL					30	22/27
V	III	Major Core VII /DSC - VII	UBCM507	Enzymology	--	5	5
		Major Core VIII/DSC - VIII	UBCM508	Intermediary metabolism	UBCM504	5	5
		Major Core IX / DSC - IX	UBCM505	Human Physiology	UBCM502	5	5
		Major Elective - I / DSE - I	UBCO501	Nutritional Biochemistry	--	5	4
			UBCO502	Stem cell Biology	UBCO604		
		Core practical V	UBCR501	Enzymology Practical	UBCM501	4	3

		Major Core X / DSC - X	UBCP501	Project	UBCP601	4	4
		Value Education/ SEC				2	1
TOTAL						30	27
VI	III	Major Core XI / DSC - XI	UBCM605	Introduction to Biotechnology	UBCM601	5	5
		Major Core XII / DSC - XII	UBCM606	Clinical Biochemistry	UBCM602	5	4
		Major Core XIII / DSC - XIII	UBCM607	Molecular Biology	UBCM603	5	4
		Major Core XIV / DSC - XIV	UBCM604	Comprehensive Viva voce	--	-	1
		Core Practical VI	UBCR601	Clinical Biochemistry practical	--	5	3
		Core Practical VII	UBCR602	Hematology & Urine analysis	--	3	2
		Major Elective – II / DSE - II	UBCO607	Molecular Endocrinology	UBCO605	5	4
			UBCO606	Pathobiology of Human Diseases and Disorders	--		
			UIDM601	Nanotechnology in medicine	--		
		Internship	UBCI601	Internship / Field Work / Field Project	-	30	- / 1
	IV	Soft Skill/ SEC				2	1
	V	Extension activity/ Physical Education/NCC				-	-/2
		Extension Programme	UROX601	Rural Outreach Programme		30	- / 1
TOTAL						30	24/27
GRAND TOTAL						192	148/166

**COURSES OFFERED TO OTHER DEPARTMENTS
NON MAJOR ELECTIVES (NME)**

Semester	Part	Category	Course code	Course Title	Previous course code	Contact Hour/ Week	Credit Min/ Max
IV	IV	Non Major Elective	UBCE301/ UBCE403	Hormonal Biochemistry	--	4	2
			UBCE302/ UBCE404	Food Microbiology	--		
			UBCE402/ UBCE303	Clinical Nutrition	--		
			UBCE304 UBCE401	Mushroom Cultivation	--		

BIOCHEMICAL TECHNIQUES

UBCM305

Semester : III
Category : Core IV
Class & Major : II B.Sc Biochemistry

Credit : 6
Hours/ Week : 6
Total Hours : 78

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Recall the principles and applications of bioinstrumentation.
CO-2	Describe the principle, Instrumentation of different types of bioanalytical techniques.
CO-3	Acquire knowledge about the basics and latest developments in the instrumentation techniques of Centrifugation, Electrophoresis (IEF, 2D PAGE) and Chromatography and their applications in various research fields.
CO-4	Learn about the basic Radioactivity principles, measurement method and its biological applications.
CO-5	Demonstrate broad knowledge in modern analytical instrumentation with deep knowledge in its core concepts and its applications.

UNIT - I ELECTROCHEMICAL PARAMETERS & MICROSCOPY **16 Hour**

Electrochemical Parameters - Definition of pH, pOH, Acid-Base Balance, Hendersons - Hasselbach Equation. Determination of pH - Hydrogen Electrode, Oxygen Electrode, Glass Electrode, Ion Sensing electrode, Buffers in Body Fluids.

Microscopy - Basic Principle and Applications - Light - Compound - Phase Contrast - Dark Field - Fluorescence Microscopy. Scanning Electron Microscopy (SEM) - Transmission Electron Microscopy (TEM).

UNIT - II CENTRIFUGATION TECHNIQUES **15 Hour**

Basic Principle of Sedimentation - Centrifugal Force, Sedimentation Rate, Svedberg Unit. Types of Centrifuge, Types of Rotors - Fixed Angle, Vertical, Swinging Bucket, Zonal, Elutriator Rotors. Preparative Ultracentrifuge - Differential Centrifugation, Density Gradient, Rate Zonal, Isopycnic Centrifugation. Analytical Ultracentrifugation - Determination of Molecular Weight by Sedimentation.

UNIT - III CHROMATOGRAPHIC TECHNIQUES **16 Hour**

General Principles of Chromatography - Partition and Adsorption Chromatography. Paper Chromatography - Principle, Sample Application, Development - Ascending, Descending and Radial, Detection of Amino Acids and Sugars. Thin Layer Chromatography - Principle, Instrumentation and Applications (Separation of Alkaloids). Column Chromatography - Principle, Factors Affecting Resolution. Basic Principles and Applications of Affinity Chromatography and HPLC.

UNIT - IV ELECTROPHORETIC TECHNIQUES **15 Hour**

Electrophoresis - Principle, Instrumentation and Applications of Paper, Starch, Agarose, SDS-PAGE, Cellulose Acetate and Immunoelectrophoresis. Isoelectric Focusing. Blotting Techniques - Southern, Northern, Western. Concepts and Applications of PCR.

UNIT - V PHOTOMETRY DETECTION METHODS & RADIOACTIVE TECHNIQUES

16 Hour

Beer - Lambert's Law, UV-Visible Spectrophotometry - Principle, Instrumentation and Applications. Flame Photometry - Flame Emission Spectrophotometry and Atomic Absorption Spectrophotometry.

Types of Radiation - Units of Radioactivity - Radioisotopes, Half - Life - Radioactivity Measurement; GM and Scintillation Counters; Radioactive Hazards - Uses and Safety Measures; Autoradiography.

Text books

- Upadhyay-Upadhyay Nath. (2016). *Biophysical chemistry*, Himalaya publications.
- Keith Wilson and John Walker. (2010). *Principle and techniques of Practical biochemistry*, (7th Ed.) Cambridge press.
- Keith Wilson and Goulding, K.H. (1993). *A biologist's guide to principles and techniques of practical biochemistry*, (3rd Ed). ELBS, London.

Reference books

- Hezl & Peck. (2016) *Analytical Biochemistry*, (3rd Ed), Prentice Hall.
- Sadasivam S and A.Manickam,(2010). *Biochemical methods*, (3rd Ed.) New Age International (P) Ltd publisher.
- Subramanian M.A, (2006). *Biophysics: Principle and techniques*. (1st Ed), MJP publishers.

E - Resources

- <https://www.pdfdrive.com/analytical-biochemistry-3rd-ed-david-holme-hazel-peckpdf-e20263959.html>
- <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=42656>
- <https://www.ebooks.com/en-us/95946455/wilson-and-walker-s-principles-and-techniques-of-biochemistry-and-molecular-biology/hofmann-andreas-clokier-samuel/>

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Define the principle, Instrumentation of different types of Light microscopy and electron microscopy and its applications in various fields of research.	K1
CO-2	Discuss the importance and applications of centrifugation techniques in modern day research	K2
CO-3	Separate and calculate the biomolecules using chromatographic techniques.	K3
CO-4	Explain electrophoretic techniques and its uses.	K4
CO-5	Explain about principle, Bioinstrumentation and applications of latest spectroscopy techniques like Turbidometry, AAS, NMR, ESR and Nephelometry.	K4

BIOCHEMICAL TECHNIQUES PRACTICAL I

UBCR302

Semester : III
Category : Core Practical III
Class & Major : II B.Sc Biochemistry

Credit : 3
Hours/ Week : 3
Total Hours : 39

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Learn the various instrumentations that are used in the analytical laboratories.
CO-2	Practice on preparation of buffers and measurement of pH.
CO-3	Acquire the basic knowledge on the theory, operation and function of analytical instruments.
CO-4	Analyze the presence of biological components by chromatography techniques.
CO-5	Practice on checking of BP and blood sugar and its consequences.

BIOMEDICAL TECHNIQUES

1. Measurement of BP
2. Measurement of Blood Sugar Level Using Glycometer.

VOLUMETRIC ANALYSIS

1. Estimation of Iron, Oxalates, Nitrite and Chromates Using Potassium Permanganate.
2. Estimation of Calcium from Milk and Urine.
3. Estimation of Copper and Potassium Dichromate by Iodometry Method.
4. Preparation of Buffers and Measurement of pH.

CHROMATOGRAPHY TECHNIQUES

1. Separation and Detection of Amino acids by Paper Chromatography.
2. Separation and Detection of Simple Sugars by Paper Chromatography
3. Separation of Polar and Non Polar Aminoacids by Thin Layer Chromatography.
4. Separation of Plant Pigments by Column Chromatography.

Text Books

- David T Plummer, *An introduction to practical biochemistry*, 3rd edition, Tata Mac Graw hill Publication, 2008.
- Keith Wilson, John Walker, *Principles and Techniques of Practical Biochemistry and Molecular Biology*, 7th edition, Cambridge University Press, 2010.

Reference Books

- Jayaraman.J. (2011). *Laboratory manual in Biochemistry*, (2nd Ed), New Age International Limited publication.
- Sadasivam.S and Manickam.A (2008). *Biochemical Methods*, (3rd Ed), New Age International publication.
- K. Wilson, K. H. Goulding Hodder & Stoughton. (1993) *Principles and Techniques of Practical Biochemistry*, (3rd Ed.)

E - Resources

- <http://elte.prompt.hu/sites/default/files/tananyagok/IntroductionToPracticalBiochemistry/book.pdf>
- <https://www.pinterest.com/pin/746049494494648558/>
- https://www.academia.edu/28271882/An_Easy_Guide_for_Practical_Biochemistry

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Apprehend the basics of instruments used in biochemical analysis and reagent preparation.	K2
CO-2	Cognize the principles of the various analytical instruments used in biochemistry research laboratories.	K2
CO-3	Explore the various separation and quantifying techniques used to isolate and measure the biological samples	K4
CO-4	Compare and sort out the suitable techniques used for the analysis of biological samples chosen.	K3
CO-5	Demonstrate on separation of sugars, amino acids and Plant pigments using different chromatographic techniques	K4

IMMUNOLOGY UBCM404

Semester : IV
Category : Core V
Class & Major : II B.Sc Biochemistry

Credit : 4
Hours/ Week : 5
Total Hours : 65

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Understand the basic concepts of the immune system.
CO-2	Identify the cellular and molecular basis of immune responsiveness.
CO-3	Learn about antigens, immunoglobulin and their diversity.
CO-4	Describe the roles of the immune system in both maintaining health and contributing to disease.
CO-5	Develop the basic techniques for identifying antigen antibody interactions.

UNIT - I INTRODUCTION

14 Hour

Antigen: Property, Specificity, Cross Reactivity, Antigenicity, Immunogenicity, Antigen Determinants, Haptens, Adjuvants. Antibody: Property, Classes & Subclasses of Ig: Structure Specificity & Distribution. (Antibody Structure, Types, Properties and their Biological Functions)

UNIT - II LYMPHOID ORGANS

12 Hour

Primary & Secondary Lymphoid Organs - Bone Marrow, Thymus, Bursa of Fabricus, Lymphnode, Spleen GALT & MALT. Cells of the Lymphoreticular System.

UNIT-III IMMUNITY**13 Hour**

Types of Immunity- Innate & Acquired Immunity – Active & Passive Immunity, Immune Response. Humoral and Cell Mediated Immunity, Immunization Schedule, Immunity to Infection. Immune Boosters.

UNIT-IV IMMUNE RESPONSE**13 Hour**

Hypersensitivity Reactions - Types and Mechanism. Autoimmunity. Transplantation – Types - Allograft Rejection Mechanism and Prevention of Graft Rejection - Immune - Suppressive Drugs. HLA - Immune Response Genes - HLA Molecules.

UNIT-V IMMUNO TECHNIQUES**13 Hour**

Immunoelectrophoresis, Immunoprecipitation, RIA, ELISA, Immunoblotting, Avidin - Biotin Mediated Immunoassay, Immunohistochemistry, Monoclonal Antibodies & Hybridoma Techniques. Complement Fixation.

Text books

- N.Arumugam. (2014). *Immunology*, Saras publication.
- Ananthanarayanan .K & Jayaramapanikar, (2020) *Text book of microbiology & Immunology*, (8th Ed.)

Reference books

- Roitt Ivanna, Jonathan Brastoff, David Nale, (2020). *Immunology*, (9th Ed.), Blackwell publishing Lit.
- Janis Kuby, (2013). *Immunology*, (8th Ed.), W.H.Freeman and company.
- Peter Delves, Seamus martin, Dennis burton, Ivanna Rotti, (2017). *Essentials of immunology*, (13th Ed.), wiley Blackwell publication.

E - Resources

- <http://sacema.org/uploads/Essential-Clinical-Immunology.pdf>
- <http://www.louisbolck.org/downloads/1822.pdf>
- https://www.roswellpark.org/sites/default/files/thanavala_9-4_14_innate_immunity_part_1.pdf
- http://www.dphu.org/uploads/attachements/books/books_5451_0.pdf
- <http://www.helmberg.at/immunology.pdf>

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Define the role of Ag and Antibody in immune system	K1
CO-2	Explain the basic concepts of the immune system, different types of immune cells and organs, the cell-mediated and humoral aspects of immunity and immune responses, its disorder and lot more.	K2
CO-3	Illustrate the immune system functions by recognizing and destroying foreign antigens including the harmful microorganisms and other disease-causing microbes.	K3
CO-4	Evaluate the adverse effect of immune system including allergy, hypersensitivity and autoimmunity.	K4
CO-5	Criticize for immunological research and execute it using immunological Techniques.	K5

PHARMACEUTICAL CHEMISTRY
UIDM402

Semester : IV
Category : Core VI
Class & Major : II B.Sc Biochemistry

Credit : 4
Hours/ Week : 4
Total Hours : 52

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Understand the Drug Metabolic Pathways, Adverse Effect and Therapeutic Value of Drugs.
CO-2	Study about the Sources of Impurities and Methods to Determine the Impurities in Inorganic Drugs and Pharmaceuticals.
CO-3	Acquire the Medicinal and Pharmaceutical Importance of Inorganic Compounds.
CO-4	Learn the Variety of Inorganic Drug Classes.
CO-5	Evaluate their Clinical Importance and Effects By Bioassays.

UNIT - I INTRODUCTION TO PHARMACEUTICAL CHEMISTRY 10 Hour

Drugs - Definition, Source and Nature, Classification and Nomenclature, ADMET - Routes of Drug Administration, Absorption and Distribution of Drugs, Factors Influencing Drug Absorption And Elimination of Drugs. Determination of ED₅₀ and LD₅₀ Values.

UNIT - II DRUGS AND RECEPTORS 10 Hour

Drug- Receptor Interactions: Receptor - Definition, Agonist and Antagonist of Drugs. Types of Receptor - G - Protein Coupled Receptor, Receptors with Intrinsic Ion Channel and Enzymatic Receptors.

Receptors Regulating Gene Expression, Involvements of Binding Forces in Drug Receptor Interaction, Drug Action not mediated by Receptors, Receptor Theories.

UNIT - III DRUG METABOLISM 10 Hour

Phase I Reactions - Role of Cytochrome P450. Methods of Study of Drug Metabolism, Microsomal and Non Microsomal Reactions. Phase II Reactions-Conjugation Reactions. Physiological Importance of Xenobiotic Metabolism.

UNIT - IV DRUGS ACTING ON VARIOUS SYSTEMS 12 Hour

Drugs Acting on Various Systems: Respiratory System - Cough, Bronchial - Asthma, Pulmonary Tuberculosis. CNS - Sedative - Hypnotic, GI Tract Drugs for Peptic Ulcer, Diarrhea and Constipation. Adverse Drug Reactions and Drug Induced Side Effects, Biological Effects of Drug Abuse, Management of Self - Poisoning and Drug Dependence, Drug Tolerance and Intolerance.

UNIT - V DRUG DELIVERY & DRUG TESTING 10 Hour

Biological Testing and Bioassays - Invitro and Invivo. Cancer Chemotherapy - Cytotoxic Drugs. Immunosuppressive Drug Therapy. Drug Delivery.

Text Books

- K. D. Tripathi, (2010). *Essentials of Medical Pharmacology*, (7th Ed), Jaypee Publishers.
- Jayashree Ghosh. (2010). *A Textbook of Pharmaceutical Chemistry*, (3rd Ed.). Jayashree Ghosh, S.Chand & Company Ltd., New Delhi.
- Donald Cairns, (2012) *Essentials of Pharmaceutical Chemistry*, (4th Ed.). Pharmaceutical Press.

Reference Books

- Satoskar R.S and Bhandar S.D, (1995). *Pharmacology and Pharmacotherapeutics*, (14th Ed.)
- Gary Waish, (1998). *Biopharmaceuticals: Biochemistry & biotechnology*, (1st Ed.) John Wiley Sons, New York.
- Bertram Katzung, (2012). *Basic and Clinical Pharmacology*, (12th Ed.). Lange Publishers.

E - Resources

- www.eso.sankaranethralaya.org/pdf/course_content/pharmacology.pdf
- <https://www.omicsonline.org/conference-proceedings/2161-0444-C1-031-010.pdf>
- www.meddean.luc.edu/lumen/meded/therapy/homepage/IntroCourse2015_2016.pdf

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Describe the drugs and its classification	K1&k2
CO-2	Explain the drug receptors and their interaction.	K2
CO-3	Illustrate the metabolism of drugs.	K3
CO-4	Distinguish the chemistry of drugs with respect to their pharmacological activity.	K4
CO-5	Critize about chemotherapeutic of drugs.	K5

BASICS OF BIOINFORMATICS**UBIA401****Semester : IV****Category : Allied IV****Class & Major : II B.Sc Biochemistry****Credits : 2****Hours/Week : 3****Total Hours : 39****COURSE OBJECTIVES**

CO No.	To enable the students to
CO-1	Understand the basics concepts of Bioinformatics and its significance in Biological data analysis.
CO-2	Classify different types of Biological databases.
CO-3	Appraise the features of DNA sequence analysis.
CO-4	Understand the concepts of FASTA & BLAST.
CO-5	Familiarize on applications of Bioinformatics

UNIT - I INTRODUCTION TO BIOINFORMATICS **08 Hour**

Bioinformatics - An Overview and Definition, Objectives and Scope - Genomics, Proteomics and Computer Aided Drug Design. Bioinformatics and Internet - Challenges and Applications. Bioinformatics Programmes in India

UNIT - II BIOLOGICAL DATABASE AND ITS TYPES **10 Hour**

Introduction to Data Types and Source. General Introduction of Biological Database; Nucleic Acid Databases - NCBI, DDBJ, SWISS-PROT and EMBL. Protein Information Resources - Biological Databases Protein Databases – Primary, Composite and Secondary. Specialized Genome Databases, TIGR and Acedb, Structure Databases – CATH, SCOP and PDB Sum. String Database

Lab demo class-NCBI, EMBL and DDBJ

UNIT - III DNA SEQUENCE ANALYSIS **07 Hour**

DNA Sequence Analysis - DNA Sequence, Features of DNA Sequence Analysis, EST - Differential Approaches to EST Analysis and C-DNA Libraries.

UNIT - IV SEQUENCE ALIGNMENT **07 Hour**

Pair Wise Alignment - Database Searching (Needleman Algorithm), Comparing Two Sequence - Identity and Similarity, FASTA And BLAST, Multiple Sequence Alignment - Definition – Clustal W, X, MAFT, PILUP.

Lab Demo Class-FASTA, BLAST and Clustal W, X, MAFT, PILUP

UNIT - V BIOINFORMATICS APPLICATIONS **07 Hour**

Perl/Python for Bioinformatics: Basic Concepts and Application in Biological Sequence Analysis. Bioinformatics Tools for Primer Designing and Checking

Text Books

- Attwood T.K and D.J Parry, (2014) *Introduction to Bioinformatics*, Pearson Education Ltd., New Delhi.
- N. Gautham, (2007). *Bioinformatics-Database and Algorithm*, Narrosa publishing house.

Reference Books

- Andreas D Baxevanis and Francis Quellette B F, (2016). *Bioinformatics- a Practical guide to the analysis of genes and proteins*, Willey publication, New Delhi.
- Arthur M. Lesk, (2006). *Introduction to Bioinformatics*, second edition, Oxford University press, UK.
- Jerry Gu, Philip E Bowne, (2009). *Structural Bioinformatics*, Willey- blockwell publication, New Delhi.

E - Resources

- www.aun.edu.eg/.../Procedure%20Bioinformatics22.../Xiong%20-%20Es...
- www.iasri.res.in/ebook/CAFT_sd/Concepts%20of%20Bioinformatics.pdf
- goldenhelix.com/.../ebooks/Teaching-Bioinformatics-Concepts-Practical
- www.Bioinformatics.org
- www.bioinfo.mbb.yale.edu/mbb452a/intro/
- www.biology.ucsd.edu/others/dsmith/Bioinformatics.htm

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Explain the concepts of biology in Computer science and scope of bioinformatics.	K2
CO-2	Illustrate the types of biological data bases.	K3
CO-3	Appraise the features of DNA sequence analysis.	K4
CO-4	Describe the concepts of FASTA & BLAST.	K2
CO-5	Explain the applications of bioinformatics.	K4

BIOCHEMICAL TECHNIQUES PRACTICAL II UBCR402

Semester : IV
Category : Core Practical IV
Class & Major : II B.Sc Biochemistry

Credit : 3
Hours/ Week : 3
Total Hours : 39

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Understand and Apply the Principles of Volumetric and Electrophoretic Techniques in Biochemical Analysis.
CO-2	Develop Technical Competence.
CO-3	Identify Different Organic Compounds Using SDS PAGE and Blotting Techniques, the Various Principles and Instrumentation behind them.
CO-4	Estimate the amount of Sugar, Amino acids, Ascorbic acid and Chloride present in the given solution using suitable Titrimetric method.
CO-5	Demo on separation of DNA and Protein using Blotting techniques.

VOLUMETRIC ANALYSIS

1. Estimation of Amino Acids by Sorenson Formal Titration Method.
2. Estimation of Ascorbic Acid by Titrimetric Method
3. Determination of Saponification Value, Iodine Value and Acid Number Using Edible Oil.
4. Estimation of Reducing Sugar by Benedict's Method.
5. Estimation of Chloride by Mohr's Method.

ELECTROPHORETIC TECHNIQUE (DEMONSTRATION)

6. Separation of Proteins by SDS PAGE.
7. Identification of DNA & Protein by Southern & Western Blots.

Text Book

- David T.Plummer, (1987). *An introduction to practical biochemistry*, (3rd Ed.). Mc Graw Hill, London.

Reference Books

- Jayaraman.J. (2011). *Laboratory manual in Biochemistry*, (2nd Ed), New Age International Limited publication.
- Sadasivam.S and Manickam.A (2008). *Biochemical Methods*, (3rd Ed), New Age International publication

E - Resources

- <http://elte.prompt.hu/sites/default/files/tananyagok/IntroductionToPracticalBiochemistry/book.pdf>
- <https://www.pinterest.com/pin/746049494494648558/>
- https://www.academia.edu/28271882/An_Easy_Guide_for_Practical_Biochemistry

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Apprehend the basics of instruments used in biochemical analysis and reagent preparation.	K2
CO-2	Cognize the principles of the various analytical instruments used in biochemistry research laboratories.	K2
CO-3	Explore the various separation and quantifying techniques used to isolate and measure the biological samples	K4
CO-4	Compare and sort out the suitable techniques used for the analysis of biological samples chosen.	K3
CO-5	Demonstrate on separation of DNA and Protein using Blotting techniques	K4

HORMONAL BIOCHEMISTRY

UBCE301/UBCE403

Semester : IV
Category : None Major Elective
Class & Major: II UG

Credit : 2
Hrs/Week : 4
Total Hrs : 52

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Understand the structure, biosynthesis and functions of hormones
CO-2	Illustrate how every aspect of our physiology and behavior is directly controlled or modified by hormones using reproduction, growth, development, stress, and metabolism.
CO-3	Recognize the roles of the endocrine system in maintaining homeostasis, integrating growth and development, responding to environmental insults and promoting successful reproduction.
CO-4	Differentiate among endocrine, paracrine and autocrine systems.
CO-5	Understand how hormones are metabolized in blood and tissues and the importance of hormone activation and degradation.

UNIT I INTRODUCTION

10 Hour

Introduction to the hormones. Hormones-definition, classification, characteristic features. Hormone receptors-features. Regulation of receptor levels. Overview mechanism of hormone action signal transduction.

UNIT II GLYCOPROTEIN HORMONES**10 Hour**

Secretion, biological action, functions and regulation of growth hormone, thyroid stimulating hormone, ardeno corticotrophin hormone, prolactin, gonadotropic hormone, follicle stimulating hormone, luteinizing hormone, antidiuretic hormone and oxytocin. Disorders-Dwarfism, gigantism, acromegaly, hyper and hypopituitarism, cushings disease and diabetes insipidus.

UNIT III THYROID AND PARATHYROID HORMONES**12 Hour**

Thyroid and parathyroid hormones: secretion, functions. Biological action of thyroid hormones. Thyroxine. Disorders: hypothyroidism- cretinism, myxoedema and hashimoto's diseases. Hyperthyroidism- Graves diseases (Exophthalmic goiter) and non-toxic goiter.

UNIT IV PANCREATIC HORMONES**10 Hour**

Pancreatic hormones: synthesis , regulation, biological action, mechanism of insulin. Glucagon, somatostatin and insulin growth factor and their disorders (esp diabetes mellitus, hypoglycemia).

UNIT V ADRENAL AND GONADAL HORMONES**10 Hour**

Adrenal and gonadal hormones: Glucocorticoids and mineralocorticoids- secretion, transport, biological effects, metabolism and excretion. Gonadal hormones- biological action of androgens and estrogens.

Text Books

- Devlin ,*Textbook of Biochemistry (with clinical correlation)* . John wiley and sons publishers .1997
- Lohar ,S. prakasa , Endocrinology –hormones & human health .MJP publishers .2006 .

Reference Book

- Austin and short ,Mechanism of hormone action .Prema Jaypee brothers .1992

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Understand the role of endocrine system in maintaining ionic and glucose homeostasis	K2
CO-2	Explain the role of glycoprotein hormones and its disorders.	K3
CO-3	Describe molecular, biochemical and physiological effects of all hormones and factors on cells and tissues.	K4
CO-4	Understand the integrative communications that regulate, growth, appetite, metabolism and reproduction	K2
CO-5	Elucidate the role of hormones in biological clock	K4

FOOD MICROBIOLOGY
UBCE302 / UBCE404

Semester : IV
Category : Non Major Elective
Class : II UG

Credit : 2
Hours/week : 4
Total Hours : 52

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Identify the important pathogens and spoilage microorganisms in foods and the conditions under which they will grow
CO-2	know the spoilage and deterioration mechanisms in foods and methods to control deterioration and spoilage via fermentation processes.
CO-3	Explain the role of beneficial microbes; harmful microorganisms and food spoilage; pathogenic microorganisms, infection and intoxication, mycotoxin, viruses and parasites
CO-4	Understand the principles involving food preservation.
CO-5	Apply the principles of food science to control and assure the quality of food products

UNIT I INTRODUCTION

10 Hour

Microorganism- introduction, definition and general classification of food microbes- yeasts, mould and bacteria (*E.coli* & *C.Botulinum*) and their role in food spoilage.

UNIT II FOOD SPOILAGE

10 Hour

General principles underlying spoilage of food, fitness and unfitness of food for consumption, contamination and spoilage of non perishable and perishable foods.

UNIT III FOOD BORNE DISEASES

12 Hour

Food in relation to disease-food born diseases, bacterial poisoning, symptoms and prevention of staphylococcal food poisoning and salmonella food poisoning.

UNIT IV FOOD PRESERVATION

10 Hour

Control and prevention of microbial food poisoning –Principles of preservation, preservation by high and low temperature, Chemical preservatives- Salt & Sugar as preservatives, new trends in preservation.

UNIT V STERILIZATION AND PASTEURIZATION

10 Hour

Sterilization-Physical agents-Heat, moist heat, fractional sterilization, pasteurization. chemical agents-Phenols, alcohols, and quaternary ammonium compounds.

Text Books

- Frazier.William.C,westhoff.D.C food microbiology TATA Mc Graw Hill, 4th edition.1993.
- Vijaya Ramesh.K Food microbiology,, MJP publishing company Ltd,2007.

Reference books

- Pelczar M.J.,chan J.E.C.S., Noel.Krieg.R.microbiology-TATA Mc Graw Hill,5th Edition,1993.
- Prescott, Harley & Kleins, Microbiology,Mc.Graw-Hill International publishing company Limited,7th edition,2008

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Explain the important pathogens and spoilage microorganisms in foods and the conditions under which they will grow	K2
CO-2	Discuss the spoilage and deterioration mechanisms in foods and methods to control deterioration and spoilage via fermentation processes.	K3
CO-3	Enumerate the role of beneficial microbes; harmful microorganisms and food spoilage; pathogenic microorganisms, infection and intoxication, mycotoxin, viruses and parasites	K4
CO-4	Define the principles involved in food preservation.	K2
CO-5	Explain the principles of food science to control and assure the quality of food products.	K4

CLINICAL NUTRITION**UBCE402/UBCE303****Semester: IV****Category: Non Major Elective****Class : II UG****Credit : 2****Hours/week : 4****Total Hours : 52****COURSE OBJECTIVES**

CO No.	To enable the students to
CO-1	Demonstrate knowledge of nutrition in health and the recommended nutrient allowances
CO-2	Understand the importance of dietary management to overcome various blood disorders.
CO-3	Aware about dietary management to overcome various GI disorders.
CO-4	Understand the importance of dietary management to overcome various systemic disorders.
CO-5	Familiarize on dietary management to overcome various renal disorders.

UNIT-I HEALTH AND NUTRITION**10 Hour**

Diet in Health- dietary requirement of Carbohydrates, Proteins, Lipids, Vitamins, Micronutrient & macronutrient. Recommended allowance for children, adolescents and adults.

UNIT-II BLOOD CELL DISORDERS**10 Hour**

Anemia – iron deficiency anemia, microcytic & macrocytic anemia, hereditary anemia-sickle cell & Thalassemia – clinical features, diagnosis & dietary management.

UNIT-III GASTROINTESTINAL DISORDERS**10 Hour**

Diet in disease- fever, fatty liver, peptic ulcer, constipation, gall stone, gastrointestinal disorders- clinical features, diagnosis & dietary management.

UNIT-IV SYSTEMIC DISORDERS**12 Hour**

Clinical features, causes, diagnosis & dietary management in Diabetes Mellitus, Cardiovascular diseases and Atherosclerosis.

UNIT-V RENAL DISORDERS**10 Hour**

Renal disorders- kidney stones, Glomerular nephritis, Chronic & acute renal failure, Causes, clinical features, Diagnosis & dietary management.

Text Books

- Swaminathan, M. *Essential of Food & Nutrition*, BAPPCO, Bangalore, 2003.
- Dr. Jyothi Singh, *Handbook of Nutrition and dietetics* Lotus Press, New Delhi, 2008.

Reference Books

- Allan Caw Robert, A. Cowan Denis St. J. Oreilly. Michael Stewart. James Sheperd. An illustrates color text, Clinical Biochemistry, “Elseiver Health Sciences”.5th edition, 2013.
- PatreciaTrueman, “*Nutritional Biochemistry*”. MJP publishes, 3rd edition, 2009.
- Chatterjee Rana Shindae. “*Text book of Medical Biochemistry*”, Jaypee publishers 7th edition, 2008.

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Define nutrition, nutrient and the role of nutrition in health and the recommended nutrient allowances	K1
CO-2	Explain the importance of dietary management to overcome various blood disorders.	K2
CO-3	Identify the various GI disorders due to dietary imbalance.	K3
CO-4	Discuss the importance of dietary management to overcome various systemic disorders.	K6
CO-5	Summarize the renal disorders that occur due to diet.	K2

MUSHROOM CULTIVATION
UBCE401 / UBCE304

Semester : IV
Category : Non Major Elective
Class & Major: II UG

Credit : 2
Hours/Week: 4
Total Hours: 52

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Study the morphology, classification, edible and poisonous mushrooms.
CO-2	Aware about the various steps involved in cultivation of mushroom
CO-3	Explore to preventive measures to be followed during cultivation and post harvest.
CO-4	Trained in cultivating and harvesting of mushrooms.
CO-5	Exposed in preparing variety of mushroom recipes.

UNIT- I INTRODUCTION TO MUSHROOMS AND ITS LIFE CYCLE 9 Hour

History of mushroom cultivation. Morphology, classification - edible and poisonous mushrooms. Wild and cultivated mushrooms. Life cycle of *Agaricus spp* , characteristics and importance of *Volvariella spp.*, *pleurotus spp.*, *Calocybe spp.*, and *Lentinus spp.*

UNIT- II CULTIVATION AND BIOLOGICAL IMPORTANCE 9 Hour

Conditions for tropical and temperate countries - isolation, spawn production, growth media, spawn running and harvesting of mushrooms. Medicinal and nutritional value of mushrooms. Composting: importance in waste recycling.

UNIT- III DISEASES AND POST HARVEST TECHNOLOGY 8 Hour

Diseases and pest affecting mushroom. Post harvest technology: Refrigeration – Freeze drying, drying, canning, irradiation and entrepreneurship.

UNIT- IV MUSHROOM CULTIVATION (PRACTICALS) 20 Hour

Bed and shed preparation, sowing seedlings, pest control, fumigation and harvesting

UNIT- V MUSHROOM RECIPIES (PRACTICALS) 6 Hour

Mushroom soup, Mushroom pickle, Mushroom Pulav, Mushroom Chips

Text Books

- Nital Bahl, Hand book on Mushroom 4th edition. Vijay primlani for oxford & IBH publishing co pvt ltd, New Delhi, 2002.
- Hand book of mushroom cultivation, TNAU publications, 1999.

Reference books

- Chang T.S and Hayes W A, 1978. *The biology and cultivation of edible mushrooms*. Academic press, New York.
- M.C.Nair, C.Gokulapalan and Lulu das, 1997. *Topics on mushroom cultivation*, Scientific publishers, Jodhpur, India

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Identify the different types of mushroom and its benefits in cooking.	K2
CO-2	Identify the fruiting stage and apply the life cycle and culture needs of many mushrooms to the garden and landscape environmental niches.	K3
CO-3	Describe and apply the uses and lore of many mushrooms and culture techniques to further explore their cultivation potential.	K4
CO-4	Apply laboratory techniques to the capture, culture, and fruiting of many types of mushrooms in the home kitchen la	K2
CO-5	Demonstrate the importance of mushroom by preparing various types of receipies.	K4

III & IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
III	Major Core IV / DSC - IV	UBCM305	Biochemical Techniques	Model preparation	Seminar
	Core Practical III	UBCR302	Biochemical Techniques practical I	DPA	Viva Voce
IV	Major Core V / DSC - V	UBCM404	Immunology	Poster presentation	Seminar
	Major Core VI / DSC - VI	UIDM402	Pharmaceutical Biochemistry	Assignment	Seminar
	Allied IV/ GE -IV	UBIA401	Basics of Bioinformatics	Assignment	Seminar
	Core practical IV	UBCR402	Biochemical Techniques Practical II	DPA	Viva Voce
	NME	UBCE304/ UBCE401	Mushroom Cultivation	Assignment	Seminar
		UBCE402/ UBCE303	Clinical nutrition	Assignment	Case study
		UBCE301/ UBCE403	Hormonal Biochemistry	Assignment	Poster presentation
		UBCE302/ UBCE404	Food Microbiology	Model preparation	Seminar

PROGRAMME PROFILE OF M.Sc., BIOCHEMISTRY

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO No.	Upon completion of these courses the students would have
PSO-1	Understand the scientific basis of life process and orient towards the applications of Knowledge acquired in solving clinical problem in society.
PSO-2	Acquire deep scientific knowledge in subjects like cell biology, enzymology, biotechnology, Metabolism, endocrinology, immunology, genetics, genetic engineering and clinical biochemistry.
PSO-3	Detect Various Disorders and Identify the Defect in the Metabolic Pathways and Evaluate Solutions for Metabolic Disorders by Applying the Knowledge of Metabolism.
PSO-4	Undertake biochemical experiments using classical and modern instruments of biochemistry & molecular biology, record and interpret the results, draw conclusions.
PSO-5	Acquiring the ability of leadership skills to manage projects in multidisciplinary environments and to develop skills to carryout experiments listed in and beyond syllabus to implement individual /group and to become an enterprenurer.
PSO-6	Communicate biochemical concepts through effective written and oral presentation and to compete globally with confidence in all the sectors of life science
PSO-7	Instilling knowledge and awareness on professional ethics, bioethical and health issues, intellectual property rights and life-long learning through career oriented courses such as IPR, biosafety and bioethics
PSO-8	develop hands on experience and laboratory experiments perceived will be constructive to pursue research in global level

Semester	Category	Course code	Course title	Previous course code	Contact Hours / Week	Credit
						Min/Max
I	Core I / DSC I	PBCM107	Bimolecular Chemistry	PBCM101	6	4
	Core II / DSC II	PBCM108	Cell Biology	PBCM102	6	4
	Core III / DSC III	PBCM109	Microbiology	PBCM203/105	6	4
	Core IV / DSC IV	PBCM110	Molecular Biology	PBCM204/106	6	4
	Core Practical I	PBCR103	Microbiology and Molecular Biology Practical	PBCR201/102	6	5
TOTAL					30	21
II	Core V/ DSC V	PBCM207	Metabolism & Regulation	PBCM201	5	4
	Core VI / DSC VI	PBCM208	Human Physiology	PBCM202	5	4
	Core VII/ DSC VII	PBCM209	Analytical Biochemistry	PBCM103/205	5	5
	Core VIII/ DSC VIII	PBCM210	Endocrinology	PBCM104/206	4	4
	Core Practical II	PBCR203	Analytical Biochemistry Practical	PBCR101/202	6	5

	Core IX/ DSC IX	PBCX201	Mushroom cultivation (Service Learning)	--	-	1
	NME /SEC				5	4
	Online Course	PMAS201	Spoken Tutorial/NPTEL	-	-	-/2
TOTAL					30	27/29
III	Core X/ DSC X	PBCM305	Enzymology and Enzyme Technology	PBCM301	6	5
	Core XI/ DSC XI	PBCM306	Immunology	PBCM303	6	5
	Core XII / DSC XII	PRMC301	Research Methodology	PBCM304	5	4
	Core Practical III	PBCR302	Enzymology & Clinical Diagnostics	PBCR301	6	5
	Core XVI / DSC XVI	PBCP401	Project	--	2	-
	Core XIII / DSC XIII	PBCI302	Plant Biochemistry& Industrial Biotechnology	PBCI301	5	4
TOTAL					30	23
IV	Core XIV / DSC XIV	PBCM403	Genetics & Genetic Engineering	PBCM401	6	5
	Core XV / DSC XV	PBCM404	Advanced Clinical Biochemistry	PBCM402	6	5
	Core XVI/ DSC XVI	PBCP401	Project	--	18	9
TOTAL					30	19
GRAND TOTAL					120	90/92

**COURSES OFFERED TO OTHER DEPARTMENT
NON MAJOR ELECTIVE**

Semester	Category	Course code	Course Title	Previous course code	Contact Hours/ Week	Credit	
						Min.	Max.
II	Non Major Elective	PBCE204	Pharmaceutical Biochemistry	PBCE101/201	5	4	4
		PBCE202	Reproductive Biology & Disorders	PBCH102			
		PBCE203	Modern Lifestyle associated diseases	PBCE103			

ENZYMOLGY & ENZYME TECHNOLOGY

PBCM305

Semester : III
Category : Core X
Class & Major : II M.Sc Biochemistry

Credit : 5
Hours/ Week : 6
Total Hours : 78

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Improve the understanding of enzymatic processes by studying the structure, physical, chemical and catalytic properties of enzymes.
CO-2	Understand the physiological classifications and mechanisms of secretion and extracellular distribution of cellular enzymes.
CO-3	Techniques employed in enzymes purification and characterizations are also emphasized in this course.
CO-4	Provide an awareness of the current and possible future applications of enzyme technologies.
CO-5	Introduced to the theory as well as applications of enzyme technology in food, medical, and household industries.

UNIT - I ENZYME AS BASIS OF LIFE

15 Hour

Enzymes as Biocatalyst, Properties, Factors Affecting Enzyme Activity, Types of Specificity, Enzyme Turnover, Fundamentals of Enzyme Assay- Enzyme Units, Coupled Kinetic Assay, Enzyme Localization. Nomenclature and Classification of Enzymes According to IUB. Monomeric Enzyme - Chymotrypsin, Trypsin and Carboxy Peptidase. Oligomeric Enzymes - Isoenzymes - LDH.

UNIT - II MECHANISM OF ENZYME ACTIVITY

16 Hour

Active Site, Lock and Key Theory, Induced Fit Model. Collision and Transition State Theories. Mechanism of Catalysis: Proximity and Orientation Effects, General Acid - Base Catalysis, Concerted Acid - Base Catalysis, Nucleophilic and Electrophilic Attacks, Catalysis by Distortion, Metal Ion Catalysis. Theories on Mechanism of Catalysis. Coenzymes - Mechanism and Action of TPP, Coenzyme A, NAD, FAD.

UNIT – III KINETICS OF ENZYME ACTION

15 Hour

Definition and Importance, Quantitative Analysis of Single Substrate - Michaelis-Menten Equation. Determination & Significance of K_m & V_{max} . Importance of K_{cat}/K_m . Determination of K_i . Line – Weaver Burk Plot, Edie Hoftee and Hanes Plot. Ping Pong and Random Ordered Mechanisms.

Inhibition- Competitive, Non-Competitive, Uncompetitive and Mixed Inhibition, their Kinetic Differentiation. Determination of Inhibition Constant from MM Equation.

UNIT - IV ENZYME REGULATION

16 Hour

Enzyme Regulation - General Mechanisms of Enzyme Regulation, Homologous Interaction - Oxygen -Haemoglobin Interaction, Heterologous Interaction -Aspartate Carbonyl Transferase. Co-Operativity and Non- Cooperativity Significance of Positive and Negative Kinetic Co-Operativity. Regulation of Allosteric Regulation - Feedback Regulation, Sequential Feedback, Enzyme Induction and Repression. Enzyme Multiplicity.

UNIT - V ENZYME TECHNOLOGY

16 Hour

Isolation and Fractionation of Enzymes – Classical Methods of Purification and Crystallization – Separation Based on Molecular Size, Electric Charge, Solubility Difference and Selective Adsorption. Enzyme Immobilization- Properties, Method and its Applications. Advantages and Disadvantages of Immobilized Enzyme. Application of Immobilized Enzyme. Enzyme Engineering - Artificial Enzyme and its Synthesis. Industrial, Diagnostic and Therapeutic Applications of Enzymes. Biosensors - Glucose Oxidase, Cholesterol Oxidase, Urease and Antibodies as Biosensors. Abzymes and Ribozymes.

Text books

- Trevor Palmer, Philip Bonner *Enzymes: Biochemistry, Biotechnology, Clinical Chemistry* 2nd edition, Horwood Publishing Limited, 2007
- Dixon and Webb, *Enzymes*, 3rd edition, Academic Press, New York, 2000.

Reference books

- E.S. West, W.R. Todd, H.S. Mason and J.T. van Bruggen, *A Text Book of Biochemistry*, 4th edition, Oxford and IBH Publishing Co., New Delhi, 2000
- Nicholas C. Price, Lewis Stevens, and Lewis Stevens, *Fundamentals of Enzymology: the Cell and Molecular Biology of Catalytic Proteins*, 3rd edition, Oxford University Press, USA, 2000.
- David L. Nelson Michael M. Cox Lehninger *Principles of Biochemistry*, W. H. Freeman; 4th edition, 2004.

E-Resources

- <https://storeiyta.firebaseio.com/.../enzymes-biochemistry-biotechnology-clinical-che>.
- <https://quacktradition4ahz.files.wordpress.com/.../fundamentals-of-enzymology-the-ce>.

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Define fundamental properties of enzymes, nomenclature, enzyme catalytic mechanisms and enzyme kinetics.	K1
CO-2	Explain the mechanism of enzyme action, importance of coenzymes.	K2
CO-3	Apply the biochemical calculation for enzyme kinetics.	K3
CO-4	Explain the mechanism of enzyme regulation.	K4
CO-5	Discover the current and future trends of applying enzyme technology for the commercialization purpose of biotechnological products.	K6

IMMUNOLOGY

PBCM306

Semester : III
Category : Core XI
Class & Major : II M.Sc Biochemistry

Credit : 5
Hours/ Week : 6
Total Hours : 78

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Study the various cell types involved in immune responses and associated functions.
CO-2	Familiarize cellular and molecular basis of immune responsiveness.
CO-3	Understand the role of cytokines in immunity and immune cell activation; and be able to identify and characterize cytokines of particular immune importance.
CO-4	Understand the significance the Major Histocompatibility Complex in terms of immune response and transplantation.
CO-5	Know the importance of Hybridoma technology and complement system.

UNIT - I INTRODUCTION

15 Hour

Introduction: Terminologies - History of Immunology - Immunohematology, Blood Groups, Blood Transfusion - Rh - Incompatibilities - Immunity - Types of Immunity - Innate and Acquired. Immune Systems: Anatomy of Lympho-Reticular System - Primary Lymphoid Organ. Secondary Lymphoid Tissue - Cells of the Immune System - Detailed Aspects of T and B Cells - Receptors – Activation and Function. (Immune Reactive Cells – Structure and Functions – Macrophages, Granulocytes, NK Cells, T and B Lymphocytes – Origin, Development, Differentiation).

UNIT - II ANTIGEN –ANTIBODY REACTIONS

16 Hour

Antigens: Types, Properties, Haptens- Adjuvants, Toxoids Antitoxins, Immunoglobulins - Structure Types and Properties. Theories of Antibody Production. Antigen - Antibody Reactions - In Vitro Methods; Agglutination - Precipitation, Complement Fixation, Immuno Fluorescence, ELISA, RIA, In Vivo Methods.

UNIT - III IMMUNOLOGICAL DISORDERS

16 Hour

Autoimmunity - Autoimmune Diseases - Pathogenesis - Treatment. Immunodeficiency Disorders-B Cell Deficiencies, T Cell Deficiencies, Secondary Immunodeficiency Diseases - Pathogenesis, Diagnosis and Treatment of AIDS. Immunization Practices- Active and Passive Immunization.

UNIT - IV HYPERSENSITIVITY REACTIONS

15 Hour

Hypersensitivity Reactions - Antibody Mediated, Type I Anaphylaxis, Type II -Antibody Dependent Cell Cytotoxicity, Type III - Immune Complex Reactions - Respective Diseases and Immunologic Methods of Diagnosis - Cell Mediated Immune Responses - Lymphokines, Cytokines. Type IV – Hypersensitivity Reactions, MHC and Transplantation.

UNIT - V HYBRIDOMA TECHNOLOGY

16 Hour

Basic Principles of Hybridoma Technology. Monoclonal Antibody (MoAb) Production and Application. Purification and Characterization of Monoclonal Antibody. Labeling of Antibodies. Complement System – Components - Classical and Alternative Pathway.

Text books

- Kuby, Richard A, Goldsby et al. *Immunology*, 4th ed., WH Freeman & Co. 2003.
- Abul Abbas, Andrew Lichtman, and Jordan Pober *Cellular and molecular immunology*, W. B. Saunders, fourth edition, 2000
- Ivan Roitt, Jonathan Brostoff, and David Male *Immunology* Mosby, London. 6th edition, 2001.

Reference books

- Charles Janeway, Jr. and Paul Travers, *Immunobiology - the immune system in health and disease*, 5th edition, Garland Publishing, Inc. 2001.
- H. C. Gooi & Helen Chapel, *Clinical Immunology: A PRACTICAL APPROACH*. IRL Press at Oxford University, 1991.

e-Resources

- https://www.mh-hannover.de/.../manipulating_the_immune_system_for_therapeutic.p..
- sacema.org/uploads/Essential-Clinical-Immunology.pdf
- www2.nau.edu/~fpm/immunology/lectures/Chap.03-09.pdf

COURSE OUTCOMES

Co No	On completion of the course the student will be able to	Bloom's level
CO-1	Identify the various cell types involved in immune responses and associated functions	K1&K2
CO-2	Distinguish the cellular and molecular basis of immune responsiveness.	K5
CO-3	Explain the role of cytokines in immunity and immune cell activation; and be able to identify and characterize cytokines of particular immune importance;	K3
CO-4	List out the significance of Major Histocompatibility Complex in terms of immune response and transplantation	K5
CO-5	Explain the importance of Hybridoma technology and complement system.	K6

RESEARCH METHODOLOGY

PRMC301

Semester : III
Category : Core XII
Class & Major : II M.Sc. Biochemistry

Credit : 4
Hours/Week : 5
Total Hours : 65

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Describe the role and importance of research
CO-2	Understand some basic concepts of research and its methodologies
CO-3	Demonstrate the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project.
CO-4	Design a good qualitative purpose statement and a good central question in qualitative research.
CO-5	Evaluate the concepts and procedures of sampling, data collection, analysis and reporting.

UNIT- I FUNDAMENTALS OF RESEARCH

13 Hour

Research-Meaning, Objectives & Motivation. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method –Understanding the language of research – Concept, Construct, Definition, Variable. Research Process. Problem Identification & Formulation –Research Question–Investigation Question –Measurement Issues –Hypothesis –Qualities of a good Hypothesis – Null Hypothesis & Alternative Hypothesis. Hypothesis Testing –Logic & Importance.

UNIT- II RESEARCH AND EXPERIMENTAL DESIGN

13 Hour

Research Design: Concept and Importance of Research – Features of a good research. Types and concepts of research design – Exploratory, Descriptive, Qualitative and Quantitative.

UNIT- III MEASUREMENT SAMPLING AND DATA ANALYSIS

13 Hour

Measurement: Concept & Problems in research –Validity and Reliability. Levels of measurement (Nominal, Ordinal, Interval, Ratio). Sampling – Types and statistics of Simple, Random, Systematic, Stratified Random & Multi-stage. Data Analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis –Cross tabulations and Chi-square test including testing hypothesis of association. ANOVA and Duncan's multiple range tests.

UNIT- IV TOOLS / TECHNIQUES FOR RESEARCH

13 Hour

Databases for Biological Science Discipline.FASTA, BLAST, EMBL net, DDBJ and NCBI. Protein sequence databases; primary databases SWISS – PROT, TrEMBL, NRL-3D. Secondary Databases; PRO SITE, PROFILES, PRINTS, Pfam, BLOCKS and IDENTITY. Composite protein databases.

UNIT- V THESIS WRITING AND PAPER PUBLICATION

13 Hour

Thesis writing-Introduction, Review of literature, materials and methods, Interpretation of results, Summary and Conclusion, Bibliography, Acknowledgement. Interpretation of Data and Paper Writing –Layout of a Research Paper, Journals in biological science, Impact factor of Journals, Ethical issues related to publishing, Plagiarism and Self-Plagiarism.

Text Books

- Panneerselvam, *Research Methodology*, 1st edition R, Prentice hall of India, New Delhi, 2004.
- Kothari CR, *Research Methodology – Methods and techniques*, 2nd edition, New Wiley Eastern Ltd., Delhi, 2009.

Reference Books

- Donald Cooper & Pamela Schindler, *Business Research Methods*, TMGH, 9th edition, 2013
- Alan Bryman & Emma Bell, *Business Research Methods*, 4th edition, Oxford University Press, 2015.
- P.Saravanel, *Research Methodology*, 14th edition, JBA publishers, 2003.

e- Books

- gent.uab.cat/diego_prior/sites/.../02_e_01_introduction-to-research-methods.pdf
- <https://www.heacademy.ac.uk/system/files/msor.3.1s.pdf>
- 164.100.133.129:81/econtent/Uploads/Research_Methods.pdf

COURSE OUTCOME

Co No	On completion of the course the student will be able to	Bloom's level
CO-1	Identify and discuss the issues and concepts salient to the research process. Selecting an appropriate research design, and implementing a research project.	K1&K2
CO-2	Learn the applications of packages like WORD, EXCEL, Power Point in entering data, preparing tables, graphs, charts etc.,	K5
CO-3	Apply foundational research skills to address a research question; Demonstrate planning, time and change management skills	K3
CO-4	Evaluate educational research critically and participate in the research community	K5
CO-5	Assess the basic function and working of analytical instruments used in research	K6

ENZYMOLOGY & CLINICAL DIAGNOSTICS

PBCR302

Semester : III
Category : Core Practical III
Class & Major : II M.Sc. Biochemistry

Credit : 5
Hours/Week : 6
Total Hours : 78

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Acquire knowledge on general principles of proper evaluation of test findings, and on the scope of particular tests or groups of tests in terms of their specificity, sensitivity, predictive and clinical value.
CO-2	Know how to apply a rational approach when choosing diagnostic algorithms and tests to monitor the efficiency of treatment.
CO-3	Analyzing, critically evaluating and solving technical and scientific problems within the broader, multidisciplinary context in the field of laboratory biomedicine and health.
CO-4	Applying professional knowledge of laboratory diagnostics while estimating clinical significance of biochemical and molecular biological indicators detecting the source of errors and variability of results incurred by performing tests, interpreting the results of laboratory analysis from clinical aspects.
CO-5	Problem-solving approach to experimental data.

ENZYMOLOGY

1. Assay of Salivary Amylase enzyme.
2. Effect of substrate concentration on enzyme activity (Salivary Amylase) and determination of K_m value.
3. Effect of inhibitor on activity of Salivary Amylase.
4. Assay of lactate dehydrogenase (LDH).
5. Effect of pH on enzyme activity (Acid phosphatase/Alkaline phosphatase).
6. Effect of temperature on enzyme activity (ACP/ALP)

CLINICAL DIAGNOSTICS

Estimation of: (from blood/plasma/serum/urine)

1. Glucose by GOD-POD Method
2. Protein estimation by Biuret method
3. Triglycerides GPO/POD by kit method
4. Cholesterol by Zak and Zaltsky Method
5. HDL
6. Calcium (Ca) by OCPC Method
7. Iron (Fe) by Dipyrldyl Method
8. Copper (Cu) by Dithiocarbonate Method
9. Phosphorus (P) by Fiske- Subbaraow Method
10. Enzyme-linked immunosorbent assay (ELISA)

Text Books

- David T. Plummer, *An Introduction to practical Biochemistry*, 3rd edition, 1999.
- J.Jayaraman, *Laboratory Mannual in Biochemistry*, 4th edition, New Age international limited publication, 1992.

Reference Books

- Pattabiraman, *LaboratoryMannual in Biochemistry*, 4th edition, 2015.
- Singh .S.P. *Practical Mannual of Biochemistry*, 8th edition, CBS Publication 2019.
- Harold Varley, *Practical Clinical Biochemistry*, 6th edition, CBS Publishers, New Delhi, 2005.

e-Resources

- <https://www.worldcat.org/title/practicalenzymology/oclc/827358447/>
- <https://www.worldcat.org/title/practical-enzymology/oclc/1080648481/>
- <https:// Ferris-Clinical-Advisor-2020-Book ebook/dp/B07VM97C5X/>
- <https:// Ferris-Clinical-Advisor-2019-Solutions-ebook/dp/B07DL6VH6J/>
- <https:// Ferris-Clinical-Advisor-Elsevieron-VitalSource ebook/dp/B00Z5KE8T4/>

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	State the principles of laboratory diagnostics based on scientific evidence.	K1
CO-2	Explain patients in self-control (diabetes, pregnancy, hypertension & haemodialysis)	K2
CO-3	Evaluate the test results after suitable diagnostic test.	K5
CO-4	Recommend marker enzymes during pathological conditions.	K5
CO-5	Apply the acquired knowledge in planning scientific research ranging from population-based studies to clinical trials.	K6

PLANT BIOCHEMISTRY & INDUSTRIAL BIOTECHNOLOGY

PBCI302

Semester : III
Category : Core XII
Class & Major : II M.Sc. Biochemistry

Credit : 4
Hours/Week : 5
Total Hours : 65

COURSE OBJECTIVES

CO No.	To enable the students
CO-1	Understand the mechanism of Nitrogen fixation and its importance in agricultural production and economics
CO-2	Know the significance of plant growth regulators in the development of plants
CO-3	Acquire knowledge about the importance of secondary metabolites and its industrial applications
CO-4	Explain and understand the biochemistry of photosynthetic process and its relation to man and its environment
CO-5	Develop a basic understanding of biochemical events associated with structural arrangement of plant cell and organization.

UNIT- I PLANT CELL AND PHOTOSYNTHESIS

13 Hour

Structure of Plant Cell. Photosynthesis: Chloroplast- Structure and Function; Photosynthetic Pigments and Light Harvesting Complexes. Photo System I & II. Photosynthetic Electron Transport and Photophosphorylation. Calvin Cycle (C3 Plants), Hatch Slack Pathway (C4 Plants), Crassulacean Acid Metabolism (CAM).

UNIT – II PLANT RESPIRATION AND METABOLISM

13 Hour

Plant Respiration: Cyanide Sensitive and Insensitive Respiration., Nitrogen Metabolism: Physical and Biological Nitrogen Fixation, Ammonification, Nitrification, Denitrification Symbiotic Nitrogen Fixation and its Regulation. Nitrogenase System, Nitrate Reductase. Sulphur Metabolism: Sulphate Activation, Reduction of Active Sulphate, Oxidation of Inorganic Sulphur, Incorporation of Sulphur into Amino Acids. Phosphorous Cycle, Carbon Cycle.

UNIT- III PLANT TISSUE CULTURE AND HORMONES

13 Hour

Plant Tissue Culture: Plant Cell Organs and Embryo Culture, Anther Culture, Somaclonal Variation, Protoplast Isolation, Fusion and Culture of Protoplasts, Application of Plant Tissue Culture. Plant Hormones: Biosynthesis, Physiological Effects and Mechanism of Action of Auxins, Gibberellic Acids, Cytokinins, Absciscic Acid, Ethylene, Brassinosteroids and Polyamines. Plant Inhibitors and Redardants.

UNIT IV- INTRODUCTION TO INDUSTRIAL BIOPROCESS

13 Hour

Biotechnology: Scope and importance, Commercial Potential of Biotechnology in India. Historical Overview of Industrial Fermentation Process -Traditional and Modern Biotechnology and its Application. Industrial Fermentation- Microorganisms, Mode of Operation, Fermentation Processes - Pictorial Representation.

UNIT V- PRODUCTION OF PRIMARY & SECONDARY METABOLITES

13 Hour

A Brief Outline of Processes for the Production of Some Commercially Important Organic Acids (Citric Acid, Lactic Acid & Acetic Acid); Amino Acids (Glutamic Acid & Tryptophan) And Alcohols (Ethanol & Butanol).

Production of Secondary Metabolites: Antibiotics – Penicillin, Streptomycin & Erythromycin, Vitamins - Vit B12 and Vit B2. Production of Recombinant Proteins Having Therapeutic and Diagnostic Applications, Vaccines, Insulins.

Text books

- Taiz & Ziger, *Plant physiology*, 5th edition, Sinauer associates, 2012.
- Slater A, NW Scott, MR Fowler. *Plant biotechnology*, 2nd edition, Oxford University Press, 2008
- Lee, S.Y., Nielsen, J. and Stephanopoulos, G., “*Industrial Biotechnology: Products and Processes*”, John Wiley & Sons, 2016.

Reference books

- William Hopkins & Norman P. A. Huner, *Introduction of Plant Physiology*, Wiley 4th edition, 2008.
- Buchanan, *Biochemistry and molecular Biology of plant*, Wiley 2nd edition, 2015.
- Okafor, N., “*Modern Industrial Microbiology and Biotechnology*”, CRC Press, 2007

e-Resources

- www.routeetvies.fr/medias/.../1-plant-biotechprinciples-techniques-and-applications1.pdf
- <https://faculty.psau.edu.sa/filedownload/doc-10-pdf-9e7f111f15db1aa3830cd806660>
- https://downloads.lww.com/wolterskluwer_vitalstream_com/.../frontmatter.pdf

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Understand the role of biochemists in evaluating the potential industrial and medicinal applications of plants.	K1
CO-2	Understands about the existence of naturally available and metabolically important growth regulators and secondary metabolites and its potential in crop development.	K2
CO-3	Demonstrates ability to explain relation between Photosynthesis, growth hormones and Plant growth.	K3
CO-4	Explain and understand the biochemistry of plant growth and development.	K4
CO-5	Develop skills and knowledge to conduct basic research work in the field of Plant Biochemistry.	K5

GENETICS AND GENETIC ENGINEERING PBCM403

Semester : III

Category : Core XIV

Class & Major : II M.Sc. Biochemistry

Credit : 5

Hours/Week : 6

Total Hours : 78

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Understand the basic principles and concepts of genetics.
CO-2	Study the basic techniques involved genetic engineering and its applications
CO-3	Acquire knowledge on various vectors used in gene cloning.
CO-4	Understand the different types of gene transfer methods.
CO-5	Aware about the applications of genetic engineering.

UNIT – I BASICS OF GENETICS

16 Hour

History of Genetics Mendelian principles of inheritance – Dominance, codominance, incomplete dominance, segregation, Multiple alleles, Multiple genes.

UNIT –II GENE INHERITANCE

16 Hour

Interaction of genes. Patterns of Inheritance – Autosomal inheritance, Sex-linked inheritance, Cytoplasmic inheritance.

UNIT – II GENETIC ENGINEERING TECHNIQUES **15 Hour**

Construction of genomic and cDNA libraries, selection and screening of recombinants, probes - types, synthesis and uses of probes. Blotting techniques (Southern, Northern and Western), PCR- types and applications, Sequencing: DNA and RNA, site directed mutagenesis. Chromosome walking, jumping, DNA finger printing and foot printing.

UNIT – III VECTORS AND GENE CLONING **16 Hour**

Enzyme uses in genetic engineering – Restriction endonucleases, restriction digestion, mapping, ligation, Cloning vectors -- Desirable properties of vectors – Prokaryotic & Eukaryotic Expression Systems (Constitutive & Inducible). Plasmid Vectors - Phage Vectors - Cosmids -- Phagemids - BACs - Yeast Vectors - YACs - Lentiviral Vectors -- Adenoviral Vectors – Plant Vectors - Insect Vectors.

UNIT – IV GENE TRANSFER METHODS **16 Hour**

Methods of gene recombination - Bacterial Conjugation, Transformation, Transduction. Gene transfer methods - Microinjection, Electroporation, Microprojectile, Shot Gun method, Ultrasonication, Liposome fusion. Competence, identification of transformed colonies/clones – Blue white screening, DNA sequencing. cDNA Library

UNIT – V APPLICATIONS OF GENETIC ENGINEERING **15 Hour**

Genetic engineering in animals - Production of transgenic mice, Therapeutic products produced by genetic engineering- plasma proteins, human hormones, Genetic engineering in plants: Use of *Agrobacterium tumefaciens* and *A. rhizogenes*, Ti plasmids, Strategies for gene transfer to plant cells – Herbicide resistant, Drought tolerant, pest resistant, salt tolerant transgenic plants and related ethical issues.

Text books

- Satyanarayana U, *Biotechnology*, 2nd edition, Books & Allied (P) Ltd, 2008.
- Bernard R. Glick, Jack J. Pasternak, and Cheryl L. Patten, *Molecular biotechnology: Principles and applications of recombinant DNA*, 4th edition, By ASM press, 2010
- Singh. K., “*Intellectual property rights on Biotechnology*”, Springer, 7th edition, 2015
- R.C. Dubey, *A text book of Biotechnology*, 5th revised edition, S. Chand Publications, 2014

Reference books

- J. Sambrook, E.F. Fritsch and T. Maniatis, *Molecular Cloning: a Laboratory Manual*, 3rd edition, Cold Spring Harbor Laboratory Press, New York, 2000
- Brown, T.A., “*Gene Cloning and DNA Analysis - An Introduction*”, 6th edition, John Wiley & Sons, 2010
- Strickberger. M.W., “*Genetics*”, 3rd edition, Pearson India, 2015.

e-Resources

- https://www.academia.edu/.../Molecular_Biochemistry_Bernard_R._Glick_Jack_J._Paste
- https://edisciplinas.usp.br/.../1/MolecularBiology_Of_The_Cell_5th.Ed-pag579+37.pdf
- datalake.neur.ai/biotechnology_and_intellectual_property_rights_legal_and_social_..
- https://en-us.technetix.com/molecular_cloning_a_laboratory_manual_download.pdf

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Define the basics concepts of classical, molecular and evolutionary genetics.	K1
CO-2	Explain how to construction genomic DNA library and cDNA library	K2
CO-3	List the various tools and techniques in rDNA technology- DNA manipulative enzymes.	K3
CO-4	Describe about direct gene transfer methods including microinjection, electroporation and biolistic gun.	K4
CO-5	Discuss the applications of genetic engineering and apply learned knowledge to their future research	K5

ADVANCED CLINICAL BIOCHEMISTRY PBCM404

Semester : III
Category : Core XIV
Class & Major : II M.Sc. Biochemistry

Credit : 5
Hours/Week : 6
Total Hours : 78

COURSE OBJECTIVES

CO No.	To enable the students to
CO-1	Understand the fundamentals of clinical biochemistry related to health.
CO-2	Study about diseases associated with free radicals.
CO-3	Know the disorders of carbohydrate, lipid and amino acid metabolism.
CO-4	Gain knowledge on the tests used to assess liver and renal function.
CO-5	Understand the concepts of oncogenes, protooncogenes and tumor suppressor genes and the tumor markers.

UNIT- I GOOD CLINICAL LAB PRACTICES

15 Hour

Importance of automation in clinical biochemistry. Good Clinical Practices: Basics and principles. Selection of Instruments, Quality assurance, maintenance of quality control programme.

UNIT- II ACID BASE BALANCES

16 Hour

Acid base balance - coagulation of blood pH within normal range disturbances in acid base balance - acidosis, alkalosis, mixed disturbances - laboratory parameters - blood gas analysis. Fluid and electrolyte balance - regulation - disturbances of fluid and electrolyte balance - laboratory parameters in the diagnosis and management of fluid and electrolyte disorders - oral rehydration therapy.

UNIT - III METABOLIC DISORDERS

16 Hour

Diabetes mellitus, Hypo & Hypercholesterolemia. Inborn errors of metabolism: a) Disorders of amino acid metabolism- Tyrosinemia, phenylketonuria, alkaptonuria b) Disorders of nucleic acid metabolism- Disorders in purine/ pyrimidine metabolism. Bone marrow disorders.

UNIT- IV EVALUATION OF ORGAN FUNCTION TESTS & PRENATAL DIAGNOSIS

15 Hour

Gastric function tests, Liver function tests, renal function test, lung, heart and pancreatic disorder.

UNIT - V CLINICALLY IMPORTANT HORMONES & MARKERS

16 Hour

Thyroid diseases – hormones and markers, Menstrual disorders – hormones and markers, Tumor markers.

Text books

- C.A.Burtis & Ashwood Teitz, *Fundamentals of Clinical Chemistry*, 6th edition, W. B. Saunders company, 2005
- David Plummer, *Practical Biochemistry*, 3rd edition, Tata McGraw- Hill, 2000.
- Harrison T.R. Fauci, Braunwald, Isselbacher, *Principles of Internal Medicine*, 14th edition, MC-Graw hill, Newyork. Volume I and II 2015

Reference books

- Thomas Devlin, *Text book of Biochemistry with clinical correlation*, 7th edition, John Wiley and Sons, 2000.
- William J. Marshall & Stephen K. Angert, *Clinical Biochemistry – Metabolic concepts and Clinical aspects*, 3rd edition, Churchill Livingstone, 2002.
- P. D. Mayne, A. Hodder, *Clinical chemistry in diagnosis and treatment*, Arnold publication, 6th revised edition, 1994.

e-Resources

- www.raftmaster.org/tietz textbook of clinical chemistry and molecular diagnostics.
- https://www.academia.edu/35117679/_U_Satyanarayana_Biochemistry

COURSE OUTCOMES

CO No.	On completion of the course the student will be able to	Bloom's Level
CO-1	Discuss the fundamentals of clinical biochemistry related to health.	K1
CO-2	Explain the clinical significance of the free radicals and the enzymes involved.	K2
CO-3	Illustrate the disorders associated with metabolism.	K3
CO-4	Identify the test use to diagnose the liver and renal function.	K4
CO-5	Differentiate the oncogenes, protooncogenes and tumor suppressor genes and the markers used to identify the tumors.	K4

III & IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
III	Core X	PBCM301	Enzymology & Enzyme Technology	Poster presentation	Seminar
	Core XI	PBCM303	Immunology	Poster presentation	Seminar
	Core XII	PRMC301	Research Methodology	Assignment	Seminar
	Core XIII	PDIM401	Plant Biochemistry & Industrial Biotechnology	Assignment	Seminar
IV	Core XIV	PBCM401	Genetics And Genetic Engineering	Assignment	Seminar
	Core XV	PBCM302/ 402	Clinical Biochemistry	Case study	Seminar

INTERNSHIP/ FIELD WORK/ FIELD PROJECT

Semester	Part	Category	Course code	Course Title	Contact	Previous Course Code	Credit
					Hrs / week		Min /Max
II	III	Internship	PBCI201	Internship / Field Work / Field Project	30 Hours	-	- / 1 (Extra Credit)
IV	III	Internship	PBCI401	Internship / Field Work / Field Project	30 Hours	-	- / 1 (Extra Credit)