

DEPARTMENT OF BIOCHEMISTRY

PREAMBLE

UG: Programme Profile & the Syllabi of Courses Offered in the Semester I and II along with III & IV Evaluation Components (with Effect from 2021 - 2024 Batch onwards).

PG: Programme Profile & the Syllabi of Courses offered in the Semester I and II 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)

Upon completion of the Programme, the students will be able to

- Understand the Various Biological Components Present in Living Cells and its Functions.
- Recognize their Own Ability to improve their own Competence in Using the Language through Professional English Course.
- 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.
- Develop Problem Solving and Analytical Skills through Case Studies, Research Projects, Experimentation, Internship, Experiential Learning and Hands - On - Experience.
- Analyze the Applications of Biochemistry in the Fields of Clinical Biochemistry, Biochemical Techniques, Molecular Biology, Biotechnology, Microbiology Etc.
- Apply the Major Theories and Research Procedures to Contemporary Social Problems.

Semester	Part	Category	Course code	Course Title	Previous course code	Hour 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)	UENL109/ UENL110	English for Communication (Stream – I)/ English for Communication (Stream – II)	--	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	UBCR102	Cellular Biology Practical	UBCR101	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)	UENL209/ UENL210	English for Communication (Stream – I)/ English for Communication (Stream – II)	--	5	3/4
	III	Major Core III/DSC - III	UBCM203	Biomolecules	UBCM202	6	6
		Core practical II	UBCR202	Qualitative analysis of Biomolecules	UBCR201	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	
IV	Non Major elective /SEC	--	--	--	3	2	
V	Extension activity/ Physical Education/NCC	--	--	--	-	1/2	
TOTAL						36	28/31
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	English for Communication (Stream – I)/ English for Communication (Stream – II)	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	UMAA405	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	English for Communication Stream – I)/ English for Communication (Stream – II)	UENL407/ UENL408	5	3/4
	III	Major Core V / DSC - V	UBCM403	Immunology	UBCO603	4	4
		Major Core VI / DSC - VI	UBCM405	Pharmaceutical Biochemistry	UIDM401	2	2
		Allied IV/ GE -IV	UBIA401	Basics of Bioinformatics	UBCM506	6	4
		Core practical IV	UBCR401	Biochemical Techniques Practical II	UBCR401	3	3
	IV	Non Major Elective			--	3	2
Soft Skill/ SEC				--	2	1	

IV	V	Extension Activity/ Physical Education/NCC			--	-	- /2
TOTAL						30	22/26
V	III	Major Core VII /DSC - VII	UBCM507	Enzymology	--	5	5
		Major Core VIII/DSC - VIII	UBCM508	Enzymes & 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	--			
	IV	Soft Skill/ SEC				2	1
V	Extension activity/ Physical Education/NCC				-	-/2	
TOTAL						30	24/26
GRAND TOTAL						192	148/162

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

Semester	Part	Category	Course code	Course Title	Previous course code	Contact Hour/Week	Credit
							Min/M ax
II	IV	Non Major Elective	UBCE202	Biomedical Techniques	--	4	2
			UBCE204	Nutrition & Health	UBCE401		
			UBCE502/ UBCE204	Women's Health, Nutrition & Disorders	--		
			UBCE304/ UBCE208	Mushroom Cultivation	--		
			UBCE209	Clinical Diagnostics	--		
			UBCE210	Reproductive Biology	--		
IV	IV	Non Major Elective	UBCE301/ UBCE403	Hormonal Biochemistry	--	4	2
			UBCE302/ UBCE404	Food Microbiology	--		
			UBCE402/ UBCE303	Clinical Nutrition	--		
			UBCE304	Mushroom Cultivation	--		

EXTRA CREDIT EARNING PROVISION (Only for Interested Students)

Semester	Part	Category	Course Code	Course Title	Credit
II	III	Internship	UBCI201	Summer Internship	1
IV	III	Internship	UBCI401	Summer Internship	1
VI	III	Self Study paper	UBCS601	Experimentation	2

EXPERIENTIAL LEARNING OFFERED IN SEMESTER VI

Course Mapping				Collaborating Agency –MSME & E.S. Hospital		
Semester	Course Code	Course Title	Assessment	Course Title	Hour/Days/ Month	Mode of Evaluation
VI	UBCM606	Clinical Biochemistry	Component III	Clinical Biochemistry	5 days	Reflection
VI	UBCM605	Introduction to Biotechnology	Component IV	Organic Farming	2 days	Reflection

BASICS OF BIOCHEMISTRY

UBCM108

Semester : I
Category : Core I/ DSC – I
Class & Major : I B.Sc. Biochemistry

Credit: 2
Hour/Week: 3
Total Hour: 39

Objectives:

To enable the students

- Understand the Basic Concepts in Biochemistry and its Applications.
- Learn about the Bioenergetics and Significance of Biological Buffers.
- Provide Knowledge on Good Laboratory Practices.

Learning Outcomes:

On Completion of the course, the students will be able to

- Understand the Importance and Scope of Biochemistry.
- Gain Knowledge about Biological Molecules and its Significance.
- Familiarize the Laws of Thermodynamics and Biological Buffers.
- Aware about the Quality Control Practices and Biosafety Measures Followed in the Laboratory.

UNIT - I OVERVIEW OF BIOCHEMISTRY

7 Hour

History and Scope of Biochemistry, Importance of Biochemistry and its Applications in Various Fields. Cells - Types, Subcellular Organelles.

UNIT - II PROPERTIES OF WATER & CONCENTRATION UNITS

8 Hour

Structure and Properties of Water & Structure of Matter - Atomic Structure, Molecular Structure; Bonding - Ionic, Covalent, Hydrogen, Co Ordinate and Vander Walls Interaction and Chemical Reactions.

Units of Measurements of Solutes in Solution - Normality, Molality, Molarity, Osmolarity, Ionic Strength, Percentage and Mole Fraction.

UNIT - III BIOMOLECULAR CHEMISTRY

7 Hour

Definition and Importance of Carbohydrates, Amino Acids, Proteins, Lipids, Nucleic Acids, Enzymes, Vitamins and Hormones.

UNIT - IV BIOENERGETICS & BIOLOGICAL BUFFERS

8 Hour

Laws of Thermodynamics - Zero, First and Second Law, Oxidation and Reduction Reaction, Redox Potential and Energy Transfer.

Inorganic Compounds - Salts, Ions, Acids and Bases; pH, Biological Buffers and their Significance.

UNIT - V QUALITY CONTROL PRACTICES AND BIOSAFETY

9 Hour

Precision, Accuracy, Specificity, Sensitivity, Percentage Error and Quality Control for Laboratory Methods. Calibration of Volumetric - Pipette, Burette and SMF.

Do's And Don'ts in the Laboratory, Automation and Instrumentation Used in Laboratory, Laboratory Associated Infections, First Aid, Biological Hazards and Biosafety.

Text Books

- Gupta, P.K. (2005). *A Text-Book of Cell and Molecular Biology*. Rastogi Publications. Meerut. India. (4th Ed.).
- Ambika Shanmugam. (2016). *Fundamentals of Biochemistry*. Published by Author. (8th Ed.).

Reference Books

- Campbell, M.K. (2006). *Biochemistry*. Philadelphia. Saunders College Publishing.
- Marshal, V.C. (2005). *Major Chemical Hazard*. Chichester. United Kingdom. Ellis Horwood Ltd.
- Raghavan, K.V. Khan, A.A. (2012). *Methodologies in Hazard Identification and Risk Assessment*. Manual by CLRI.
- Sadasivam, S. Manickam, A. (2008). *Biochemical Methods*. New Age International (P) Ltd.

E - Resources

- <https://epgp.inflibnet.ac.in/>
- Biochemistry-book-U-Satyanarayana
ebook/dp/B07F9QHV6Z?asin=B07F9QHV6Z&revisionId=&format=2&depth=1
- <https://www.amazon.com/dp/B0725LHWPB?tag=uuid10-20&asin=B0725LHWPB&revisionId=f5f49437&format=1&depth=1>

CELLULAR BIOLOGY

UBCM107

Semester : I

Category : Core II/DSC - II

Class & Major: I B.Sc. Biochemistry

Credit : 6

Hour/Week : 6

Total Hour : 78

Objectives:

To enable the students

- Basic Knowledge on Origin of Life and Cell Theory.
- Gain Knowledge about the Structure and Function of Various Cell Organelles in Prokaryotic and Eukaryotic Cells.
- Acquire insight into Cell Division and Cell Death Mechanisms.

Learning Outcomes:

On Completion of the course, the students will be able to

- Understand about the Origin and Evolution of the Cell.
- Get Knowledge on Structure of Nucleus and Organization of Chromosomes.
- Illustrate the Structure and Properties of Cell Membrane and Different Types of Transport Mechanism across Cell Membrane.
- Disseminate Knowledge about the Chemistry and Functions of Sub Cellular Organelles
- Elucidate the Cell Cycle, Cell Division and Cell Death Mechanisms.

UNIT - I ORGIN OF LIFE & CELL THEORY

15 Hour

An Overview of Cells - Origin and Evolution of Cells. Cell Theory, Classification of Cells - Prokaryotic and Eukaryotic Cells, Comparison of Prokaryotic and Eukaryotic Cells. Mycoplasma Viruses.

UNIT – II NUCLEUS & CHROMOSOMES

18 Hour

Nucleus - Structure and Functions. Chromosomes - Chromatin Structure. The Cell Cycle - Phases of Cell Cycle. Meiotic and Mitotic Cell Division. Apoptosis and Necrosis.

UNIT - III CELL WALL AND CELL MEMBRANE

15 Hour

Structure and Functions - Bacterial Cell Wall and Plant Cell Wall; Cell Membrane - Fluid Mosaic Model and Unit Membrane Model Structure. Membrane Proteins and their Properties Membrane Carbohydrates and their Role. Transport across Membranes - Uniport, Antiport, Diffusion, Active and Passive Transport.

UNIT-IV ENDOPLASMIC RETICULUM, GOLGI APPARATUS, LYSOSOMES 15 Hour

Endoplasmic Reticulum - Types, Structure and Functions. Golgi Apparatus - Structure and Function. Lysosomes - Structure and Functions, Morphology and Functions of Peroxisomes and Glyoxysomes.

UNIT - V MITOCHONDRIA & CYTOSKELETON

15 Hour

Mitochondria - Structure and Functions. Cytoskeleton - Types of Filaments and their Functions Microtubules - Chemistry and Functions. Cilia and Flagella. Ribosomes - Types Structure and Function. Vacuoles - Structure and Function.

Text Books

- Lohar, S.Prakash. (2007). *Cell and Molecular Biology*. MJP Publishers.
- Verma,P.S. and Agarwal. (2008). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. S. Chand Publication.

Reference Books

- Cooper, G.M. and Hausman, R.E. (2013). *The Cell: A Molecular Approach*. ASM Press & Sinauer Associates. (8th Ed.). Sunderland (Washington DC).
- Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments*. John Wiley and Sons. (6th Ed.).

E - Resources

- <https://epgp.inflibnet.ac.in/>
- <https://nptel.ac.in/courses/102/103/102103012/>
- https://swayam.gov.in/nd2_cec19_bt12/preview
- <https://www.saraspublication.com/books/cell-biology-molecular-biology/>

CELLULAR BIOLOGY PRACTICAL

UBCR102

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

Credit : 3
Hour/Week : 3
Total Hour : 39

Objectives:

To enable the students

- Understand Plant and Animal Cells.
- Gain Practical Insight of Structural Features of Prokaryotes and Eukaryotic Cells.
- Apply the Methods in Cell Biology.

Learning Outcomes:

On Completion of the course, the students will be able to

- Acquainted to Various Microscopic Techniques to Visualize Subcellular Organelles.
- Differentiate the Cells of Various Living Organisms and Get Awareness of Physiological Processes of Cell E.G. Cell Divisions.
- Observe and Correctly Identify Different Cell Types, Cellular Structures Using Different Microscopic Techniques.
- Observe and Classify the Prokaryotic Cells (Bacteria) Using Differential Staining.

Experiments

1. Use of Microscopes.
2. Blood Smear Preparation
3. Mounting Buccal Epithelium and Observing Living Cells Using Vital Staining.
4. Mitosis in Onion Root Tip Squash.
5. Cytochemical Staining of Protein by Methylene Blue.
6. Cell Counting and Viability (Yeast / Bacteria)
7. Study of Prepared Slides of Histology (any five)
 - a) Columnar Epithelium
 - b) Ciliated Epithelium
 - c) Glandular Epithelium
 - d) Alveolar Connective Tissue
 - e) Cartilage T.S
 - f) Cardiac Muscle
 - g) Striated Muscle
 - h) Non Striated Muscle
 - i) Nervous Tissue
8. Barr Body Staining from Buccal Epithelial Cells
9. Isolation of Chloroplast from Spinach Leaves.

Text Book

- Dr.Rajan, S. Mrs. Selvi Christy, R. (2010). *Experimental Procedure in Life Science*. Anjanaa Book House. Chennai.

Reference books

- Chris Hawes & Beatrice Satiat Jeunermaitre, (2007). *Plant Cell Biology: A Practical Approach*. Oxford University Press. USA.
- John Dawey & Mike Lord, (2013) *Essential Cell Biology: A Practical Approach*. Oxford University Press. USA.

E - Resources

- <https://epgp.inflibnet.ac.in/>
- <https://www.vlab.co.in/>
- <https://vlab.amrita.edu/?pg=topMenu&id=1>
- https://C:/Users/CSLAB/Downloads/CellBiologyPracticalManual_ContentList.pdf
- https://www.bjcancer.org/Sites_OldFiles/_Library/UserFiles/pdf/Essential%20Cell%20Biology,Volume%202.pdf

BIOMOLECULES UBCM203

Semester : II
Category : Major Core III/DSC – III
Class & Major : I B.Sc. Biochemistry

Credit: 6
Hour/Week: 6
Total Hour: 78

Objectives:

To enable the students

- Understand the Structure of Biomolecules Associated with Life Processes.
- Elucidate the Roles of Biomolecules in the Functioning of Living Cells.
- Provide Sufficient Knowledge about the Structure, Properties and Roles of Carbohydrates, Proteins, Lipids, Nucleic Acids, Vitamins and Minerals.

Learning Outcomes:

On Completion of the course, the students will be able to

- Knowledge on Carbohydrates and its Biological Significance.
- An in Depth Understanding on the Basic Properties, Mechanisms and Significances of Biological Proteins.
- Information about All Lipids and Their Biological Significance.
- Gain Clear Idea on the Types, Structure and Biological Functions of Nucleic Acids
- Aware of the Importance of Vitamins and Minerals in Biological Systems.

UNIT- I CARBOHYDRATES

16 Hour

Classification of Carbohydrates, Physical Properties - Stereo and Optical Isomerism, Anomeric form and Mutarotation. Structure, Properties, Occurrence and Biomedical Importance of Mono, Di and Oligosaccharides. Polysaccharides - Chemistry and Functions. Homopolysaccharides - Starch, Glycogen and Cellulose. Heteropolysaccharides - Hyaluronic Acid, Chondroitin Sulfate and Heparin. Mucopolysaccharides (Proteoglycans, Glycosaminoglycans).

UNIT- II PROTEINS AND AMINOACIDS

17 Hour

Amino Acids: Structure, Classification, Physical and Chemical Properties. Peptide Bond, Peptide Synthesis, Biologically Important Peptides - Structure and Function (Insulin, Glutathione, Vasopressin). Protein - Introduction, Physical and Chemical Properties, Classification Based on Solubility, Shape, Composition and Function. Protein Functions - Nutrition: Science and Everyday Application. Structure of Protein - Primary, Secondary, Tertiary and Quaternary Structure of Protein.

UNIT - III LIPIDS

15 Hour

Definition, Classification of Lipids, Simple, Compound and Derived. Simple Lipids - Physical and Chemical Properties of Fats. Characterization of Fat - Saponification Number, Acid Number, Iodine Number and RM Number. Compound Lipids - Structure and Function of Phospholipids, Glycolipids and Lipoproteins. Derived Lipids - Fatty Acids - Saturated and Unsaturated. Essential Fatty Acids and Functions of Fatty Acids. Steroids - Structure and Functions of Cholesterol.

UNIT - IV NUCLEIC ACIDS

15 Hour

Nature of Nucleic Acids, Structure of Purines, Pyrimidines, Nucleosides and Nucleotides. Structure and Functions of DNA, Types of DNA - A, B and Z Forms; Structure and Functions of RNA and its Types. Properties - Denaturation, Renaturation, T_m, Hypo & Hyperchromicity, Nucleosome and Histones.

UNIT - V VITAMINS AND MINERALS

15 Hour

Vitamins - Definition and Classification. Source, Structure and Biological Role, Daily Requirement and Deficiency Manifestation of the Fat Soluble Vitamins and Water Soluble Vitamins.

Minerals: Mineral Requirement, Essential Macro Minerals and Essential Micro Minerals, Sources and Functions.

Text Books

- Murray, R.K. Granner, D.K. Mayes, P.A. Rodwell, V.W. (2016). *Harper's Biochemistry*. McGraw Hill. (25th Ed.).
- Jain, J.L. Sunjay Jain. Nitin Jain. (2008) *Fundamentals of Biochemistry*. S. Chand Publication.
- Satyanarayan, V. Chakrapani, V. (2007). *Essentials of Biochemistry*. Kolkota, Books & Allied.

Reference Books

- Lubertstryer, (2019). *Biochemistry*. W.H.Freeman and Company. (9th Ed.).
- Nelson, D.L. and Cox, M.M. (2013) *Lehninger: Principles of Biochemistry*. W.H. Freeman and Company. (9th Ed.). New York.
- Devlin, T.M. John Wiley & Sons, Inc. (2011). *Textbook of Biochemistry with Clinical Correlations*. (7th Ed.). New York.

E- Resources

- <https://epgp.inflibnet.ac.in/>
- <https://nptel.ac.in/courses/102/105/102105034/>
- <https://www.mooc-list.com/course/biochemistry-biomolecules-methods-and-mechanisms-edx>
- https://books.google.co.in/books?id=P3TWDwAAQBAJ&printsec=frontcover&source=gs_b_s_ge_summary_r&cad=0#v=onepage&q&f=false

QUALITATIVE ANALYSIS OF BIOMOLECULES
UBCR202

Semester : II
Category : Core practical II
Class & Major : I B.Sc. Biochemistry

Credit : 5
Hour/Week : 5
Total Hour : 65

Objectives:

To enable the students

- Analyze the Presence of Sugar, Amino Acids, Proteins and Lipids through Qualitative Test.

Learning Outcomes:

On Completion of the course, the students will be able to

- Understand the Importance of Qualitative Test in the Laboratory for Diagnoses.
- Acquire Skill to Perform the Experiment in the Real Lab.
- Analyze the Tests for Carbohydrates, Amino Acids, Proteins and Lipids.

QUALITATIVE ANALYSIS

1. ANALYSIS OF CARBOHYDRATES

20 Hour

Colour Reactions of Sugars and Osazone Test.

a) Monosaccharides:

Pentoses - Ribose

Hexoses - Glucose, Fructose, Galactose and Mannose.

b) Disaccharides:

Sucrose, Maltose and Lactose.

c) Polysaccharides:

Starch and Dextrin.

2. ANALYSIS OF AMINOACIDS

15 Hour

Colour Reactions of Amino Acids Such as

- Tyrosine
- Tryptophan
- Arginine
- Histidine
- Proline
- Cysteine
- Methionine

3. ANALYSIS OF PROTEINS

15 Hour

Egg albumin - Solubility, Biuret, Millons, Xanthoproteic.

4. ANALYSIS OF LIPIDS

15 Hour

Lipids - Solubility, Iodine Test, Acrolein test, Salkowski's Test, Liebermann Burchard Test.

Reference Books

- Dr. Jayaraman, J. (2011). *Manuals in Biochemistry*. New Age International Pub. Bangalore.
- Plummer. (2000). *Practical Biochemistry*. Tata Mcgraw Hill Publishing Company. New Delhi.
- Sadasivam, S. Manickam, V.A. *Biochemical Methods*. New Age International Publishers.
- Anil Kumar. Sarika Garg. Neha Garg. (2012). *Biochemical Tests - Principles and Protocols*. Vinod Vasishtha Viva Books Pvt Ltd.

E - Resources

- <https://epgp.inflibnet.ac.in/>
- <https://www.sciencedirect.com/book/9780128009697/introductory-experiments-on-biomolecules-and-their-interactions>
- <https://vlab.amrita.edu/?pg=topMenu&id=1>

MICROBIOLOGY

UMBA202

Semester : II
Category : Allied II/GE - II
Class & Major : I B.Sc. Biochemistry

Credit: 2
Hour/Week: 3
Total Hour : 39

Objectives:

To enable the students

- Understand the Different Types of Microbes.
- Gain Theoretical Knowledge about the Microbes Present in the Environment, Infectious Microbes and Microbes Used In Industry.

Learning Outcomes:

On Completion of the course, the students will be able to

- Gain Knowledge on Different Types of Microbes and Culture Media.
- Aware about Common Microbes and its Taxonomy.
- Identify the Common Infectious Agents and the Diseases that they Cause.
- Explain the Use of Microbes in the Industry and its Process.

UNIT - I INTRODUCTION

8 Hour

History and Scope of Microbiology - Prokaryotes and Eukaryotes - Bacteria, Fungi, Algae, Protozoa and Viruses - Structure and Functions of the Cellular Components - Growth and Nutrition - Media and Culture.

UNIT - II CLASSIFICATION OF MICROBES

8 Hour

Classification of Microbes - Numerical Taxonomy - Molecular Taxonomy - Methods of Microbial Identification. Gram Positive and Gram Negative Bacteria.

UNIT - III ENVIRONMENTAL MICROBIOLOGY

8Hour

Microbiology of Soil - Normal Microflora - Role of Soil Microbes in Biogeochemical Cycles (C,N,S). Microorganisms in Agricultural Waste Water Treatment, Vermiculture, Microbial Pesticides. Biogeochemical Importance of Bacteria in Marine & Freshwater Ecosystems.

UNIT - IV MEDICAL MICROBIOLOGY

8 Hour

Sterilization and Disinfection. Disease Reservoirs - Epidemiological Terminologies, Infectious Disease Transmissions. Respiratory Infection Caused by Bacteria and Viruses; COVID - 19 Pandemic Diseases, Tuberculosis, AIDS, Water Borne Diseases. Antimicrobial Agents, Antibiotics - Penicillins and Cephalosporins, Broad Spectrum Antibiotics.

UNIT - V INDUSTRIAL MICROBIOLOGY

7 Hour

Industrial Use of Microbes - Fermentors and Fermentation Technology, Industrial Production of Alcohol, Antibiotics, Aminoacids and Enzymes. Microbiology of Food - Sources of Contamination - Food Spoilage - Food Preservation Methods.

Texts Books

- Pelczar, M.J. Chan, E.C.S. King, N.R. (2001). *Microbiology - Concepts and Applications*. Tata McGraw Hill. New Delhi.
- Ananthanarayan, R. and Paniker, C.K.J. (2000). *A Text Book of Microbiology*. Orient Longman Ltd. (6th Ed.). Hyderabad,

Reference Books

- Kathleen Park Talaro and Talaro, A. *Foundation in Microbiology*. McGraw Hill. (3rd Ed.). New York.
- Cappuccino, J.G and Sharman, N. *Microbiology: A Laboratory Manual*. Addition Wesley Longman Inc. (4th Ed.). New York.

E - Resources

- <https://epgp.inflibnet.ac.in/>
- https://onlinecourses.swayam2.ac.in/cec20_ag09/preview
- https://onlinecourses.swayam2.ac.in/cec20_bt14/preview
- http://www.grsmu.by/files/file/university/cafedry/microbiologii-virysologii-immynologii/files/essential_microbiology.pdf
- <https://libguides.com.edu/c.php?g=649592&p=4555275>

MICROBIOLOGY PRACTICAL UMBR202

Semester : II
Category : Allied practical II
Class & Major : I B.Sc. Biochemistry

Credit : 2
Hour/Week : 3
Total Hour : 39

Objectives:

To enable the students

- Learn & Practice in a Microbiology Laboratory.
- Obtain Culture, Identify and Explain Microorganisms in Environmental Cultures.

Learning Outcomes:

On Completion of the course, the students will be able to

- Summarize the Fundamental Insights to Exploit Microbes for Manufacturing of Products Which Have Huge Industrial Significance.
- Integrate Various Biochemical Processes to Obtain Products Such as Food, Chemicals, Vaccines, Medicine.
- Analyze the Role of Microbes in Industry Using Technology.
- Learn Different Types of Pure Culture Techniques, Preservation of Pure Culture and Culture Collection Centers.
- Isolate Cultures in Pure form and Preserve Cultures for Further Use in Research Studies.

Experiments

1. Use of Microscope, Principle of Fixation and Staining
2. Preparation of Microbiological Media.
3. Dispose of Microbes - Control of Microbial Contamination by Sterilization Techniques.
4. Identification of Microbes through Staining by Simple & Differential Methods
5. Microbial Pure Culture by Isolation Techniques.
6. Identification and Enumeration of Microorganisms from Soil.
7. Determination of Growth Pattern by Growth Curve Methods.
8. Biosafety in Microbiological and Biomedical Laboratories

Reference Books

- Kathleen Park Talaro. Talaro, A. (2010). *Foundation in Microbiology*. Mc Graw Hill. (2nd Ed.). New York.
- Cappuccino, J.G. Sharman, N. (2005) *Microbiology: A Laboratory Manual*. Addition Wesley Longman Inc. New York.
- Daniel Lim. (2015). *Microbiology*. McGraw-Hill. New York.

E- Resources

- file:///C:/Users/CSLAB/Downloads/microbiologylabmanual.pdf
- <https://www.routledge.com/Practical-Handbook-of-Microbiology/Green-Goldman/p/book/9780367567637>
- <https://vlab.amrita.edu/?sub=3&brch=76>

NUTRITION AND HEALTH
UBCE204

Semester : II
Category : Non major elective/SEC
Class & Major: I UG

Credit : 2
Hour/Week : 3
Total Hour : 39

Objectives

To enable the students:

- Understand the Nutrients in Foods and the Specific Functions in Maintaining Health.
- Obtain Knowledge of Nutrients and their Nutritional Value.
- Learn about Various Food Preservation Process.

Learning Outcomes:

On Completion of the course, the students will be able to

- Define Nutrition and its Function in Maintaining Good Health.
- Describe the Importance of Nutrients.
- Gain Knowledge on Diet and Diet Therapy.
- Aware About the Chemistry and Applications of Food Enzymes, Additives and Flavor.

UNIT – I INTRODUCTION

7 Hour

Introduction to Nutrition - Food as a Source of Nutrients, Functions of Foods, Adequate, Optimum and Good Nutrition, Malnutrition; Inter Relationship Between Nutrition and Health Visible Symptoms of Good Health.

UNIT – II NUTRIENTS

7 Hour

Digestion, Absorption, Transport and Utilization of Nutrients in the Body - Carbohydrates, Fats and Oils, Proteins, Vitamins and Minerals.

UNIT – III NORMAL DIET

8 Hour

Role of Dietician - Hospital and Community; Basic Concepts in Diet Therapy; Therapeutic Adaptation of the Normal Diet; Routine Hospital Diets - Regular Diet, Light Diet, Soft Diet, Full Liquid Diet and Tube Feeding.

UNIT – IV DIET THERAPY

8 Hour

Therapeutic Diets for the Following Disorders - Underweight - Definition, Etiology, Treatment; Obesity - Definition, Etiology, Treatment; Diseases of Gastrointestinal Tract Disorder; Peptic Ulcer, Constipation, Acute and Chronic Diarrhea. Hepatitis in Liver.

UNIT – V FOOD PRESERVATION

9 Hour

Biochemical Constituents of Food Grains, Fruits and Vegetables; Changes during Processing and Preservation; General Principles and Method of Food Preservation; Preservation with Chemicals - Mechanism of Microbial Inhibition, Inorganic Preservatives, Antibiotics, Mold Inhibitors and Antioxidants.

Text Books

- Swaminathan, M. (2004). *Essentials of Food and Nutrition*. Bappco Publication.
- Davidson Passmore. (2015). *Human Nutrition and Dietetics*. Bappco Publications.
- Garrow, J.S. Philip, W. James, T. Ralph, A. (2000). *Human Nutrition and Dietetics*. (10th Ed). Churchill Livingstone.

Reference Books

- Swaminathan. (2006). *Principle of Nutrition*. Bappco Publication.
- Robinson Cornell. (2001). *Normal and Therapeutic Nutrition*. Bappco Publication.
- Michael, J. Gibney. Ian, A. Macdonald. Helen, M. Roche. (2004). *Nutrition & Metabolism*. Blackwel Publishing Ltd.

E - Resources

- <https://epgp.inflibnet.ac.in/>
- http://www.freebookcentre.net/medical_books_download/Biology-of-Human-Nutrition.html
- <http://faculty.sdmiramar.edu/faculty/sdccd/mmmcmahon/nutrition/#>

BIOMEDICAL TECHNIQUES

UBCE202

Semester : I

Category : Non major elective

Class & Major : II UG

Credit : 2

Hour/Week : 4

Total Hour : 52

Objectives

To enable the students:

- Study the Different Techniques Employed in Biochemistry and its Importance.
- Experiment the Techniques in Sample Analysis.

Learning Outcomes:

On Completion of the course, the students will be able to

- Describe the Methodology & Applications Involved in Biotechniques.
- Demonstrate Knowledge and Practical Skills of Using Instruments in Biology and Medical Field
- Perform Techniques Involved in Molecular Biology and Diagnosis of Diseases.
- Demonstrate Competency in the Ability to Work Well Both Independently and Collaboratively and to Conduct, Analyze, Report Research Findings.
- Utilize a Standardized Approach in Determining Health and Social Factors Influencing Treatment in Women and Apply to an Individual Patient.

UNIT -I BASICS IN LABORATORY TECHNIQUES

12 Hour

Instrumentation to Laboratory Equipments and Basic Laboratory Operation and Role of Lab Technician, Types of Specimen Collection, and Collection Procedure - Blood and Urine. Unit of Measurement, Reagent Preparation and Laboratory Calculation - Metric System.

UNIT -II SEROLOGY

10 Hour

Blood Pressure, Pulse, Clotting Time, Bleeding Time, Hb Estimation, Total Count - RBC, WBC, Differential WBC Count, ESR and Haematocrit Value.

UNIT- III BLOOD COLLECTION AND GROUPING

10 Hour

Blood Grouping and Rh Factors. Blood Collection, Screening Test - HIV, Hbs Ag. Blood Grouping, Cross Matching, Incompatible Blood Transfusion.

UNIT – IV HISTOPATHOLOGY

10 Hour

Brief Outline of Histopathology, Tissue Cutting, Fixation Embedding Tissue Slicing by Microtome, Slide Mounting and Staining Techniques.

UNIT – V BIOCHEMICAL ANALYSIS

10 Hour

Techniques of Measuring: Blood Glucose, Urea, Uric Acid, TG, AST, ALT, ALP, ACP, Cholesterol and Total Protein.

Text Books

- Ambika Shanmugam. (2010). *Fundamentals of Biochemistry for Medical Students*. Published by the Author.

Reference Books

- Mukherjee, L. (2009). *Medical Laboratory Technology*. Tata McGraw - Hill Publishing Company Limited. (15th Ed.).
- Talib, H. (2008). *Medical Laboratory Technology*. McGraw - Hill Publishing Company Limited.

E - Resources

- <https://epgp.inflibnet.ac.in/>
- <https://www.amazon.in/Textbook-Biomedical-Laboratory-Techniques-ebook/dp/B071D3V5CB>
- <https://www.amazon.in/Theories-Techniques-Biomedical-Field-Biomed-ebook/dp/B083H1W812>

WOMEN'S HEALTH, NUTRITION & DISORDERS

UBCE502/UBCE204

Semester : II

Category : NME

Class & Major: II UG

Credit : 2

Hour/Week: 4

Total Hour:52

Objectives:

To enable the students

- Study the Physiological Changes that Occurs during the Women's Life.
- Awareness on Anaemia and about Various Diseases Due to Hormone Imbalance.

Learning Outcomes:

On Completion of the course, the students will be able to

- Develop the Skills Necessary for Lifelong Learning in the Area of Women's Health.
- Describe Women's Health from a Biopsychosocial Perspective that Includes the Biologic, Social, Economic, Political, and Spiritual Determinants of Health.
- Utilize Information Regarding Ethnic, Socioeconomic, Cultural, Physiologic and Psychosocial Factors in Developing Individual Care Plans for the Provision of Care in Women.
- Identify Treatment Options and Demonstrate Differences in Treatment of Pregnant Vs. Non Pregnant Women.
- Identify the Gestational Weeks When the Embryo Fetus is Most Vulnerable to Drug Induced Injury and Explain the Rationale for this.

UNIT - I WOMEN'S HEALTH

10 Hour

Women Health - Definition, Concept, Stages of Women Life - Child Hood, Adolescence, Young Women, Middle Age, Elderly Women, Physical & Psychological Changes, Steps to Follow Healthy Life Style.

UNIT - II PUBERTY**10 Hour**

Puberty - Definition, Stages of Development of Secondary Sexual Characteristics, Factors Affecting the Onset of Puberty - Genetic Factors, Psychological Factors, Geographical Location, Nutritional Status, Normal & Abnormal Influence of Hormone on Reproductive System.

UNIT – III PREGNANCY & LACTATION**10 Hour**

Pregnancy - Definition, Stages of Pregnancy, Role of Hormones During Pregnancy, Influence of Drugs During Pregnancy, Parturition, Lactation, Importance of Breast Feeding, Precaution During Pregnancy & Lactation.

UNIT - IV DISORDERS**12 Hour**

Menstrual Cycle, Role of Hormone in Menstrual Cycle, Menstrual Disorders, Premenstrual Syndrome, PCOD, Endometrioses, Menorrhoea, Dysmenorrhoea, Amenorrhoea, Risk Factors of Hormone Replacement Therapy - Heart Attack, Breast Cancer, Stroke. Osteoporosis - Sign & Symptoms of Osteoporosis, Treatment for Osteoporosis.

UNIT - V ANAEMIA**10 Hour**

Anaemia - Definition, Types of Anaemia - Iron Deficiency, Microcytic & Macrocytic Anaemia, Aplastic Anaemia, Sickle Cell Anaemia, Vitamin Deficiency Anaemia, Anaemia During Chronic Infection & Pregnancy Signs & Symptoms of Anaemia, Diagnosis, Treatment & Prevention.

Text Books

- Guyton, Arthu. C. (2001). *Textbook of Medical Physiology*. Philadelphia, W.B. Saunders. (8th Ed.).
- Sembulingam, K. Prema Sembulingam. (2006). *Essentials of Medical Physiology*. Publication. Jaypee Brothers. New Delhi.

Reference Books

- Hillman, R.S. Kennet Ault. (2010). *Hematology in Clinical Practice*. McGraw-Hill. (5th Ed.). New York.
- Paulman, P. et al. (2011). *Conn's Current Therapy*. Philadelphia Saunders.

E - Resources

- <https://epgp.inflibnet.ac.in/>
- <https://www.elsevier.com/books/women-and-health/goldman/978-0-12-288145-9>
- <https://www.routledge.com/Optimizing-Womens-Health-through-Nutrition/Thompson-Ward/p/book/9780367388133>

MUSHROOM CULTIVATION

UBCE304 /UBCE208

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

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

Objectives:

To enable the students

- Cite Ideas on Types and Importance of Mushroom.
- Express the Intricacies of Mushroom Cultivation.
- Practice Cultivation by Set Up of Own Unit.

Learning Outcomes:

On Completion of the course, the students will be able to

- Knows the Most Important Kinds of Substrata for Mushroom Cultivation, Belonging to the Wastes of Agricultural, Silvicultural and Forest Industry Management and Have Skills to Prepare Media for the Mushroom Cultivation from these Wastes;
- Can Determine the Most Important Species of Cultivated Mushrooms and Knows the Basic Ways of the Cultivation of Each of them.
- Appreciate the Importance of Embarking on Self - Employment and has Developed the Confidence and Personal Skills for the Same

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

- Nita Bahl. (2009). *Hand Book of Mushroom*. Vijay Primplani for Oxford Publication Co. Pvt Ltd. (4th Ed.). New Delhi.
- Nair, M.C. Gokulapalan, C. Lulu Das. (2008). *Topics on Mushroom Cultivation*. Scientific Publishers. (3rd Ed.). Jodhapur. India.

Reference Books

- Chang, T.S. Hayes, W.A. (2007). *The Biology and Cultivation of Edible Mushrooms*. Academic Press. (2nd Ed.). New York.
- Ignacimuthu, S. (2008). *Applied Plant Biotechnology*. Oxford & IBH Publishing Co. Pvt. Ltd. (3rd Ed.). New Delhi.

E - Resources

- <https://epgp.inflibnet.ac.in/>
- <https://www.amazon.in/Mushroom-Cultivation-Illustrated-Growing-Mushrooms-ebook/dp/B07CZT44QP>
- <https://www.amazon.in/Mushroom-Cultivation-Completed-Updated-Mushrooms-ebook/dp/B083D8RF1C>

CLINICAL DIAGNOSTICS

UBCE209

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

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

Objectives:

To enable the students

- Gain Knowledge in Basic Biochemistry and in their Applications to Human Health.
- Interpret the Disease at an Earlier Stage.
- Acquire a Thorough Knowledge of Normal and Abnormal Biochemistry and to Apply this Knowledge to the Understanding of Human Disease.
- Work Effectively in a Health Care Organization.

Learning Outcomes:

On Completion of the course, the students will be able to

- Knows How to Access Decision Support Tools and Checklists in Real Time to Assist in Formulating an Appropriate Differential Diagnosis.
- Discuss Preparation, Care and Aftercare of Patients Having Ultrasound, Cardiovascular, CT, MRI And RNI Examinations and Procedures.
- Identify the Measurements that are Made in Routine Examinations.

UNIT – I DISORDERS OF CARBOHYDRATE METABOLISM 12 Hour

Diabetes Mellitus - Causes, Types, Complications and Treatment. GTT. Difference between Diabetes Mellitus and Diabetes Insipidus. Protein Calorie Malnutrition, Kwashiorkor and Marasmus - Causes, Complications and its Treatment.

UNIT – II DISORDERS OF LIPID METABLISM 10 Hour

Abnormal Lipid Levels, Role of HDL and LDL Cholesterol, Atherosclerosis, Coronary Heart Disease, Heart Attack, Obesity and its Complications.

UNIT – III HORMONAL IMBALANCE 10 Hour

Menstrual Cycle, Irregular Menstrual Cycle, Hormonal Imbalance, PCOD and its Effects, Causes, Detection and its Treatment.

UNIT – IV KIDNEY DISORDERS 10 Hour

Kidney Structure, Function, Kidney Stones, Difference between Kidney and Gall Stones, Chronic Renal Failure - Causes, Symptoms and its Treatment.

UNIT – V BLOOD AND BMI 10 Hour

Blood Pressure and its Regulation, Normal and Abnormal Levels, Blood Grouping (ABO & Rh), BMI and its Role.

Text Books

- Chatterjea, M.N. Rana Shinde. (2008). *Textbook of Medical Biochemistry*. Jaypee Publications.
- Mukherjee. (2004). *Medical Laboratory Techniques*. Tata McGraw - Hill Publishing Company Limited. (15th Ed.).

Reference Books

- Swaminathan. (2006). *Principle of Nutrition*. Bappco Publication.
- Devlin. T.M. (2005). *Textbook of Biochemistry with Clinical Correlations*. John Wiley and Sons Publications.

E - Resources

- <https://www.springer.com/gp/book/9789811376764>
- <https://www.kobo.com/us/en/ebook/oxford-handbook-of-clinical-diagnosis>
- <https://www.amazon.in/Clinical-Diagnosis-Management-Laboratory-Methods-ebook/dp/B01DSRRV26>

REPRODUCTIVE BIOLOGY

UBCE210

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

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

Objectives:

To enable the students

- Gain Knowledge about Reproductive System.
- Understand the Menstrual Cycle and Identify the Changes During Menopause Stage.
- Aware of the Stages of Pregnancy, Parturition, Lactation.

Learning Outcomes:

On Completion of the course, the students will be able to

- Discuss the Structure, Function and Mode of Action of the Major Male and Female Reproductive Hormones.
- Describe the Major Changes that Occur in the Female Reproductive Tract Over the Menstrual Cycle.
- Understand Risk Factors for Cancers of the Male Reproductive Tract and Consider the Role of Hormones in their Development and Treatment.

UNIT - MALE REPRODUCTIVE SYSTEM

10 Hour

Male Reproductive System - Primary Sex Organs, Structure and Functions of Testis and Prostate Gland, Spermatogenesis, Semen and its Composition, Disorders - Hypergonadism, Hypogonadism.

UNIT - II FEMALE REPRODUCTIVE SYSTEM

10 Hour

Female Reproductive System - Primary Sex Organs, Structure and Functions of Ovary, Ovulation, Oogenesis, Disorder - Polycystic Ovarian Disorder, Family Planning - Pills, Condoms, Intrauterine Devices.

UNIT - III MENSTRUAL CYCLE

12 Hour

Puberty, Menstrual Cycle - Definition, Changes during Menstrual Cycle - Ovarian and Uterine. Regulation of Menstrual Cycle, Menopause - Causes and Changes.

UNIT - IV FERTILIZATION AND PREGNANCY**10 Hour**

Pregnancy - Definition, Types, Stages and Metabolic Changes during Pregnancy.
Fertilization - Infertility in Male and Female.

UNIT - V PARTURITION AND LACTATION**10 Hour**

Gestation Period, Parturition Stages, Placenta - Introduction, Function. Lactation - Milk Secretion, Milk Ejection.

Text books

- Sastry K.V. (2017). *Endocrinology and Reproductive Biology*. Rastogi Publications.
- Sembulingam. K Prema Sembulingam. (2009). *Essentials of Medical Physiology*. Jaypee Brothers. (2nd Ed.). New Delhi.

Reference books

- Richard, E. Jones., Kristin, H. Lopez. (2016). *Human Reproductive Biology*. (3rd Ed.).
- Chatterjea, C.C. (Vol I & Vol II). (2006). *Human Physiology*. Medical Allied Agency. (11th Ed.).

E - Resources

- <https://bookboon.com/en/introduction-to-clinical-biochemistry-ebook>.
- <https://www.kobo.com/us/en/ebook/clinical-biochemistry-e-book>
- <https://www.elsevier.com/books/human-reproductive-biology/jones/978-0-12-382184-3>

III & IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
I	Core I/ DSC - I	UBCM108	Basics of Biochemistry	Open book test	Group Discussion
	Core II/DSC -II	UBCM107	Cellular Biology	Album Preparation	Assignment
II	NME/SEC	UBCE202	Biomedical Techniques	Assignment	DPA+ Practical Test
		UBCE204	Nutrition & Health	Diet Chart Preparation	Case Study
	Core III/ DSC III	UBCM203	Biomolecules	Model Preparation	Assignment
	Allied II/GE II	UMBA202	Microbiology	Food contamination Identification - Exhibits	Culture Preparation

PROGRAMME PROFILE OF M.Sc., BIOCHEMISTRY

PROGRAMME SPECIFIC OUTCOMES (PSO)

Upon completion of the Programme, the students will be able to

- Recognize, Demonstrate and Understand the Structure, Chemical Properties and Reactions of Biomolecules and their Biopolymer Structure to Predict Chemical Properties and Reactivity.
- Acquire Deep Scientific Knowledge in Subjects Like, Cell Biology, Molecular Biology, Biotechnology, Endocrinology, Enzymology, Genetics & Genetic Engineering and Clinical Biochemistry.
- Acquire Knowledge about the Qualitative & Quantitative Analysis of Different Molecule Using Different Types of Microscopes, Chromatographic Techniques, Spectroscopic, Radioisotopes and Electrophoresis Techniques.
- Detect Various Disorders and Identify the Defect in the Metabolic Pathways and Evaluate Solutions for Metabolic Disorders by Applying the Knowledge of Metabolism.
- Translate the Knowledge of Biochemistry to Address Environmental, Intellectual, Societal and Ethical Issues through Projects.

Semester	Category	Course code	Course title	Previous course code	Contact Hour / 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 Hour/ 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			

BIOMOLECULAR CHEMISTRY

PBCM107

Semester : I
Category : Core I/ DSC I
Class & Major : I M.Sc. Biochemistry

Credit : 4
Hour/Week: 6
Total Hour: 78

Objectives:

To enable the students

- Emphasizes on Various Biomolecules and its Structure.
- Learn about the Significance of the Complex Biomolecules, Polysaccharides, Lipids, Proteins, Nucleic Acids, Vitamins, Etc.

Learning Outcomes:

On Completion of the course, the students will be able to

- Understand about Organization of Homo and Heteroglycans.
- Gain Clear Knowledge on Aminoacids and Protein Characterization.
- Evaluate the Structure and Hierarchical Organization of Nucleic Acids With their Biological Function.
- Acquire Knowledge on Various Accessory Molecules Like Vitamins Porphyrins.
- Interpret the Role of Various Biological Structures in Cell to Cell Interaction.

UNIT - I CARBOHYDRATES - HOMO AND HETEROGLYCANS 15 Hour

Classification, Chemical Properties of Carbohydrates, Chemistry and Biological Roles of Homo and Heteropolysaccharides. Structural Elucidation of Polysaccharides; Oligosaccharides - Lectin Interaction in Biochemical Processes. Structure and Role of Proteoglycans, Glycoproteins and Glycolipids (Gangliosides and Lipopolysaccharides).

UNIT - II AMINO ACIDS & PROTEINS 16 Hour

Amino Acids - Classification, Structure and Physiochemical Properties, Chemical Synthesis of Peptides - Solid Phase Peptide Synthesis. Proteins - Classification, Purification and Criteria of Homogeneity. Structural Organization, Sequence Determination and Characterization of Proteins. Conformation of Proteins - Ramachandran Plots. Denaturation and Renaturation of Proteins. Apoprotein and Prosthetic Group - Porphyrins - Structure and Properties of Porphyrins - Heme, Chlorophyll and Cytochromes.

UNIT - III NUCLEIC ACIDS 16 Hour

Watson - Crick Model of DNA Structure. A, B And Z - DNA Cruciform Structure in DNA, Formation and Stability of Cruciforms, Miscellaneous Alternative Conformation of DNA, Slipped Mismatched DNA, Parallel Stranded, Anisomorphic DNA, Palindrome, Secondary and Tertiary Structure of RNA, Methods for Nucleic Acid Sequence Determination, Molecular Hybridization, Cot Value Curve, Hypochromic Effect, DNA - Protein Interactions.

UNIT - IV LIPIDS 15 Hour

Lipids - Classification - Saturated and Unsaturated Fatty Acids, Phospholipids - Classification, Structure and Functions. Ceramides and Sphingomyelins. Eicosanoids, Structure and Functions of Prostaglandins, Thromboxanes, Leukotrienes Types and Functions of Plasma Lipoproteins. Amphipathic Lipids - Membranes, Micelles, Emulsions and Liposomes. Steroids - Cholesterol Structure and Biological Role - Bile Acids, Bile Salts.

UNIT - V VITAMINS AND PORPHYRINS 16 Hour

Vitamins - Water Soluble - Thiamine, Riboflavin, Niacin, Pyridoxine, Folic Acid, Ascorbic Acid- Sources, Structure, Biochemical Functions, Deficiency Diseases, Daily Requirements; Fat Soluble - Vitamin A, Vitamin D2, Vitamin E And Vitamin K - Sources, Structure, Biochemical Functions, Deficiency Diseases, Daily Requirements.

Text Books

- David, L. Nelson. Michael, M. Cox. (2017). *Lehninger - Principles of Biochemistry*. W.H. Freeman and Company. (7th Ed.). New York.
- Robert, K. Murray. et. al. (2015). *Harpers Biochemistry*. Prentices Hall International. (30th Ed.).

Reference Books

- Voet. Voet. (2018). *Biochemistry*. Prentices Hall International. John Wiley & Sons. (5th Ed.).
- Champe, P.C. Richard, A. Harvey. (2017). *Lippincotts Biochemistry*. Williams & Wilkins Publishers. (7th Ed.).

Journals

- Indian Journal of Biochemistry & Biophysics.
- Indian Journal of Experimental Biology.
- International Journal of Biological Macromolecules.

E - Resources

- https://onlinecourses.nptel.ac.in/noc20_cy07/preview
- https://onlinecourses.swayam2.ac.in/cec21_bt10/preview
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2>
- <https://shodhganga.inflibnet.ac.in>
- <https://epgp.inflibnet.ac.in/>

CELL BIOLOGY PBCM108

Semester : I
Category : Core II/ DSC II
Class & Major : I M.Sc. Biochemistry

Credit : 4
Hour/Week : 6
Total Hour : 78

Objectives:

To enable the students

- Understand The Structure and Functions of Prokaryotic, Eukaryotic Cells and their Metabolic Process.
- Explain the Arrangement, Functions and Properties of Biomolecules in Membranes.
- Study the Role of Membrane Channels in Transportation and Different Movement Process Across the Membrane.

Learning Outcomes:

On Completion of the course, the students will be able to

- Understand the Molecular Organization of Cells, Cell - Cell Communication, Cell Junctions, Cytoskeleton and Extracellular Matrix Protein.
- Appreciate Membrane Composition and Transport Mechanisms.
- Interpret the Role of Various Biological Structures in Cell to Cell Interactions.
- Comprehend the Steps in Cell & Tissue Culture.

UNIT - I CELLULAR ORGANIZATION, DIVISION AND CYTOSKELETONS 15 Hour

Structure and Function Prokaryotic and Eukaryotic Cells. Mechanism of Cell Division - Mitosis and Meiosis, Structure and Organization of Chromatin. Phases of Cell Cycle and Regulation of Cell Growth and Cell Cycle, Cell Motility - Molecular Motors, Microtubules, Structure and Composition, Microtubular Associated Proteins - Role in Intracellular Motility.

UNIT - II CELLULAR ORGANELLES

15 Hour

Cellular Organelles - Nucleus - Internal Organization, Traffic between the Nucleus the Nucleolus and Cytoplasm, Endoplasmic Reticulum - Protein Sorting and Transport, Golgi Apparatus and Lysosomes, Morphology and Function of Mitochondria, Chloroplasts and Peroxisomes, Glyoxysomes.

UNIT - III METHODS IN CELL BIOLOGY

16 Hour

Methods for Disrupting Tissues and Cells, Organ and Tissue Slice Techniques, Isolation of Clones, Tissue Culture Techniques (Animal and Plant), Cell Fixation - Fluid Fixatives, Freezing and Section Drying, Fixation for Electron Microscopy - Buffered Osmium Solutions, Fixation of Organic and Inorganic Substances, Staining Techniques Acid and Basic, Fluorescent and Radioactive Dyes, Staining of Lipids, Steroids, Nucleic Acids, Proteins and Enzymatic Reaction Products. Histopathological Studies - Organ Specific Morphohistological Examination, Identification of Morphological Changes Related to Pathology.

UNIT - IV CELLULAR SIGNALLING

16 Hour

Differentiation of Cell Membrane - Microvilli, Tight Junctions, Epithelia, Bell and Spot Desmosomes - Mechanical Function, Cell - Cell Interaction, Cell Adhesion Proteins, Cell Junctions, Tight Junctions, Cell Surface of Plant Cells and Cancer Cells. Overview of Membrane Protein - Peripheral and Integral, Molecular Model of Cell Membrane - Fluid Mosaic Model and Membrane Fluidity, Solute Transport Across Membrane - Passive Transport, Active Transport by ATP Powered Pumps, Types of Transport Systems.

UNIT - V CELLULAR AGING: CELL DEATH MEDIATED DISEASES

16 Hour

Cell Aging and Death - Necrosis and Apoptosis. Mechanisms of Cell Death: Apoptosis; Necrosis and Autophagy - Mitochondrial and Death Receptor Pathway. Signal Transduction in Health and Disease: Cancer, Neurodegeneration, Diabetes and Obesity and Inflammation.

Text Books

- Arnold Berk, Chris A. Kaiser, Harvey Lodish, Angelika Amon, Hidde Ploegh, Anthony Bretscher, Monty Krieger and Kelsey C. Martin. (2016). *Molecular Cell Biology*. (7th Ed.) W.H. Freeman.
- James D. Watson, A. Baker Tania, P. Bell Stephen, Gann Alexander, Levine Michael and Losick Richard. (2017). *Molecular Biology of the Gene*. (7th Ed.) Pearson Education.

References Books

- Gerald Karp. (2013). *Cell and Molecular Biology by Concepts and Experiments*. (7th Ed.) John Wiley sons & Inc.
- Lodish, Berk et al. (2016). *Molecular Cell Biology*. (8th Ed.) Freeman and Co.

Journals

- Indian Journal of Biochemistry & Biophysics
- Indian Journal of Experimental Biology
- International Journal of Biological Macromolecules

E - Resources

- <https://nptel.ac.in/courses/102/106/102106>
- https://onlinecourses.swayam2.ac.in/cec19_bt12/preview
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2>
- <https://shodhganga.inflibnet.ac.in>
- <https://epgp.inflibnet.ac.in/>

MICROBIOLOGY

PBCM109

Semester : II
Category : Core III/ DSC III
Class & Major: I M.Sc. Biochemistry

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

Objectives:

To enable the students

- Study the Structure and Organization of Microorganisms in Various Fields.
- Elucidate the Role of Microbes in Industrial, Clinical and Environmental Domains.

Learning Outcomes:

On Completion of the course, the students will be able to

- Understand the Basics of Microbiology Like Characterization and Classification of Microorganisms, Cultivation, Nutrition, Physiology and Growth of Microbial Cells.
- Demonstrate Various Classes and Structure of Microbes.
- Discuss Preparation and Applications of Products from Industries. Role of Microbes in Nitrogen Fixation, Purification of Water.
- Learn about Methods of Sterilization & Preparation of Various Culture Media.

UNIT - I GENERAL MICROBIOLOGY

15 Hour

Introduction and Scope of Microbiology. Brief Study of Structure and Organization of Major Groups of Microorganisms - Archaeobacteria, Cyanobacteria, Eubacteria, Fungi, Algae, Protozoa and Viruses. Culture of Microorganisms - Batch, Continuous and Pure Cultures. Control of Microorganisms - Physical, Chemical and Chemotherapeutic Agents. Preservation of Microorganisms.

UNIT - II ENVIRONMENTAL MICROBIOLOGY

16 Hour

Microbiology of Soil - Soil Microflora, Role of Soil Microbes in Biogeochemical Cycles (C,N,S) - Marine and Fresh Water Microbiology. Contamination of Domestic and Marine Waters. Water Purification and Sewage Treatment. Microbes in Waste Water Treatments. Microbiology of Air.

UNIT - III INDUSTRIAL MICROBIOLOGY

17 Hour

Selection of Industrially Useful Microbes. Fermentors & Fermentation Technology - Upstream Processing.

Microbial Products in Pharmaceutical and Agriculture Industry: Production, Harvest, Recovery and Uses Enzymes, Vinegar, Amino Acids, Antibiotics (Penicillins, Tetracycline), Vitamins (B₂, B₁₂), Organic Acids (Acetic Acid, Citric Acid, Alcohol) & Formulation of Biofertilizer (*Rhizobium*) and Biopesticides (*Bacillus Thuringiensis*).

UNIT - IV CLINICAL MICROBIOLOGY

15 Hour

Epidemiology of Infectious Diseases. Bacterial Diseases of Human (Typhoid, Cholera, Syphilis, Gonorrhoea and Pertusis). Fungal Diseases of Human (Superficial, Cutaneous, Subcutaneous and Systemic Mycoses). Viral Diseases of Human (COVID-19 Pandemic Diseases, AIDS, Hepatitis, Polio, Rabies and Measles). Mycoplasmal, Chlamydial, Rickettial and Protozoan Diseases of Human. Hospital Acquired Infections.

UNIT - V MICROBIOLOGY OF FOOD

15 Hour

Microbiology of Fermented Foods - Yoghurt, Cheese, Bread, Sauerkraut. Mushroom Farming - Use of Enzymes in Food Industry. Microbes As Foods - SCP Production Food Borne Diseases - Bacterial and Non - Bacterial. Microbiology of Food: Sources of Contamination, Food Spoilage and Food Preservation Methods. Microbial Quality and Safety - Determining Microorganisms in Food Culture, Microscopy and Sampling Methods.

Text Books

- Prescott. et al. (2017). *Microbiology*. Mcgraw Hill Education. (7th Ed.). USA.
- Joanne, M. Willey. Linda Sherwood. Christopher, J. Woolverton. (2017). *Prescott's Microbiology*. Tata McGraw Hill Publishing Company Ltd. (10th Ed.). New Delhi.

Reference Books

- Martin Alexander. (2009). *Introduction to Soil Microbiology*. Wiley International. (4th Ed.). New York.
- Gladwin. Trattler. (2013). *Clinical Microbiology Made Ridiculously Simple*. Medmaster. (6th Ed.). UK.
- Panicker. (2005). *Microbiology*. Orient Longman. Hyderabad. (6th Ed).

Journals

- Journal of Clinical Microbiology
- Applied and Environmental Microbiology Journal
- European Journal of Clinical Microbiology

E - Resources

- https://onlinecourses.nptel.ac.in/noc20_ce17/preview
- <https://www.classcentral.com/course/swayam-food-microbiology-and-food-safety-17609>
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2>
- <https://microbiologyresearch.org>
- <https://shodhganga.inflibnet.ac.in>
- <https://epgp.inflibnet.ac.in/>

MOLECULAR BIOLOGY
PBCM210

Semester : I
Category : Core IV/ DSC IV
Class & Major : I M.Sc. Biochemistry

Credit : 4
Hour/Week : 6
Total Hour : 78

Objectives:

To enable the students

- Impart Knowledge about Molecular Basis for Cell Division and Replication
- Enlighten the Students about the Process of RNA & Protein Synthesis and their Segregation.
- Expose the Students to the Molecular Mechanisms of Gene Regulation.

Learning Outcomes:

On Completion of the course, the students will be able to

- Explain Nucleic Acid As Genetic Information Carriers, Possible Modes of Replication and Roles of Replication Enzymes.
- Learn about the Mechanism and Regulation of Transcription in Prokaryotes along with Reverse Transcription.
- Understand the Classes of DNA Sequences, Centromere, Telomere, Satellite DNA, Minisatellite and Applications of Satellite DNA and Split Genes.
- Analyze the Changes in Coding Sequences by Applying Genetic Code Concept.
- Comprehend Protein Targeting and the Role of Ubiquitine in Protein Degradation and Chaperons in Folding.

UNIT - I PROKARYOTIC TRANSCRIPTION AND REGULATION

16 Hour

Prokaryotic and Eukaryotic DNA Replication - Mechanism of Replication, Enzymes and Necessary Proteins in DNA Replication, Telomeres, Telomerase and End Replication. DNA Mutation and Repair - Mutation Subtypes, Mismatch, Base - Excision, Nucleotide - Excision and Direct Repair. DNA Recombination - Homologous, Non - Homologous and Site - Specific. DNA Transposition. Basic Principles of Transcription. Transcription - Initiation, Elongation and Termination. Inhibitors of Transcription. Post - Transcriptional Processing of rRNA and tRNA. Regulation of Transcription In Prokaryotes - The Lac, Trp, Arab, Gal Operon.

UNIT - II EUKARYOTIC TRANSCRIPTION AND REGULATION

16 Hour

Eukaryotic RNA Polymerases - Structure and Functions. RNA Pol I, II and III Promoters, Transcription Factors, Transcription Complex Assembly and Mechanism of Transcription. Transcriptional Regulation in Eukaryotes - Hormonal (Steroid Hormone Receptors), Phosphorylation (Stat Proteins), Activation of Transcriptional Elongation by HIV Tat Protein, Cell Determination, Homeodomain Proteins. Post Transcriptional Modification - 5' Cap Formation - 3' End Processing and Polyadenylation - Splicing- Editing- Nuclear Export of mRNA - mRNA Stability

UNIT- III GENETIC CODE, TRANSLATION

15 Hour

Genetic Code - Prokaryotic and Eukaryotic Translation - Translational Machinery. Mechanism of Initiation - Elongation and Termination. Regulation of Translation. Inhibitors of

Translation. Co - and Post - Translational Modifications. Protein Targeting. Protein Degradation: The Ubiquitine Pathway - Protein Folding - Models, Molecular Chaperones.

UNIT – IV GENE EXPRESSION AND REGULATION

15 Hour

Levels of Gene Expression. Principles of Gene Regulation, Upregulation, Downregulation, Induction, Repression, Global and Narrow Domain Mechanisms. Genetic and Epigenetic Gene Regulation by DNA Methylation. DNA Methylation in Prokaryotes DNA Methylation in Eukaryotes - Cytosine Methylation, CpG Islands. Methylation and Gene Regulation in Mammals and Plants.

UNIT - V GENOMICS

16 Hour

Genomics: An Overview. Genome Projects: HGP Genome Sequencing Approaches; Structural Genomics; Chromosome Maps - RFLP, SSLP, RAPD Physical Mapping. Positional Cloning. Functional Genomics - Study of Gene Interactions; Proteomics. SNPs and Implications; DNA Micro Arrays.

Text Books

- Harvey Lodish Baltimore. et.al. (2010). *Molecular Cell Biology*. (8th Ed.)
- Ajoy Paul. (2011). *Textbook of Cell and Molecular Biology*. Books and Allied Ltd.

Reference Books

- George, M.Malacinski. (2013). *Freifeder's Essentials of Molecular Biology*. Norosa Publishing House.
- Bruce Alberts. Alexander Johnson. Julian Lewis. David Morgan. Martin Raff. Keith Roberts. Peter Walter. (2014). *Molecular Biology of Cell*. Garland Science Publication.
- Watson, J.D. Tania, A. Baker. Stephen, P. Bell. Michael Levine. Richard Losick. (2013). *Molecular Biology of the Gene*. Benjamin/Cummings Publ. Co. Inc. (7th Ed.). California.

Journals

- International Journal of Genetics and Molecular Biology.
- International Journal of Biochemistry and Molecular Biology.
- Indian journal of genetics and molecular biology.

E - Resources

- https://onlinecourses.swayam2.ac.in/cec20_ma13/preview
- <https://www.classcentral.com/course/swayam-molecular-biology-19952>
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2>
- <https://www.nature.com/scitable/topicpage/epigenetic-influences-and-disease-895/>
- <https://shodhganga.inflibnet.ac.in>
- <https://epgp.inflibnet.ac.in/>

MICROBIOLOGY & MOLECULAR BIOLOGY PRACTICAL

PBCR103

Semester : I

Category : Core Practical I

Class & Major : I M.Sc. Biochemistry

Credit: 5

Hour/Week: 6

Total Hour: 78

Objectives:

To enable the students

- Gain Practical Knowledge about Microbes.
- Experiment Molecular Biological Techniques.

Learning Outcomes:

On Completion of the course, the students will be able to

- Equipped with the Knowledge to Handle Microbes and Basic Instrumentation Used in Microbiological Laboratory.
- Various Basic Techniques to Isolate, Characterize the Microbes Morphologically Will Be Known to them.
- Differentiate the Main Types of Prokaryotes through their Grouping Abilities and List their Characteristic and Differentiating Properties

Microbiology:

1. Determination of Microbiological Techniques by Sterilization, Media Preparation, Preparation of Slants and Stabs, Pouring of Medium into Plates, Sub-Culturing.
2. Isolation of Microorganisms from Soil Collected from Different Places by Serial Dilution, Plating for Counting Colonies, Single Colony Isolation Techniques and its Preservation.
3. Examination of Microorganisms by Simple Staining, Gram Staining, Acid Fast Staining, Endospore Staining, Staining of Flagella, Staining of Capsule, Staining of Fungi, Localization of Root Nodule Bacteria by Staining.
4. Determination of Bacterial Growth Studies by Haemocytometer, Colony Counting and Bacterial Growth Curve and Generation Time.
5. Antibiotic Sensitivity Tests by Paper Disc, Cup Method and MIC Determination.
6. Bacteriological Examination of Water / Industrial Effluents

Molecular Biology:

1. Preparation of Genomic DNA from Plant Tissue by CTAB Method.
2. Plasmid DNA Isolation by Alkaline Lysis Method.
3. Isolation Of Chromosomal DNA From Blood Samples By Phenol Chloroform Method.
4. Demonstration of ELISA.

Text Books

- Cappuccino, J.G. Sharman, N. (2010). *Microbiology: A Laboratory Manual*. Addition Wesley Longman Inc. (3rd Ed.). New York.
- Schleif, Robert F. Wensink, Pieter. C. (2019). *Practical Methods in Molecular Biology*. (4th Ed.).

Reference Books

- Kathleen Park Talaro. Talaro, A. (2005). *Foundation in Microbiology*. McGraw-Hill. (2nd Ed.). New York.
- Sue Carson Heather Miller Melissa Srougi D. Scott Withero. (2020). *Molecular Biology Techniques: A Classroom Laboratory Manual*. (4th Ed.). Academic Press.

E - Resources

- <https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham>
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2>
- <https://vlab.amrita.edu/?sub=3&brch=73>
- <https://shodhganga.inflibnet.ac.in>
- <https://epgp.inflibnet.ac.in/>

METABOLISM AND REGULATION PBCM207

Semester : II
Category : Core V/ DSC V
Class & Major : I M.Sc. Biochemistry

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

Objectives:

To enable the students

- Understand the Fundamental Energetics of Biochemical Processes, Chemical Logic of Metabolic Pathways.
- Impart Knowledge about the Basic Metabolic Pathway of Carbohydrates.
- Enable the Students to Understand the Inter Relationship of Carbohydrates, Proteins and Fat Metabolism.

Learning Outcomes:

On Completion of the course, the students will be able to

- Explain Biochemical Energy Generation through Carbohydrate Metabolism.
- Outline Lipid Metabolism with Respect to Several Human Diseases, Due to Defects in the Metabolic Pathway.
- Explain Energy Yielding and Energy Requiring Reactions in Life and Diversity of Metabolic Reactions in Amino Acid Pathway
- Analyse the Integration of Biochemical Process with Specific Control Sites and Key Junctions.

UNIT - I BIOENERGETICS

13 Hour

Free Energy and Entropy. Phosphoryl Group Transfers and ATP. Enzymes Involved in Redox Reactions. The Electron Transport Chain - Organization and Role in Electron Capture. Oxidative Phosphorylation - Electron Transfer Reactions in Mitochondria. F₁F₀ ATPase - Structure and Mechanism of Action. The Chemiosmotic Theory. Inhibitors of Respiratory Chain and Oxidative Phosphorylation - Uncouplers, Ionophores. Regulation of Oxidative Phosphorylation. Mitochondrial Transport Systems - ATP/ADP Exchange, Malate / Glycerophosphate Shuttle.

UNIT - II CARBOHYDRATE METABOLISM

13 Hour

Carbohydrate Metabolism: Glycolysis and Gluconeogenesis - Pathway, Key Enzymes and Co - Ordinate Regulation. Pyruvate Dehydrogenase Complex and the Regulation of this Enzyme through Reversible Covalent Modification. The Citricacid Cycle and Regulation. The Pentose Phosphate Pathway. Metabolism of Glycogen and Regulation.

UNIT - III LIPID METABOLISM

13 Hour

Lipogenesis: Biosynthesis of Fatty Acid, Triglycerides, Phospholipids and Cholesterol. Regulation of Triacylglycerol, Phospholipids and Cholesterol Biosynthesis and Disorders. Oxidation of Lipids. Role of Carnitine Cycle in the Regulation of β - Oxidation. Ketogenesis and its Control. Lipoprotein Metabolism - Exogenous and Endogenous Pathways.

UNIT-IV METABOLISM OF AMINO ACIDS, PURINES AND PYRIMIDINES 13 Hour

Amino Acid Metabolism - Degradation of Amino Acids, Oxidative and Nonoxidative Deamination, Transamination, Decarboxylation, Detoxication of Ammonia - Urea Cycle Catabolism of Carbon Skeletons of Amino Acids - Ketogenic and Glucogenic Amino Acids. Disorders of Amino Acid Metabolism - Phenylketonuria, Alkaptonuria and Albinism Digestion and Absorption of Nucleoproteins, Metabolism of Purines - De Novo and Salvage Pathways for Purine Biosynthesis, Regulation of Biosynthesis of Nucleotides. Purine Catabolic Pathway. Hyperuricemia. Metabolism of Pyrimidines Biosynthesis and Catabolism. Orotic Aciduria.

UNIT - V METABOLIC INTEGRATION AND HORMONAL REGULATION 13 Hour

Key Junctions in Metabolism - Glucose - 6 - Phosphate, Pyruvate and Acetyl CoA. Metabolic Profiles of Brain, Muscle, Liver, Kidney and Adipose Tissue. Metabolic Inter Relationships in Various Nutritional and Hormonal States - Obesity, Aerobic, Anaerobic Endurance, Exercise, Pregnancy, Lactation, IDDM, NIDDM and Starvation.

Text Books

- Murray. et al. (2015). *Harper's Biochemistry*. (30th Ed.). Mc. Graw Hill.
- David L. Nelson, Michael M. Cox. (2017). *Lehninger - Principles of Biochemistry*. W.H. Freeman and Company. (7th Ed.). New York.

References Books

- Voet. Voet. (2018). *Biochemistry*. Prentices Hall International. John Wiley & Sons. (5th Ed.).
- Champe, P.C. Richard, A. Harvey. (2009). *Lippincotts Biochemistry*. Williams & Wilkins Publishers.

Journals

- Indian Journal of Biochemistry & Biophysics
- Biochemistry & Analytical Biochemistry
- Endocrinology & Metabolism International Journal

E - Resources

- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2>
- https://onlinecourses.nptel.ac.in/noc21_bt18/preview
- www.ncbi.nlm.nih.gov > NCBI > Literature > Bookshelf
- <http://www.ggu.ac.in/download/SWAYAM-BOOKLET%2008.08.18.pdf>
- Cellular metabolism /toctrisbioscience
- <https://shodhganga.inflibnet.ac.in>
- <https://epgp.inflibnet.ac.in/>

HUMAN PHYSIOLOGY

PBCM208

Semester : II
Category : Core VI/ DSC VI
Class & Major : I M.Sc. Biochemistry

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

Objectives:

To enable the students

- Gain Knowledge on Physiology of Human Body and to Study the Way the Body Functions.
- Study the Female and Male Reproductive System.
- Learn the Biochemical Changes Occurring in Pregnancy, Parturition and Lactation.

Learning Outcomes:

On Completion of the course, the students will be able to

- Understand the Fundamental Components & Functions of Digestive, Reproductive & Excretory System.
- Discuss The Importance of Cardiac and Respiratory System and to Create Awareness on Cardiovascular and Respiratory Diseases.
- Discuss the Functions of Nervous System and the Mechanism of Synaptic Transmission.
- Explain the Importance of Reproductive System.

UNIT - I BLOOD, HEART AND RESPIRATION

13 Hour

Internal Environment and Homeostasis- Coordinated Body Functions. Cardiophysiology - Functional Anatomy of Heart - Genesis and Spread of Cardiac Impulses - Cardiac Cycle - Heart Sound- Cardiac Output - Cardiovascular Regulatory Mechanisms - Basic E.C.G. Structure of Lungs, Mechanism and Regulation of Respiration. Transport of Blood Gases - O₂ and CO₂. Acid - Base Balance - Role of Buffers, Erythrocytes, Respiratory System and Kidneys. Acidosis and Alkalosis - Metabolic and Respiratory. Fluid Electrolyte Balance - Regulation of Water Balance and Sodium Balance - Role of Renin - Angiotensin and ADH.

UNIT- II DIGESTION AND EXCRETION

13 Hour

Digestive Secretions - Composition, Functions and Regulation of Saliva, Gastric, Pancreatic, Intestinal and Bile Secretions. Digestions and Absorption of Carbohydrates, Lipids, Proteins and Nucleic Acids. Excretory System - Structure of Nephron. Formation of Urine - Glomerular Filtration, Tubular Reabsorption of Glucose, Water and Electrolytes, Tubular Secretion.

UNIT - III REPRODUCTIVE SYSTEM

13 Hour

Male Reproductive System:- Source, Synthesis, Chemistry and Metabolism of Androgens, Physiological Roles and Mechanism of Action. Pathophysiology. Female Reproductive System: - Ovarian Steroid Hormone Synthesis, Physiological Role, Mechanism of Action, Neuroendocrine Control of Ovarian Function. Pathophysiology. Endocrinology of Pregnancy, Parturition and Lactation. Sex Differentiation and Development, Puberty and Hormone Control. Human Infertility - Reasons, Therapy and Treatment.

UNIT - IV NERVOUS SYSTEM

13 Hour

Nerve Physiology - Structure of Neuron and Synapse - Excitability - Action Potential - Conduction of Nerve Impulse - Synaptic Transmission - Neurotransmitter Systems. Muscle Physiology - Skeletal and Smooth Muscle - Electrical Properties and Ionic Properties - Types of Muscle Contraction - Neuromuscular Transmission.

UNIT - V MUSCULAR AND CYTOSKELETON SYSTEM

13 Hour

Structure of Muscle Cells and Muscle Contraction, Molecular Organization of Muscle, Proteins of Contractile Element - Their Organization and Role in Contraction, Energy for Contraction. Types of Tissue. Epithelium - Organization and Types. The Basement Membrane. Bone and Cartilage. ECM Components - Collagen, Elastin, Fibrillin, Fibronectin, Laminin and Proteoglycans.

Text Books

- Sembulingam, K. (2018). *Essential of Medical Physiology*. Prema Jaypee Brothers. (8th Ed.). New Delhi.
- Chatterjee, C.C. (2020). *Human Physiology*. (13th Ed.).
- Jain, A.K. (2008). *Textbook of Human Physiology*. (4th Ed.).

References Books

- Guyton and Hall. (2020). *Textbook of Medical Physiology*, (15th Ed.). Publisher: Saunders.
- Bernhard, K. Winfried, B. (2016). *Hormones and the Endocrine System: A text Book of Endocrinology*. Springer Nature Publishers.

Journals

- International Journal of Advanced Physiology and Allied Sciences
- American Journal of Physiology
- Indian Journal of Physiology and Pharmacology
- National Journal of Physiology, Pharmacy and Pharmacology

E - Resources

- <https://www.coursera.org/learn/physiology>
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2>
- <https://opentextbc.ca/anatomyandphysiology/>
- <https://shodhganga.inflibnet.ac.in>
- <https://epgp.inflibnet.ac.in/>

ANALYTICAL BIOCHEMISTRY

PBCM209

Semester : II
Category : Core VII/ DSC VII
Class & Major : I M.Sc. Biochemistry

Credit : 5
Hour/Week : 5
Total Hour : 65

Objectives:

To enable the students

- Understand the Working Principles of Analytical Instruments.
- Explain Electrochemical Principles in Separation of Compounds.
- Inculcate the Fundamentals of Radioactivity and Microscopy

Learning Outcomes:

On Completion of the course, the students will be able to

- Obtain Necessary Knowledge to Perform Techniques Essential to Biochemistry.
- Use Appropriate Electrophoretic Method in Separation of Biomolecules.
- Apply Practically the Knowledge Acquired on Radioactivity and Microscopy in Biochemical Analysis.
- Differentiate the Principles of Paper, Ion Exchange, Gel & Affinity Chromatography.
- Explain the Instrument Components, Principles of Operation and Applications of Spectroscopy.

UNIT - I MICROSCOPY AND ELECTROCHEMICAL TECHNIQUES 13 Hour

Microscopy - Basic Principles and Applications - Light - Compound - Phase Contrast - Dark Field - Fluorescence Microscopy Scanning Electron Microscopy (SEM) - Transmission Electron Microscopy (TEM) - Scanning Tunneling Microscopy - (STM) - Confocal Microscopy. Electrochemical Techniques - Principles, Electrochemical Cells - pH Measurement, Glass Electrode, Oxygen Electrode - Principle and Application. Biosensors.

UNIT-II ULTRACENTRIFUGATION AND RADIOACTIVITY TECHNIQUES 15 Hour

Ultracentrifugation - Basic Principles. Preparative Ultracentrifugation - Differential Centrifugation and Density Gradient Centrifugation. Analytical Centrifugation - Schlieren Optical System - Applications - Determination of Molecular Mass and Purity of Macromolecules. Radioactivity - Types of Radioisotopes - Half Life - Units of Radioactivity - Uses of Radioisotopes In Life Sciences & Biotechnology - Detection and Measurement Techniques - Liquid Scintillation Counting - Solid State Counting - Geiger Counter - Radiation Hazard & Laboratory Handling Methods.

UNIT - III ELECTROPHORESIS TECHNIQUES 13 Hour

Electrophoresis - General Principles, Support Media. Electrophoresis of Proteins - SDS - PAGE, 2D - PAGE, Native Gels, Gradient Gels, Isoelectric Focusing. Cellulose Acetate Electrophoresis. Detection, Estimation and Recovery of Proteins in Gels. Protein Blotting. Electrophoresis of Nucleic Acids - Agarose Gel Electrophoresis, DNA Sequencing Gels, Pulsed Field Gel Electrophoresis.

UNIT - IV CHROMATOGRAPHY TECHNIQUES 11 Hour

Principles of Chromatography, Size Exclusion, Ion - Exchange and Affinity Chromatography. High Performance Thin Layer Chromatography (HPTLC), Gas Liquid Chromatography (GLC), Thin Layer Chromatography (TLC), Paper Chromatography, GC-MS, LC-MS, MALDI - TOF, ICPMS, HPLC And Surface Plasma Resonance Methods.

UNIT - V SPECTROSCOPY TECHNIQUES

13 Hour

Laws of Absorption and Absorption Spectrum. Principle, Instrumentation and Applications of FTIR. Atomic Spectroscopy - Principle and Applications of Atomic Flame and Flameless Spectrophotometry. Use of Lasers for Spectroscopy.

Text Books

- Wilson. Walkers. (2018). *Principles and Techniques of Biochemistry and Molecular Biology*. Cambridge University Press.
- Upadhyay. Upadhyay. Nath. (2010). *Biophysical Chemistry Principles and Techniques*. Himalaya Publication.

References Books

- David Frifelder. (2009). *Physical Biochemistry*. W. H. Freeman. (3rd Ed.).
- Robert, D. Braun. (2010). *Introduction to Instrumental Analysis*. Pharma Book Syndicate.
- Artie Weissberg. (2016). *Analytical Biochemistry*. Syrawood Publising House.

Journals

- Biochemistry & Analytical Biochemistry
- International Journal of Analytical Biochemistry Research
- Analytical and Bioanalytical Chemistry

E - Resources

- <https://nptel.ac.in/courses/102/103/102103044/>
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2>
- <http://www.nature.com/subjects/analytical-biochemistry>
- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=944>
- <https://epgp.inflibnet.ac.in/>

ENDOCRINOLOGY

PBCM210

Semester : II
Category : Core VIII/ DSC VIII
Class & Major : I M.Sc. Biochemistry

Credit : 4
Hour/Week : 4
Total Hour : 52

Objectives:

To enable the students

- Acquire In-Depth Knowledge about Types, Classification, Biosynthesis, Interaction, Function and Regulation of Hormones.
- Impart Knowledge on Cell Surface Receptors in Signal Transduction Pathways.
- Expose Students to the Various Molecules Involved in Signal Transduction with Special Emphasis on Receptors.

Learning Outcomes:

On Completion of the Course, the Students will be able to,

- Understand the Role of Hypothalamo - Pituitary Axis in the Coordination of Nervous & Endocrine System.
- Learn the Functions of Pituitary, Parathyroid and Thyroid Secretion & Associated Disorders.
- Explain the Actions of Adrenal and Gonadal, GI Tract and Pancreatic Hormones & Secretions.
- Discuss the MAP Kinase and Nuclear Receptor Mediated Pathway and Analyse Signaling Cross Talk.

UNIT - I CLASSIFICATION AND MECHANISM

10 Hour

Introduction to Hormones, Definition and Classification. Mechanism of Action of Hormones and its Regulation. Hypothalamic and Pituitary Hormones - Anterior Pituitary Hormones: Biological Actions Regulation and Disorders of Growth Hormones. Posterior Pituitary Hormones - Biological Actions and Regulation of Vasopressin. Diabetes Insipidus and Hypo and Hyper Pituitarism.

UNIT - II AMINO ACID DERIVED HORMONES

10 Hour

Thyroid Hormones - Transport, Metabolic Fate and Biological Actions. Hypo and Hyper Thyroidism. Hormonal Regulation of Calcium and Phosphate Metabolism. Secretion and Biological Actions of PTH, Calcitonin. Hypo and Hyper Calcemia. Adrenal Cortical Hormones. Regulation, Transport and Biological Effects. Adrenal Medullary Hormones - Secretion, Regulation and Biological Effects of Catecholamines.

UNIT - III STEROID HORMONES

10 Hour

Structure, Biosynthesis, Transport of Steroid Hormones in Blood and Metabolic Inactivation of Steroid Hormones, Control of Synthesis and Release of Steroid Hormones, Hormones that Directly Stimulate Synthesis and Release of Steroid Hormone with Reference to the Second Messengers and the Signal Pathway (Cortisol, Aldosterone, Testosterone, 17B - Estradiol, Progesterone and Calcitriol).

UNIT-IV HORMONE RECEPTORS AND REGULATION

10 Hour

Signal Transduction - Hormone - Receptor Interactions, Biochemistry of Receptor Activation. Signal Transduction through Cytoplasmic and Nuclear Receptors. Endocrine, Paracrine and Autocrine Signaling. Sensory Transduction: Nerve Cells, Synapses, Ion Channels,

Neurotransmitters, Neurotransmitter Receptors and Impulse Transmission. Receptors and Signaling Pathways - Cell Surface Receptors: G-Protein Coupled Receptors, Receptor Kinases.

UNIT-V SECOND MESSENGERS

12 Hour

Second Messengers - Cyclic Nucleotides, Role of cGMP in Visual Transduction, cAMP and CREB. Involvement of Protein - Protein Interaction in Signaling Pathways. Metabolic Pathways for the Formation of Inositol Triphosphate from Phosphatidyl Inositol Diphosphate, Formation of DAG, Ca²⁺ Channel Activation, Phosphoregulation of Inositol, Activation and Translocation of Protein Kinase C in Cell Membrane. The Ras-Raf MAP Kinase Cascade. Crosstalk in Signaling Pathways.

Text Books

- Norman Levin. (2019). *Manual of Endocrinology and Metabolism*. Wolters Kluwer Publishers. (5th Ed.).
- Williams S.Melmed. et al. (2015). *Text Book of Endocrinology*. Aunders Publication. (13th Ed.).

Reference Books

- Susan.Porterfield, (2007). *Endocrine Physiology*. Mosby Publishers. (3rd Ed).
- Bernhard K, Winfried B. (2016). *Hormones and the Endocrine System: A Text Book of Endocrinology*. Springer Nature Publishers.
- Lary Jameson J. (2017). *Harrisons Endocrinology*. McGraw Hill Publishers. (20th Ed.).

Journals

- Indian Journal of Endocrinology and Metabolism
- Journal of Cell Signaling
- Journal of signal transduction
- International Journal of Endocrinology and Metabolism

E - Resources

- <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2>
- <http://www.springer.com/medicine/internal/journal/12020>
- <https://www.kobo.com/us/en/ebook/molecular-endocrinology-1>
- <https://www.ebooks.com/en-ao/297039/molecular-endocrinology/franklyn-f-bolander/>
- <https://shodhganga.inflibnet.ac.in>
- <https://epgp.inflibnet.ac.in/>

ANALYTICAL BIOCHEMISTRY PRACTICAL
PBCR203

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

Credit : 4
Hour/Week : 6
Total Hour : 78

Objectives:

To enable the students

- Train in Various Chromatographic and Electrophoresis Techniques for Biochemical Analysis.
- Train in Using Different Instruments and Preparation of Solutions.
- Attain Technical Competence in the Specific Discipline.

Learning Outcomes:

On Completion of the course, the students will be able to

- Gain the Basic Knowledge on the Theory, Operation and Function of Analytical Instruments
- Experienced in Handling of Various Instrumentations those are used in the Analytical Laboratories.
- Separate Biomolecules by Appropriate Chromatographic and Electrophoretic Methods.

Experiments

1. Preparation of Buffers and Measurements of pH.
2. Titrable Acidity of Aminoacids.
3. Paper Chromatography of Sugars and Aminoacids.
4. Thin Layer Chromatography of Aminoacids and Lipids.
5. Separation of Plant Pigments by Column Chromatography.
6. Paper Electrophoresis.
7. SDS PAGE/Agarose Gel Electrophoresis.
8. Preparation of Cell Free Homogenate, Isolation of Mitochondria & Nuclei from Liver and Chloroplast from Leaves.
9. Separation of Biological Compounds Using FTIR.

Text Books

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

Reference Books

- Jayaraman, J. (2011). *Laboratory Manual in Biochemistry*. New Age International Limited Publication. (2nd Ed).
- Sadasivam, S. Manickam, A. (2013). *Biochemical Methods*. (3rd Ed.). New Age International Publication.
- Wilson, K. Goulding Hodder, K.H. Stoughton. (2012). *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
- <https://shodhganga.inflibnet.ac.in>
- <https://epgp.inflibnet.ac.in/>

MUSHROOM CULTIVATION (SERVICE LEARNING)

PBCX201

Semester : II

Credit: 1

Category : Core IX/DSC IX

Total Hour: 40

Class & Major : I M.Sc. Biochemistry

Target Group : Villagers in the age group of 20-50 years

Objectives:

To enable the students

- Create Awareness on the Nutritive Value of Mushroom.
- Enable Mushroom Cultivation in a Small Scale Range.

Learning Outcomes:

On Completion of the course, the students will be able to

- Understand the Importance of Embarking on Self-Employment and has developed the Confidence and Personal Skills for the same.
- Identify Business Opportunities in Chosen Sector / Sub-Sector and Plan and Market and Sell Products / Services
- Start a Small Business Enterprise by Liaising with Different Stake Holders.

UNIT – I INTRODUCTION

8 Hour

Definition, Edible & Poisonous Mushroom, Nutritive and Medicinal Value of Mushroom. Composting - Importance in Waste Recycling.

UNIT - II GROWTH CHARACTERISTICS OF MUSHROOM

8 Hour

Growth & Substrate for Volvariella Species, Pleurotus Species, Agaricus Species, Calcybe Species & Lentinus Species of Mushroom.

UNIT – III CULTIVATION OF MUSHROOM

8 Hour

Conditions for Tropical & Temperate Countries, Isolation, Spawn Production, Growth Media, Spawn Running and Harvesting of Mushroom.

UNIT - IV DISEASE & POST HARVEST TECHNOLOGY

8 Hour

Insect Pest, Nematodes, Mites, Viruses, Fungal Competitors and other Important Diseases. Post Harvest Technology, Freezing, Dry Freezing, Drying, Canning Etc. Entrepreneurship

UNIT - V FEED BACK & RESULT FROM SOCIETY

8 Hour

Evaluation of Results, Mushroom Yield, Income through Mushroom Cultivation, Feedback - Oral and Written from Villagers. Activity: Cultivation of Mushroom for Commercial Purposes.

Text Books

- Nita Bahl. (2009). *Hand Book of Mushroom*. (4th Ed.). Vijay Primplani for Oxford Publication Co. Pvt Ltd, New Delhi,
- Nair M.C & Gokulapalan. C and Lulu Das. (2008). *Topics on Mushroom Cultivation*. (3rd Ed.). Scientific Publishers, Jodhapur, India.

Reference Books

- Chang.T.S. & Hayes. W.A. (2007). *The Biology and Cultivation of Edible Mushrooms*. (2nd Ed.) Academic Press, New York.
- Cotter, Tradd. (2014). *Organic Mushroom Farming and Mycoremediation: Simple To Advanced and Experimental Techniques for Indoor and Outdoor Cultivation*. Chelsea Green Publishing.

E - Resources

- https://onlinecourses.swayam2.ac.in/nos20_ge07/preview
- <https://nios.ac.in/departmentsunits/vocational-education/stand-alone-courses/oyster-mushroom-production-technology.aspx>
- <https://www.classcentral.com/course/swayam-vocational-mushroom-production-23137>

PHARMACEUTICAL BIOCHEMISTRY

PBCE101/201

Semester : II

Category : Non-Major Elective I

Class & Major : I PG

Credit :4

Hour/Week : 5

Total Hour : 65

Objectives:

To enable the students

- Understand the Drug Metabolic Pathways, Adverse Effect and Therapeutic Value of Drugs.
- Evaluate their Clinical Importance and Effects by Bioassays.

Learning Outcomes:

On Completion of the course, the students will be able to

- Knowledge about the Sources of Impurities and Methods to Determine the Impurities in Inorganic Drugs and Pharmaceuticals.
- Understand the Medicinal and Pharmaceutical Importance of Inorganic Compounds.
- To have been Introduced to a Variety of Inorganic Drug Classes.

UNIT - I BIOPHARMACEUTICALS

11 Hour

Definition, Various Routes of Administration with Advantages/Disadvantages, Bioavailability Concepts in Drug Absorption and Distribution, Theories of Drug Dissolution, Drug Partition Hypothesis, Permeability and Distribution of Drugs, Perfusion Rate and Volume of Distribution, Protein Binding of Drugs, Kinetics of Drug Binding, Various Factors that affect Drug Absorption and Distribution, Drug Interactions in the Level of Drug Absorption and Distribution. Biopharmaceuticals and Pharmacokinetics and their Importance in Formulation. Biopharmaceuticals - Production and Clinical Usage of Biopharmaceuticals.

UNIT - II BIOMEDICAL IMPORTANCE OF DRUGS

12 Hour

Biochemical Role of Hormones, Vitamins, Enzymes, Nucleic Acids, Bioenergetics. General Principles of Immunology. Immunological Techniques. Adverse Drug Interaction. Preparation and Storage and Uses of Official Radiopharmaceuticals.

UNIT - III PHARMACODYNAMICS OF DRUGS

15 Hour

Sedatives, Analgesics, NSAIDS, Neuroleptics, Antidepressants, Anxiolytics, Anticonvulsants, Antihistaminics, Local Anaesthetics, Cardio Vascular Drugs - Antianginal Agents, Vasodilators, Adrenergic & Cholinergic Drugs, Cardiotonic Agents, Diuretics, Antihypersensitive Drugs, Hypoglycemic Agents, Antilipidemic Agents, Coagulants, Anticoagulants, Antiplatelet Agents. Chemotherapeutic Agents - Antibiotics, Antibacterials, Sulphadiazine. Antiprotozoal Drugs, Antiviral, Antitubercular, Antimalarial, Anticancer, Antiamoebic Drugs. Diagnostic Agents.

UNIT - IV TOXICOLOGY

15 Hour

Toxicology, Drug Interactions and Pharmacology of Drugs Acting on Central Nervous System, Cardiovascular System, Autonomic Nervous System, Gastro Intestinal System and Respiratory System. Hormones, Chemotherapeutic Agents Including Anticancer Drugs. Bioassays.

UNIT - V CHEMOTHERAPY OF MICROBIAL DISEASES

12 Hour

Chemotherapy of Microbial Diseases: Urinary Antiseptics, Sulphonamides, Penicillin, Streptomycin, Tetracyclines and other Antibiotics. Anti - Tubercular Agents, Antifungal Agents, Antiviral Drugs, Anti - Leprotic Drugs. Chemotherapy of Protozoal Diseases, Anthelmintic Drugs. Chemotherapy of Cancer.

Text Books

- Alfred Burger. (2009). *A Guide to Chemical Basis of Drugs Design*. John Wiley & Sons.
- Goodman and Gilman's. (2006). *The Pharmacological Basis of Therapeutics*. (8th Ed.), Pergamon Press.

Reference Books

- John Smith and Haywel Williams. (2008). *Introduction to the Principles of Drug Design*. Wright PSG.
- Manfred E Wolff. (2012) *Burgers Medicinal Chemistry – The Basis of Medicinal Chemistry*. Part – I. John Wiley & Sons.

E - Resources

- <https://www.schandpublishing.com/books/highereducation/medical/pharmaceutical-biochemistry/9788121942485/#.YM-UE2gzbIU>
- https://onlinecourses.nptel.ac.in/noc20_cy16/preview
- https://onlinecourses.swayam2.ac.in/cec20_bt19/preview

REPRODUCTIVE BIOLOGY AND DISORDERS

PBCE102/202

Semester : II
Category : NME
Class & Major : I PG

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

Objectives:

To enable the students

- Study on Biological Aspects of Human Reproduction
- Discuss on Birth Control, Infertility and Sexually Transmitted Diseases

Learning Outcomes:

On Completion of the course, the students will be able to

- Describe the Structure of the Organs of the Reproductive System in Males and Females and Indicate how this Relates to Function.
- Explain the Processes of Spermatogenesis, Oogenesis and Folliculogenesis and be Able to Compare and Contrast these Processes.
- Describe the Hormonal, Tissue and Behavioural Changes that Occur across the Menstrual Cycle and explain how these are regulated.

UNIT - I INTRODUCTION OF REPRODUCTIVE SYSTEM

10 Hour

Reproduction - Definition, Structure and Function of Male and Female Reproductive System. Endocrine Control of Reproductive Function.

UNIT – II REPRODUCTIVE CYCLE

15 Hour

Menstrual Cycle - Ovarian Cycle (Follicular Phase, Ovulation, Luteal Phase), Uterine Cycle (Menstruation, Proliferative Phase and Secretory Phase), Cycle Abnormalities and Disorders - Dysmenorrhea, Hypomenorrhea, Menorrhagia, Polymenorrhea, Oligomenorrhea, Metrorrhagia, Infertility, Abortion, Polycystic Ovarian Syndrome.

UNIT – III GAMETES AND FERTILIZATION

10 Hour

Ultra Structure of Sperm and Egg, Gametogenesis, Oogenesis. Fertilization - External, Internal, Artificial and In - Vitro. Embryo Transfer, Test for Sperm Viability and Function.

UNIT – IV FOETAL DEVELOPMENT

15 Hour

Pregnancy and Fetal Development - Prenatal Development of Foetus, Stages of Fetal Growth and Pregnancy Test, Contraception, Risk Factors of Miscarriage, Pregnancy Loss and Still Birth.

UNIT – V SEXUALLY TRANSMITTED DISEASES

15 Hour

HIV/AIDS - Definition, Causes and Symptoms, Diagnosis, Mode of Transmission, Prevention and Treatment. Syphilis - Types, Causes and Symptoms, Diagnosis, Congenital Syphilis, Prevention and Treatment.

Text books

- Sastry K.V. (2017). *Endocrinology and Reproductive Biology*. Rastogi Publications.
- Sachdeva R.K. (2012). *A Guide to Obstetrics and Gynaecology*. Jaypee Brother Publications.

Reference books

- Richard. E. Jones., Kristin H. Lopez. (2016). *Human Reproductive Biology*. (3rd Ed.).
- Taylor, J., Green N.P.O., Stout G.W. (2010). *Biological Sciences*. (3rd Ed.).

e - Resources

- <https://bookboon.com/en/introduction-to-clinical-biochemistry-ebook>.
- <https://www.kobo.com/us/en/ebook/clinical-biochemistry-e-book-1>.
- <https://www.elsevier.com/books/human-reproductive-biology/jones/978-0-12-382184-3>

MODERN LIFESTYLE ASSOCIATED DISEASES

PBCE103/203

Semester : II

Category : NME/SEC

Class & Major : I PG

Credit : 4

Hour/Week : 5

Total Hour : 65

Objectives:

To enable the students

- Obtain Knowledge and Understanding of Health, Nutrition and other Lifestyle and Associated Diseases.
- Choose Healthy Life Style to Cope with Modern Life.

UNIT I - DIABETES

12 Hour

Definition, Types, Causes, Prevalence, Diagnosis, Complications, Treatment and Preventive Measures. The Diabetic Lifestyle, Gestational Diabetes, Diabetes and Diet Coping Skills for Diabetics.

UNIT II - HYPERTENSION

13 Hour

Definition, Signs and Symptoms, Causes, Types (Primary and Secondary). Blood Pressure (Effectively and Benefit of BP Reduction). Retinopathy, Diagnosis, Treatment and Prevention.

UNIT - III OBESITY AND CORONARY HEART DISEASE

15 Hour

Definition, Causes of Obesity, BMI, Health Consequences, Strategies to Reduce Obesity, Strategies to Promote Health, Childhood Obesity and Diet, Prevention.

Coronary Heart Disease: Types, Symptoms, Diagnosis, Prevention and Management and Treatment. Medication Requirement, CHD and Diet, Stroke Prevention Measures, Pharmacological Management of CHD.

UNIT IV - OSTEOPOROSIS

13 Hour

Definition, Types, Symptoms, Treatment, Causes and Prevention. Diagnosis, Diet and Osteoporosis and Exercise. Drugs in Osteoporosis, Bone Disease, Dietary Requirement for Osteoporosis.

UNIT V - ANAEMIA

12 Hour

Definition, Causes, Types, Symptoms and Treatment of Anaemia. Iron Deficiency, Diet and Anaemia. Anaemia and Pregnancy - Prevalence and Consequences of Anaemia in Pregnancy. Anaemia Treatment.

Text Books

- Kumar, M. Kumar. R. (2014). *Guide to Prevention of Lifestyle Diseases*. Deep and Deep Publications.
- Tudith Stern. Alexandra Kuzaks. (2011). *Obesity: A Reference Handbook*. ABC-CLIO.

Reference Books

- Mindori Hiramatsu. Toshikazu Toshikawa. Lister Packer. (2012). *Molecular Interventions in Lifestyle Related Diseases*. CRC Press.
- David, L.Katz. (2014). *Diseases Proof*. Plume.

E - Resources

- <https://www.elsevier.com/books/clinical-biochemistry/murphy/978-0-7020-7298-7>
- <https://bookboon.com/en/introduction-to-clinical-biochemistry-ebook>
- <https://www.kobo.com/us/en/ebook/clinical-biochemistry-e-book-1>

III & IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
I	Core I	PBCM101	Bimolecular Chemistry	Assignment	Seminar
	Core II	PBCM102	Cell Biology	Poster Preparation	Seminar
	Core III	PBCM203/105	Microbiology	Case Study	Culture preparation
	Core IV	PBCM204/106	Molecular Biology	Poster Preparation	Seminar
II	Core V	PBCM201	Metabolism and Regulation	Poster Preparation	Seminar
	Core VI	PBCM202	Human physiology	Model preparation	Seminar
	Core VII	PBCM103/205	Analytical biochemistry	Model preparation	Seminar
	Core VIII	PBCM104/206	Endocrinology	Model preparation	Seminar
	NME	PBCE201	Pharmaceutical Biochemistry	Assignment	Seminar
		PBCE202	Reproductive Biology and Disorder	Seminar	Seminar
		PBCE203	Modern life Style Associated Disease	Case Study	Seminar