

DEPARTMENT OF BIOCHEMISTRY

PREAMBLE

- UG** : Course profile and list of courses offered to other departments (With effect from 2018 –2021 batch onwards)
- PG** : Course profile and list of courses offered to other departments (With effect from 2018 –2020 batch onwards) and
- M.Phil** : Course profile and syllabi of courses offered in the first semester (With effect from 2018 – 2019 batch onwards) are presented in this booklet.

COURSE PROFILE B.Sc. (Biochemistry)

- PSO1:** Ability to analyze the various biological components through analytical tools in living cells.
- PSO2:** Development of practical laboratory skills and strong speculative foundation in the cross over discipline of Chemistry, Microbiology & Bioinformatics.
- PSO3:** Understanding of the applications of Biochemistry in various fields such as Clinical Biochemistry, Genetic Engineering, Molecular biology & Biotechnology.
- PSO4:** Acquire practical skills that will prepare for a future career in the interdisciplinary subjects.

Sem ester	Part	Category	Course code	Course Title	Hours per week	Credit	
						Min	Max
I	I	Language	UTAL105/ UTAL106/ UHIL101/ UFRL101	Basic Tamil I/ Advanced Tamil I/ Hindi I / French I	4	2	3
	II	English I	UENL107/ UENL108	General English I/ Advanced English I	5	3	4
	III	Core I	UBCM106	Fundamentals of Biochemistry	2	1	1
		Core II	UBCM105/ UBCM201	Cell Biology	6	6	6
		Core practical I	UBCR101	Cell Biology Practical	3	3	3
		Allied I	UCHA102	Chemistry	5	4	4
		Allied I practical	UCHR102	Chemistry Practical	3	2	2
	IV	Value education			2	1	1
TOTAL					30	22	24
II	I	Language	UTAL205/ UTAL206/ UHIL201/ UFRL201	Basic Tamil II/ Advanced Tamil II/ Hindi II/ French II	4	2	3
	II	English II	UENL207/ UENL208	General English II/ Advanced English II	5	3	4
	III	Core III	UBCM202	Biomolecules	5	5	5
		Core practical II	UBCR201	Qualitative analysis of Biomolecules	3	3	3
		Allied II	UMBA201	Microbiology	4	4	4
		Allied II practical	UMBR201	Microbiology Practical	3	2	2
	IV	Non Major elective			4	2	2
		Soft skill			2	1	1
	V	Extension activity/ Physical Education/NCC			-	1	2
TOTAL					30	23	26
III	I	Language	UTAL305/ UTAL306/ UHIL301/ UFRL301	Basic Tamil III/ Advanced Tamil III/ Hindi III/ French III	4	2	3
	II	English III	UENL307/	Basic English III/ Advanced	5	3	4

			UENL308	English III			
	III	Core IV	UBCM304	Biochemical Techniques	6	6	6
		Core practical III	UBCR301	Biochemical Techniques practical I	5	5	5
		Allied III	UMAA305	Biostatistics	5	4	4
	IV	Online courses		NPTEL/Spoken Tutorial	3	1	2
		Value Education			2	1	1
TOTAL					30	22	25
IV	I	Language	UTAL405/ UTAL406/ UHIL401/ UFRL401	Basic Tamil IV/ Advanced Tamil IV/ Hindi IV/ French IV	4	2	3
	II	English IV	UENL407/ UENL408	Basic English IV/ Advanced English IV	5	3	4
	III	Core V	UBCM403	Immunology	6	6	6
		Core VI	UIDM401	Pharmaceutical chemistry	6	5	5
		Core practical IV	UBCR401	Biochemical Techniques Practical II	5	5	5
		Core X	UBCP501	Project	2	-	-
	IV	Soft skill			2	1	1
V	Extension activity/ Physical Education/NCC			-	-	2	
TOTAL					30	22	26
V	III	Core VII	UBCM501	Enzymes & Intermediary metabolism	6	6	6
		Core VIII	UBCM502	Human Physiology	6	6	6
		Core IX	UBCM503	Basics of Bioinformatics	6	6	6
		Core practical V	UBCR501	Enzymology practical	6	3	3
		Core X	UBCP501	Project	4	4	4
		Value education			2	1	1
TOTAL					30	26	26
VI	III	Core XI	UBCM601	Introduction to Biotechnology	5	4	4
		Core XII	UBCM602	Clinical Biochemistry	5	5	5
		Core XIII	UBCM603	Molecular Biology	5	5	5
		Core XIV	UBCM604	Comprehensive Viva voce	-	1	1
		Core practical VI	UBCR601	Clinical Biochemistry practical	5	3	3
		Core practical VII	UBCR602	Hematology & Urine analysis	3	2	2
		Major Elective	UBCO604	Stem cell Biology	5	4	4
			UBCO605	Molecular Endocrinology			
			UBCO606	Pathobiology of Human Diseases and Disorders			
			UIDM601	Nanotechnology in medicine			
	IV	Soft skill			2	1	1
V	Extension activity/ Physical Education/NCC			-	-	2	
TOTAL					30	25	27
GRAND TOTAL					180	140	154

**COURSES OFFERED TO OTHER DEPARTMENTS
NON MAJOR ELECTIVES**

Semester	Part	Category	Course code	Course Title	Contact Hour/Week	Credit	
						Min	Max
II	IV	Non Major Elective	UBCE202	Biomedical Techniques	4	2	2
			UBCE401/UBCE203	Nutrition & Health			
			UBCE502/UBCE204	Women's Health, Nutrition & Disorders			
			UBCE304/UBCE208	Mushroom Cultivation			
			UBCE209	Clinical Diagnostics			
			UBCE210	Reproductive Biology			

EXTRA CREDIT EARNING PROVISION (Only for Interested Students)

Semester	Category	Course Code	Course Title	Credit
II	Internship	UBCI201	Summer Internship	1
IV	Internship	UBCI401	Summer Internship	1

UBCM106 FUNDAMENTALS OF BIOCHEMISTRY

Semester : I **Credit : 1**
Category : Core I **Hours/week: 2**
Class & Major: I B.Sc. Biochemistry **Total Hours: 26**

Objectives

To enable the students

- Understand the importance and scope of biochemistry, biosafety measures in laboratory.
- Gain adequate knowledge about structure, properties and functions of biomolecules.
- Evaluate the bioenergetics using biochemical calculations.

UNIT - I INTRODUCTION TO BIOCHEMISTRY 5 Hrs

History and Scope of Biochemistry, Importance of Biochemistry and its applications in various fields. Cells – types, Subcellular organelles; Tissues – types.

UNIT - II BIOMOLECULAR CHEMISTRY 5 Hrs

Structure and Properties of water - Definition & Importance of Carbohydrates, Amino acids - Proteins - Lipids - Nucleic Acids - Vitamins and Hormones.

UNIT - III CELLULAR CHEMISTRY 5 Hrs

Structure of matter - atomic structure, molecular structure; Bonding – Ionic, Covalent, Hydrogen, Coordinate and Vander walls interaction and chemical reactions; Inorganic compounds - Salts, Ions, Acids and Bases; pH, biological buffers and their significance.

UNIT - IV BIOENERGETICS AND BIOCHEMICAL CALCULATIONS 6 Hrs

Laws of thermodynamics- Zero, First and Second Law, oxidation and reduction reaction, redox potential and energy transfer.

Units of measurements of solutes in solution - Normality, Molality, Molarity, Osmolarity, Ionic strength; Percentage, mole fraction.

UNIT - V QUALITY CONTROL PRACTICES AND BIOSAFETY 5 Hrs

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, laboratory associated infections and other hazards, assessment of biological hazards and levels of biosafety, prudent biosafety practices in the laboratory/ institution.

Text Books

- Gupta P.K, "A Text-book of Cell and Molecular Biology", Rastogi Publications, Meerut, India, 2005.
- Campbell M.K. "Biochemistry, Saunders College Publishing", Philadelphia, (Jd Edition) 2006.

Reference Books

- Ambika Shanmugam, "Fundamentals of Biochemistry", 4th edition, Published by Author, 2006.
- Marshal V. C, "Major Chemical Hazards", 3rd edition, Ellis Horwood Ltd., Chichester, United Kingdom, 2005.
- Raghavan K. V & Khan A.A, "Methodologies in Hazard Identification and Risk Assessment", 3rd edition, Manual by CLRI, 2002.
- Sadasivam .S and Manickam.A, "Biochemical Methods", 3rd Edition, New age International (P) Ltd, 2008.

UBCM105/UBCM201 CELL BIOLOGY

Semester	:I	Credit	: 5
Category	:Core I	Hours/week	: 6
Class & Major	:I B.Sc. Biochemistry	Total Hours	:78

Objectives

To enable the students

- Understand the dynamic nature of the Cell.
- Specify the structural features and differences between prokaryotes and eukaryotic cells.

UNIT - I ORGIN & CLASSIFICATION OF CELLS **15 Hrs**

An overview of cells- origin and evolution of cells. Cell theory, Classification of cells- prokaryotic and eukaryotic cells, comparison of prokaryotic and eukaryotic cells. Molecular composition of cells- water, carbohydrates, lipids, nucleic acids and proteins.

UNIT - II CELL MEMBRANE **15 Hrs**

Cell membrane- Fluid mosaic model of membrane structure. Membrane proteins and their properties Membrane carbohydrates and their role. Transport across membranes- Diffusion, active and passive transport.

UNIT-III ENDOPLASMIC RETICULUM, GOLGI APPARATUS & LYSOMES **15 Hrs**

Endoplasmic reticulum- types, structure and functions. Golgi apparatus- structure and function. Lysosomes- structure and functions, morphology and functions of peroxisomes and glyoxysomes.

UNIT - IV MITOCHONDRIA CYTOSKELETON **15 Hrs**

Mitochondria- structure and functions. Cytoskeleton- types of filaments and their functions Microtubules- chemistry and functions. Cilia and flagella.

UNIT - V NUCLEUS CHROMOSOMES **18 Hrs**

Nucleus- structure and functions. Chromosomes- chromatin structure. The cell cycle- Phases of cell cycle. Meiotic and mitotic cell division. Apoptosis and Necrosis.

Text Books

- Lohar, S.Prakash., "*Cell and Molecular Biology*", MJP publishers, 2007.
- Verma.P.S and Agarwal., "*Cell biology, Genetics, Molecular Biology, Evolution and Ecology*", S.Chand Publication, 2008.

Reference Books

- Cooper.M., "*The cell-A molecular approach*", ASM Press, 1995.
- Harvey Lodish, Baltimore and Arnold Berk, et.al ., , "*Third Edition, Molecular and cell biology*", 1995.
- Rastogi.S.C., "*Biochemistry*".Second Edition, Delhi,Tata Mc Graw Hill, 2007.

UBCR101 CELL BIOLOGY PRACTICAL

Semester	:I	Credit	: 3
Category	:Core Practical	Hours/Week:	3
Class & Major:	I B.Sc. Biochemistry	Total Hours:	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.

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. 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
6. Barr Body staining from buccal epithelial cells
7. Isolation of chloroplast from spinach leaves.

Text Book

- Dr.S.Rajan & Mrs. R.Selvi Christy, "*Experimental procedure in Life Science*", First Edition, Anjanaa Book House, Chennai, 2010.

Reference books

- Chris Hawes & Beatrice Satiat Jeunermaitre(Editors) *Plant Cell Biology: "A practical Approach"*, 2nd Edition, Oxford University Press, USA 2001.
- John Dawey & Mike Lord, "*Essential Cell Biology: A practical approach Vol.2*", 2nd Edition, Oxford University Press, USA 2003.

UBCM202 BIOMOLECULES

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

Credit : 5
Hours/week: 5
Total Hours:65

Objectives

To enable the students

- Understand the principles of the structure of molecules associated with life processes. and their roles in the functioning of living cells.
- Elucidate the roles of biomolecules in the functioning of living cells.

UNIT- I CARBOHYDRATES

12 Hrs

Classification of carbohydrates, physical properties- Stereo & optical isomerism, anomeric form & Mutarotation. Occurrence and biological importance of mono, di & polysaccharides - Cellulose, starch, glycogen, pectin. Introduction to mucopolysaccharides (proteoglycans, glycosaminoglycans).

UNIT- II PROTEINS AND AMINOACIDS

15 Hrs

Classification based on solubility, shape, composition and function. Stereo & optical isomerism, Zwitterions, physical & chemical properties, titration of amino acids, Essential amino acids. Protein Introduction, classification based on solubility, shape, composition and function. Functional aspects of protein. Structure of protein- Primary, secondary, tertiary & quaternary structure of protein. Biologically important peptides. Structure and function (Insulin, glutathione, vasopressin).

UNIT - III LIPIDS

15 Hrs

Definition, classification,& function of fatty acids, phospholipids, glycolipids, sphingomyelin, Plasmalogen & sterol. Essential fatty acid and non- essential fatty acid.

UNIT - I NUCLEIC ACIDS

13 Hrs

Nature of nucleic acids, structure of purines, pyrimidines, nucleosides & nucleotides. Structure of DNA - Watson and Crick models. Types of DNA. Structure of RNA and its types. Properties – Denaturation, Renaturation, T_m, Hypo & Hyperchromicity.

UNIT - V VITAMINS

10 Hrs

Vitamins: Classification of vitamins – water soluble vitamins and non water soluble vitamins. General biological function.

Text Books

- Eric E. Conn, Paul K. Stumpf, George Bruening and Roy H.Dol., "*Textbook of Biochemistry*", John Wiley and Sons, 2005.
- Jain.J.L, Sunjay Jain and Nitin Jain., "*Fundamentals of Biochemistry*", S.Chand Publication, 2008.

Reference Books

- Ambika Shanmugam., *Fundamentals of Biochemistry*, Seventh Edition, published by Author, 2006.
- David L.Nelson, Michael M.Cox ., *Lehninger's Principles of Biochemistry* , Fourth edition, Newyork, W.H.Freeman and Company, 2005.
- Satyanarayan.V, Chakrapani.V ., *Essentials Of Biochemistry*, second edition, Kolkota, Books & Allied, 2007.

UBCR201 QUALITATIVE ANALYSIS OF BIOMOLECULES PRACTICAL

Semester	:II	Credit	: 3
Category	:Core practical II	Hours/week:	3
Class & Major:	I B.Sc. Biochemistry	Total Hours:	39

Objectives

To enable the students

- To acquire the ability to solve problems related to biochemical techniques.
- To analyze the biological fluids for the diagnosis of the diseases.

QUALITATIVE ANALYSIS

1. ANALYSIS OF CARBOHYDRATES 12 Hrs

Colour reactions of sugars and osazone test.

- a) Monosaccharides: Pentoses- Ribose and Arabinose Hexoses- Glucose, Fructose, Galactose and Mannose.
- b) Disaccharides: Sucrose, Maltose, Lactose.
- c) Polysaccharides: Starch, Dextrin and Glycogen.

2. ANALYSIS OF AMINOACIDS 9 Hrs

Colour reactions of aminoacids such as Tyrosine, Tryptophan, Arginine, Histidine and Cysteine.

3. ANALYSIS OF PROTEINS 9 Hrs

Egg albumin-Solubility, Biuret, Millons, Xanthoproteic, Denaturation by heat, pH change and Precipitation by acidic reagents.

4. ANALYSIS OF LIPIDS 9 Hrs

Solubility, Saponification tests for unsaturation and Liebermann Burchard test for cholesterol.

Text Book

- Jayaraman.J., "*Laboratory manual in Biochemistry*", New Age International Limited Publication.

Reference Books

- Pattabiraman.,” *Laboratory Manual in biochemistry*”, CBS Publication.
- Singh.S.P., “*Practical Manual of Biochemistry*”, Sixth Edition, CBS Publication, 2006.
- Varley., “*Practical biochemistry*”, CBS Publication.

UMBA201 MICROBIOLOGY

Semester	:II	Credit	: 4
Category	:Allied II	Hours/week:	4
Class & Major:	I B.Sc. Biochemistry	Total Hours:	52

Objectives

To enable the students

- Understand the living microbes present in the environment.
- Specify the impact of endemic bacterial and viral infections on health.

UNIT - I INTRODUCTION 10 Hrs

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 10 Hrs

Classification of microbes- Numerical taxonomy-Molecular taxonomy- methods of microbial identification. Gram positive and gram negative bacteria.

UNIT - III ENVIRONMENTAL MICROBIOLOGY 10 Hrs

Microbiology of soil – soil microflora - role of soil microbes in biogeochemical cycles(C,N,S) – Role of microbes in waste water treatment-water purification and sewage treatment. Marine and fresh water microbiology.

UNIT - IV MEDICAL MICROBIOLOGY 12 Hrs

Disease reservoirs- Epidemiological terminologies, Infectious disease transmissions. Respiratory infection caused by bacteria and viruses; Tuberculosis, AIDS, water borne diseases. Antimicrobial agents, antibiotics, Penicillins and cephalosporins, broad spectrum antibiotics.

UNIT - V INDUSTRIAL MICROBIOLOGY 10 Hrs

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. Fermentation.

Texts Books

- Pelczar, M.J., Chan, E.C.S., King, N.R. “*Microbiology- Concepts and Applications*”. 3rd edition, Tata McGraw – Hill, New Delhi, 2001.
- Ananthanarayan, R. and Paniker, C.K.J.. “*A text book of Microbiology*”, 6th edition, Orient Longman Ltd., Hyderabad, 2000.

Reference Books

- Kathleen Park Talaro and Talaro, A. “*Foundation in Microbiology*”, 3rd edition, McGraw-Hill, New York.
- Cappuccino, J.G and Sharman, N.. “*Microbiology: A Laboratory manual*”, 4th edition. Addition Wesley Longman Inc., New York.
- Daniel Lim. “*Microbiology*”, 2nd edition. McGraw-Hill, New York.

UMBR201 MICROBIOLOGY PRACTICAL

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

Credit : 2
Hours/week: 3
Total Hours:39

Objectives

To enable the students

- Learn & practice in a microbiology laboratory.
- Obtain culture , identify and explain microorganisms in environmental cultures.

Experiments

1. Preparation of microbiological media.
2. Control of microbial contamination by sterilization techniques.
3. Identification of microbes through staining by simple & differential methods.
4. Microbial pure culture by isolation techniques.
5. Identification and enumeration of microorganisms from soil.
6. Determination of growth pattern by growth curve methods.

Reference books

- Kathleen Park Talaro & Talaro A., “*Foundation in Microbiology*”, 2nd edition, McGraw-Hill, New York, 2005.
- Cappuccino J.G & Sharman N., “*Microbiology: A Laboratory Manua*”l, 3rd edition, Addition Wesley Longman Inc., New York, 2005.
- Daniel Lim, “*Microbiology*”, 2nd edition, McGraw-Hill, New York, 2005.

UBCE202 BIOMEDICAL TECHNIQUES

Semester :II
Category :Non major elective
Class & Major:II UG

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

Objectives

To enable the students

- Study the different techniques employed in Biochemistry and its importance.
- Experiment the techniques in sample analysis.

UNIT -I BASICS IN LABORATORY TECHNIQUES **12 Hrs**

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 Hrs**

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 Hrs**

Blood grouping and Rh factors. Blood collection, screening test-HIV, HBs Ag. Blood grouping, Cross matching, Incompatible blood transfusion.

UNIT – IV HISTOPATHOLOGY **10 Hrs**

Brief outline of Histopathology, Tissue cutting, Fixation Embedding Tissue slicing by microtome, slide mounting and staining techniques.

UNIT – V BIOCHEMICAL ANALYSIS **10 Hrs**

Techniques of measuring: blood glucose, urea, uric acid, TG, AST, ALT, ALP, ACP, Cholesterol and Total protein.

Text Book

- Ambika Shanmugam., “*Fundamentals of Biochemistry for medical students*”, Published by the author, 2006.

Reference Books

- Ambika Shanmugam., “*Fundamentals of Biochemistry for medical students*”, Published by the author, 2006.
- Mukherjee.L., “*Medical laboratory technology*”, 15th edition, Tata McGraw-Hill Publishing Company Limited, 2004.
- Talib.H., “*Medical laboratory technology*”, McGraw-Hill Publishing Company Limited

UBCE401/UBCE203 NUTRITION AND HEALTH

Semester	:II	Credit	: 2
Category	:Non major elective	Hours/week:	4
Class & Major:	II UG	Total Hours:	52

Objectives

To enable the students

- Study the relationship between nutrition and its importance in the well being of humans.
- Integrate the biochemical applications and diet therapy.

UNIT – I INTRODUCTION **15 Hrs**

Introduction to nutrition – definition of nutrients, 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 **15 Hrs**

Digestion, absorption, transport and utilization of nutrients in the body – Carbohydrates, fats and oils, proteins, vitamins and minerals.

UNIT – III NORMAL DIET**10 Hrs**

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**10 Hrs**

Therapeutic diets for the following disorders – underweight – definition, etiology, treatment; obesity – definition, etiology, treatment; diseases of gastrointestinal tract; peptic ulcer and duodenal ulcer; dumping syndrome; acute and chronic diarrhea.

UNIT – FOOD PRESERVATION**10 Hrs**

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

- M. Swaminathan. “*Essentials of Food and Nutrition (Vol I & Vol II)*”, Bappco publication, 1994.
- Davidson, Passmore. “*Human Nutrition and Dietetics*”, Bappco publications, 1987.

Reference Books

- Swaminathan. “*Principle of Nutrition*”, Bappco publication, 1986.
- Robinson Cornell, “*Normal and Therapeutic Nutrition*”, Bappco publication, 6th edition, 1982.
- Michael J. Gibney, Ian A Macdonald, Helen M Roche. “*Nutrition & Metabolism*”, Blackwel publishing ltd., 2004.

UBCE502/UBCE204 WOMEN’S HEALTH, NUTRITION & DISORDERS**Semester :II****Credit : 2****Category :NME****Hours/week: 4****Class &Major:II UG****Total hours: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.

UNIT - I WOMEN’S HEALTH**10 Hrs**

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 Hrs**

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 Hrs**

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 Hrs**

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 Hrs**

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, “*Textbook of Medical Physiology*”, 8th Edition, Philadelphia, W.B. Saunders , 1991.
- K. Sembulingam and Prema Sembulingam, “*Essentials of medical physiology*”, Publication, New Delhi, Jaypee Brothers, 2006.

Reference Books

- W Ganong Lange, “*Review Of Medical Physiology*” , 21st Edition, 2003.
- Hillman RS, Kennet Ault, “*Hematology in Clinical Practice*”, 5th Edition, New York, McGraw-Hill, 2010.
- Paulman P (2011), Iron deficiency, In ET Bope, et al., eds., “*Conn's Current Therapy*”, 2011, Philadelphia, Saunders.

UBCE304 /UBCE208 MUSHROOM CULTIVATION

Semester	:III	Credit	: 2
Category	:Non Major Elective	Hours/Week:	4
Class & Major:	II UG	Total Hours:	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.

UNIT- I INTRODUCTION TO MUSHROOMS AND ITS LIFE CYCLE **9 Hrs**

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 Hrs**

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 Hrs**
Diseases and pest affecting mushroom. Post harvest technology: Refrigeration – Freeze drying, drying, canning, irradiation and entrepreneurship.
- UNIT- IV MUSHROOM CULTIVATION (PRACTICALS)** **20 Hrs**
Bed and shed preparation, sowing seedlings, pest control, fumigation and harvesting
- UNIT- V MUSHROOM RECIPIES (PRACTICALS)** **6 Hrs**
Mushroom soup, Mushroom pickle, Mushroom Pulav, Mushroom Chips

Text Books

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

Reference books

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

UBCE209 CLINICAL DIAGNOSTICS

Semester	:II	Credit	: 2
Category	: Non Major Elective	Hours/week	: 4
Class & Major:	II UG	Total Hours:	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.

UNIT – I DISORDERS OF CARBOHYDRATE METABOLISM **12 Hrs**
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 Hrs**
Abnormal lipid levels, role of HDL and LDL cholesterol, Atherosclerosis, Coronary heart disease, heart attack, Obesity and its complications.

UNIT – III HORMONAL IMBALANCE **10 Hrs**
Menstrual cycle, Irregular menstrual cycle, Hormonal imbalance, PCOD and its effects, causes, detection and its treatment.

UNIT – IV KIDNEY DISORDERS **10 Hrs**

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 Hrs**

Blood pressure and its regulation, normal and abnormal levels, Blood grouping (ABO & Rh), BMI and its role.

Text Books

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

Reference Books

- Swaminathan, "*Nutritional Biochemistry*", Bappco Publication, 1999.
- T. M. Devlin, "*Textbook of Biochemistry with Clinical Correlations*", John Wiley and Sons Publications, 2005.

UBCE210 REPRODUCTIVE BIOLOGY

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

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

UNIT – MALE REPRODUCTIVE SYSTEM **10 Hrs**

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 Hrs**

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 Hrs**

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 Hrs**

Pregnancy – Definition, types, stages and metabolic changes during Pregnancy. Fertilization – Infertility in male and female.

UNIT – V PARTURITION AND LACTATION**10 Hrs**

Gestation period, Parturition stages, placenta – Introduction, function. Lactation – Milk secretion, Milk ejection.

Text Books

- Sembulingam. K and Prema Sembulingam, "*Essentials of Medical Physiology*", Jaypee Brothers, New Delhi, 2nd Edition, 2009.
- Dr.H.D.Singh, "*Hand book of Human physiology*", 1st edition, 2007.
- C.C. Chatterjea (Vol I & Vol II), "*Human Physiology*", Medical Allied Agency, 11th edition, 2006.

Reference Books

- Guyton & Hall, "*Textbook of Medical Physiology*", Reed Elsevier India Private Limited, New Delhi, 10th edition , 2000.
- Murray et al, "*Harper's Physiological Biochemistry*", Tata McGraw Hill Publication. Co. Limited, New Delhi, 2000,
- RA Agarwal, Anil K.Srivastava, Kaushal Kumar, "*Animal Physiology and Biochemistry*", 2008.

III & IV EVALUATION COMPONENTS OF CIA

Semester	Category	Course Code	Course Title	Component III	Component IV
I	Core I	UBCM106	Fundamentals of Biochemistry	Open book test	Group Discussion
	Core II	UBCM105	Cell Biology	Album Preparation	Assignment
II	Core III	UBCM202	Biomolecules	Model Preparation	Assignment
	Allied II	UMBA201	Microbiology	Food contamination Identification	Culture Preparation
	NME	UBCE202	Biomedical Techniques	Assignment	DPA+ Practical Test
		UBCE203	Nutrition & Health	Diet Chart Preparation	Case Study
		UBCE401/UBCE204	Women's Health, Nutrition & Disorder	Chart Preparation	Case Study
		UBCE304/UBCE208	Mushroom Cultivation	Assignment	Seminar
UBCE209		Clinical Diagnostics	Case Study	DPA+ Practical Test	
UBCE210	Reproductive Biology	Poster Presentation	Assignment		

COURSE PROFILE M.Sc. (Biochemistry)

PSO1: Understanding of the scientific basis of life process and orientation towards the application of knowledge acquired in solving clinical problem.

PSO2: Enhancing student's skills & employability through academic, research and internship opportunities (PG service learning).

PSO3: Exposure to basic research through the provision of PG research based project.

PSO4: Developments of analytical and Cognitive skills in Biochemistry that allow independent exploration of biological science through research methods.

PSO5: Acquiring an appreciation of impact of life science on society.

PSO6: Analysis & interpretation of investigative data in life science.

Semester	Category	Course code	Course title	Contact Hours / Week	Credit	
					Min	Max
I	Core I	PBCM101	Biomolecular Chemistry	6	4	4
	Core II	PBCM102	Cell Biology	6	4	4
	Core III	PBCM203/105	Microbiology	6	5	5
	Core IV	PBCM204/106	Molecular Biology	6	4	4
	Core practical I	PBCR201/102	Microbiology and Molecular Biology Practical	6	5	5
TOTAL				30	22	22
II	Core V	PBCM201	Metabolism & Regulation	5	4	4
	Core VI	PBCM202	Human Physiology	5	4	4
	Core VII	PBCM103/205	Analytical Biochemistry	5	4	4
	Core VIII	PBCM104/206	Endocrinology	4	4	4
	Core practical II	PBCR101/202	Analytical Biochemistry Practicals	6	5	5
	Core IX	PBCX201	Mushroom cultivation (Service Learning)	-	1	1
	NME			5	4	4
TOTAL				30	26	26
III	Core X	PBCM301	Enzymology and Enzyme Technology	6	5	5
	Core XI	PBCM303	Immunology	6	5	5
	Core XII	PBCM304	Research Methodology in Biochemistry	5	4	4
	Core Practical III	PBCR301	Enzymology & Clinical Diagnostics	6	5	5
	Core XVI	PBCP401	Project	2	-	-
	Core XIII	PBCI401/301	Plant Biochemistry & Pharmaceutical chemistry	5	4	4
TOTAL				30	23	23
IV	Core XIV	PBCM401	Genetics & Genetic Engineering	6	5	5
	Core XV	PBCM302/402	Clinical Biochemistry	6	5	5
	Core XVI	PBCP401	Project	18	9	9
TOTAL				30	19	19
GRAND TOTAL				120	90	90

COURSES OFFERED TO OTHER DEPARTMENTS

NON- MAJOR ELECTIVES

Semester	Category	Course code	Course Title	Contact Hours/Week	Credit	
					Min.	Max.
II	Non major elective	PBCE101/201	Pharmaceutical Biochemistry	5	4	4
		PBCE102/202	Reproductive Biology & Disorders			
		PBCE103/203	Modern Life style associated diseases			

PBCM101 BIOMOLECULAR CHEMISTRY

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

Credit : 4
Hours/week : 6
Total Hours:78

Objectives

To enable the students

- Define biomolecules, recognize classifications and structures.
- Elucidate the role of biomolecules in biological functions.

UNIT - I HOMO AND HETEROGLYCANS

15 Hrs

Polysaccharides - occurrence, structure, isolation, properties and functions of homoglycans - starch, glycogen, cellulose, dextrin, inulin, chitins. Occurrence, structure, properties, and functions of heteroglycans - bacterial cell wall polysaccharides, glycoaminoglycans, pectins, amino sugars and deoxy sugars, blood group substances and sialic acids. Glycoprotein and their biological applications. Lectins structure and functions.

UNIT - II PROTEINS

15 Hrs

Classification of proteins on the basis of solubility and shape, structure, and biological functions. Isolation, fractionation and purification of proteins. Denaturation and renaturation of proteins. Primary structure - determination of amino acid sequence of proteins. The peptide bond: Ramachandran plot. Secondary structure - weak interactions involved - alpha helix and beta sheet and beta turns structure. Pauling and Corey model for fibrous proteins . Collagen triple helix. Super secondary structures - helix-loop-helix. Tertiary structure - alpha and beta domains. Quaternary structure - structure of hemoglobin. Solid state synthesis of peptides.

UNIT - III NUCLEIC ACIDS

16 Hrs

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 mispaired DNA, parallel stranded, anisomorphic DNA, palindrome, secondary and tertiary structure of RNA, hnRNA, methods for nucleic acid sequence determination,

denaturation, strand separation, fractionation, isolation and purification of DNA, mRNA, rRNA and tRNA, molecular hybridization, Cot value curve, hypochromic effect, DNA-protein interactions

UNIT - IV LIPIDS

16 Hrs

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 Hrs

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. Porphyrins the porphyrin ring system, chlorophyll, hemoglobin, myoglobin and cytochrome.

Text Books

- David L. Nelson and Michael M. Cox. Lehninger's, "*Principle of Biochemistry*", 4th edition, W. H. Freeman, 2004.
- Thomas M. Devlin, John Wiley-Liss, "*Text Book of Biochemistry with Clinical Correlation*", 3rd edition, Hoboken NJ publishers, 2006.

Reference Books

- L. Stryer, "*Biochemistry*", 5th Edition, W.H. Freeman and Co, 2002
- Voet & Voet, "*Fundamentals of Biochemistry*", 2nd edition, John Wiley and sons NY, 2002.
- Zubey, "*Biochemistry*", 3rd edition, GL WCB Publishers, 2005.

PBCM102 CELL BIOLOGY

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

Credit : 4
Hours/week: 6
Total Hours: 78

Objectives

To enable the students

- Understand the structure and functions of prokaryotic, eukaryotic cells and their metabolic process.
- Apply the biochemical techniques for identification of morphological and functional changes in cell related to pathology.

UNIT - I CELLULAR ORGANIZATION, DIVISION AND CYTOSKELETONS 15Hrs

Cell types - organization of prokaryotic and eukaryotic cells, cell division - mitosis and meiosis, cell cycle - 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 Hrs

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 Hrs

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 COMMUNICATION AND TRANSPORT

16 Hrs

Differentiation of cell membrane - microvilli, tight junctions, epithelia, Bell and sqot 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 CELL DEATH AND SIGNALING

16 Hrs

Cell aging and death - necrosis and apoptosis - mitochondrial and death receptor pathway. Cell signaling - signaling molecules and their receptors, functions of cell surface receptors, pathways of intracellular signal transduction, G protein coupled receptors, receptors tyrosine kinases, ras, MAP kinase pathways.

Text Books

- Harvey Lodish, “*Molecular cell Biology*”, Sol edition ,W. H. Freeman, 2007.
- Brachet J.,& Mirsky A. E., “*The Cell - Biochemistry, Physiology and Morphology*”, 3rd edition, Academic Press, 2005.

References Books

- Becker, “*The World of the cell*”, 5th edition, Kleinsmith and Harden Academic Internet Publishers, 2006.
- Geoffrey M. Cooper and Robert E. Hausman, “*The Cell: A Molecular Approac*”h, 4th Edition, 2006.
- Gerald Karp, “*Cell and Molecular Biology by concepts and experiments*”, 4th edition, John Wiley sons & Inc, 2005.

PBCM203/105 MICROBIOLOGY

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

Credit : 5
Hours/week: 6
Total Hours: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.

UNIT - I GENERAL MICROBIOLOGY

15 Hrs

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

15 Hrs

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

16 Hrs

Selection of industrially useful microbes. Fermentors and fermentation technology. Industrial production of alcohol, vinegar, lactic acid, antibiotics, enzymes and amino acids. Microbiology of food: sources of contamination, food spoilage and food preservation methods.

UNIT - IV CLINICAL MICROBIOLOGY

16 Hrs

Epidemic, endemic, pandemic and sporadic diseases. Pathogenicity, virulence and infection. 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 (AIDS, hepatitis, polio, rabies and measles). Mycoplasmal, Chlamydial, Rickettial and protozoan diseases of human. Mycotoxins.

UNIT - V APPLIED MICROBIOLOGY

16 Hrs

Role of microbes in the manufacture of antibiotics and vaccines. Microorganisms as biofertilizers. Microbes as foods - SCP production. Role of microbes in biogas production, petroleum industry and mining. Microbial degradation of lignin, cellulose and pesticides. Microbial immobilization. Microbes in biological warfare.

Text Books

- Pelczar et al., "*Microbiology*", 3rd edition, Tata McGraw-Hill, New Delhi, 2004.
- Prescott et al., "*Microbiology*", 2nd edition, WMC Brown Publishers, USA, 2003.

Reference Books

- Martin Alexander , “*Introduction to soil microbiology*”, 4th edition, WileyInternational, NY, 2004
- Gladwin & Trattler, “*Clinical Microbiology Made Ridiculously Simple*”, 6th edition, Medmaster, UK,2013

PBCM204/106 MOLECULAR BIOLOGY

Semester	:I	Credit	: 4
Category	:Core IV	Hours/week:	6
Class & Major:	I M.Sc. Biochemistry	Total Hours:	78

Objectives

To enable the students

- Study the molecular mechanisms of Prokaryotes and Eukaryotes.
- Assess the structure and function of genes and proteins by Genomics & Proteomics.

UNIT - 1 PROKARYOTIC TRANSCRIPTION AND REGULATION **16 Hrs**

Replication of DNA: DNA in prokaryotes and eukaryotes. Enzymes involved in replication, events on the replication fork and termination, mechanism of replication. Inhibitors of DNA replication and DNA repair. Type of damages, types of mutation – point mutation and frame shift mutation. Suppressor mutations – nonsense & missense suppression. Gene mutation and chromosomal aberration. 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 **15 Hrs**

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. Posttranscriptional processing of mRNA, rRNA and t-RNA. Alternative splicing. Catalytic RNA (ribozymes), RNA editing, Antisense RNA and RNAi

UNIT- III GENETIC CODE, TRANSLATION **16 Hrs**

The genetic code- general features. Mitochondrial genetic code. Components of protein synthesis– mRNA, ribosomes and tRNA. Mechanism of protein synthesis in bacteria and eukaryotes- amino acid activation, initiation, elongation and termination. Translational control in bacteria and eukaryotes. Regulation of protein synthesis- constitutive, and narrow domain regulation. Inhibition of protein synthesis. Co- and post-translational modifications. Protein

targeting- the signal sequence hypothesis, targeting proteins to membranes, nucleus and intracellular organelles. Protein degradation: the ubiquitine pathway. Protein folding-models, molecular chaperones.

UNIT – IV GENE EXPRESSION AND REGULATION **15 Hrs**

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 restriction-

modification systems, Dam methylation, Dcm methylation. DNA methylation in eukaryotes- cytosine methylation, CpG islands. Methylation and gene regulation in mammals and plants. Epigenetic 12 gene regulation by DNA methylation in mammals- role of imprinting and Xchromosome inactivation.

UNIT - V GENOMICS

16 Hrs

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; DNAmicro arrays. Developmental genetics: overview. Drosophila development maternal effect genes and zygotic genes.

Text Books

- Alberts, “*Molecular Biology of the Cell*”, 4th ed, Garland Sci, 2002.
- Lodish et al, “*Molecular Cell Biology*”, 4th ed, Freeman, 2000.
- Pitot HC, “*Fundamentals of Oncology*”, 3rd edition, Marcel Dekker, 2002.

Reference Books

- Stansfield et al. “*Molecular Cell Biology, 2nd edition*”, Schaum’s Outlines, McGraw Hill, 2002.
- Lewin. “*Genes VII*”, 2nd edition, Oxford University Press, 2000.
- Twyman. “*Advanced Molecular Biology*”, 3rd ed, Viva Publ, 2005.

PBCR201/102 MICROBIOLOGY & MOLECULAR BIOLOGY PRACTICAL

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

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

Objectives

To enable the students

- Gain practical knowledge about Microbes.
- Experiment molecular biological techniques.

Microbiology:

1. Determination of microbiological techniques by sterilization, media preparation, preparation of slants and stabs, pouring of medium into plates, sub-cultureing.
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, bacterial growth curve and generation time.

5. Antibiotic sensitivity tests by paper disc, cup method and MIC determination.

Molecular Biology:

6. Preparation of genomic DNA from plant tissue by CTAB method.

7. Plasmid DNA isolation by alkaline lysis method.

8. Isolation of chromosomal DNA from blood samples by phenol Chloroform method.

9. Demonstration of ELISA.

PBCM201 METABOLISM AND REGULATION

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

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

Objectives

To enable the students

- Understand the reactions involved in metabolism of biomolecules.
- Coordinate and regulate the metabolic pathways .

UNIT - I BIOENERGETICS

13 Hrs

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 Hrs

Glycolysis and gluconeogenesis– pathway, key enzymes and co-ordinate regulation. Mechanism of pyruvate dehydrogenase multienzyme complex and the regulation of this enzyme through reversible covalent modification. The citric acid cycle and regulation. The pentose phosphate pathway. Metabolism of glycogen and regulation. Glycogen storage diseases. Blood glucose homeostasis– role of tissues and hormones.

UNIT - III LIPID METABOLISM

13 Hrs

Lipogenesis- Control of acetyl CoA carboxylase - Role of hormones - Effect of diet on fatty acid biosynthesis. Regulation of biosynthesis of triacylglycerol, phospholipids and cholesterol. Metabolism of triacylglycerol during stress. α , β , γ , Oxidation of fatty acids– 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 Hrs

Overview of biosynthesis of nonessential amino acids. Catabolism of amino acid nitrogen– transamination, deamination, ammonia formation, the urea cycle and regulation of ureogenesis. Importance of glutamate dehydrogenase. Catabolism of carbon skeletons of

amino acids– overview only. Disorders of amino acid metabolism– phenylketonuria, alkaptonuria and albinism only. 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 Hrs

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

- Stryer, “*Biochemistry*”, 3rd ed, Freeman, 2002.
- Murray et al., “*Harper’s Biochemistry*”, 2nd ed, Mc. GrawHill, 2000.

References Books

- Nelson Cox, Lehninger’s, “*Principles of Biochemistry*”, 3rd Edition, McMillan Worth, 2000.
- Donald Voet, J.G. Voet, John Wiley,” *Biochemistry*”, 4th edition, 2006.
- Davidson & Sittman, “*Biochemistry NM., 3rd edition*”, Lippincott. Williams and Wilkins, 2005

PBCM202 HUMAN PHYSIOLOGY

Semester	:II	Credit	: 4
Category	:Core VI	Hours/week:	5
Class & Major:	I M.Sc. Biochemistry	Total Hours:	65

Objectives

To enable the students

- Understand the physiology of human body and to study the way the body functions.
- Revise the function and coordination of organs to maintain normal biological system.

UNIT - I BLOOD AND RESPIRATION 13 Hrs

Composition and functions of blood and plasma. Blood groups. Blood coagulation - mechanism, fibrinolysis, anticoagulants. Hemoglobin - structure, abnormal types, anemia. Structure of heart, cardiac cycle, heart sounds, E.C.G (elementary knowledge) vasomotor circulation, coronary circulation, blood pressure, spleen, lymph, normal composition and function of lymph - role of different lymph cells. 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 Hrs

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 Hrs

Structure and function of reproductive organs, composition of semen, transport of sperm, ovulation, sexual cycle, physiology of pregnancy, parturition and lactation.

UNIT - IV NERVOUS SYSTEM

13 Hrs

Structure and function of nerves, neurons, resting and action potential, transmission of nerve impulses, synaptic transmission, compounds affecting synaptic transmission, neuromuscular junction, composition and functions of cerebrospinal fluid, brain - chemical composition and metabolic adaptation, neurotransmitters and cAMP, biochemical aspects of learning and memory, enkephalins and endorphins. Structure of muscle cells and muscle contraction, molecular organization of muscle, proteins of contractile element - their organization and role in contraction, energy for contraction.

UNIT -V MUSCULAR AND CYTOSKELETON SYSTEM

13 Hrs

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. Major classes of cell junctions – anchoring, tight and gap junctions. Major families of cell adhesion molecules (CAMs) – the cadherins (classical and desmosomal). The integrins. The extracellular matrix of epithelial and nonepithelial tissues. ECM components – collagen, elastin, fibrillin, fibronectin, laminin and proteoglycans.

Text Books

- William. F. Ganong. “*Review of Medical Physiology*”, 22nd ed, McGraw-Hill Medical, 2008.
- M.S.Swaminathan, “*Principles of Nutrition*”, 3rd Edition, 2004.

References Books

- Guyton, “*Human Physiology and Mechanisms of Disease* “, 6th edition, Saunders Publications, 2004.
- C.C. Chatterjee “*Human physiology*”, 11th edition, 2007.
- Davidson & Passmore, “*Human Nutrition and Dietetics*”. Churchill Livingstone; 8th edition, 2004.

PBCM103/205 ANALYTICAL BIOCHEMISTRY

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

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

Objectives:

To enable the students

- Understand the working principles of analytical instruments.
- Apply and analyze the biochemical samples using analytical instruments.

UNIT - I MICROSCOPY AND ELECTROCHEMICAL TECHNIQUES

13 Hrs

Microscopy - bright field, darkfield, fluorescence and phase contrast microscope. Scanning and transmission electron microscopy. Electrochemical techniques -principles,

electrochemical cells - pH, Henderson - Hasselbalch equation, buffer capacity, pH measurement, glass electrode. Ion-selective and gas sensing electrodes, oxygen electrode - principle and application. Biosensors.

UNIT-II ULTRACENTRIFUGATION AND RADIOACTIVITY TECHNIQUES 15Hrs

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. Nature of radioactivity - stable and radioactive isotopes - units and interaction of radioactivity with matter. Detection and measurement of radioactivity - GM counter, solid and liquid scintillation counter - tissue solubilizers, counting efficiency, primary and secondary fluors, quenching - Cerenkov counting. Autoradiography. Applications of radioisotopes in the biological sciences.

UNIT – III ELECTROPHORESIS TECHNIQUES 13 Hrs

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 Hrs

Chromatographic techniques - General principles of partition and adsorption chromatography. Thin layer, column, ion - exchange, molecular exclusion, gas - liquid and HPLC, normal phase, reverse phase, chromatofocusing, immunoaffinity, capillary electrochromatography.

UNIT – V SPECTROSCOPY TECHNIQUES 13 Hrs

Laws of absorption and absorption spectrum. Principles of turbidimetry and nephelometry. Principle, instrumentation and application of luminometry. Atomic spectroscopy - Principle and applications of atomic flame and flameless spectrophotometry. Use of lasers for spectroscopy.

Text Books

- Wilson K. & Walker, “*Practical Biochemistry*”, Cambridge University press, 5th edition, 2000
- David T. Plummer. “*An introduction to Practical Biochemistry*”, 2005.

References Books

- David Frifelder. *Physical Biochemistry*, W. H. Freeman; 3 edition, 2005
- Galen Wood Ewing McGraw, “*Instrumental Methods of Chemical Analysis*” by -Hill College, Fifth edition.
- Robert D. Braun, “*Introduction to Instrumental Analysis*”, Pharma Book Syndicate, 2006.

PBCM104/206 ENDOCRINOLOGY

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

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

Objectives

To enable the students

- Acquire in-depth knowledge about types, classification, biosynthesis, interaction, function and regulation of hormones.
- To assess the involvement of signaling pathways in response to hormones.

UNIT - I CLASSIFICATION AND MECHANISM

10 Hrs

Hormones - definition, classification based on receptors, hormone cascade system involving CNS, hypothalamus, anterior pituitary, target gland, feedback mechanisms, classification of hormones (polypeptides, glycoproteins and POMC peptides), major polypeptide hormones and their actions, genes and formation of polypeptide hormones - POMC peptides and vasopressin.

UNIT - II AMINO ACID DERIVED HORMONES

10 Hrs

Synthesis of amino acid derived hormones-epinephrine and thyroxine, inactivation and degradation of hormones, signal transduction and second messengers - adenylate cyclase system, cAMP, adrenalin and glycogen degradation. G-protein as cellular transducer, inositol triphosphate and calcium release, glycogen phosphorylase kinase, DAG and protein kinase C-pathway.

UNIT-III CYCLIC HORMONAL CASCADE SYSTEM & PROTEIN KINASES 12Hrs

Cyclic hormonal cascade system - chronotropic control, melatonin and serotonin - light and dark cycle, ovarian cycle and role of hormones, hormone - receptor interactions, multiple hormone subunits Sactchard analysis, structure beta -adrenergic receptor and insulin receptor, internalization of receptors, intracellular action - protein kinases, insulin receptor - transduction through tyrosine kinase, vasopressin - protein kinase A, GnRH-protein kinase C, atrial natriuretic factor - protein kinase G.

UNIT - IV STEROID HORMONES

10 Hrs

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-V HORMONE RECEPTORS AND REGULATION

10 Hrs

1Steroid hormone receptors, intracellular protein receptors, structural organization of receptor protein, hormone binding domain, antigenic domain and DNA binding domain, organizations of functional elements - hormone response elements, positive and negative transcriptional effects of S.R, receptor activation - upregulation and down regulation, apoptosis - steroid hormone action at cell level, multiple endocrine neoplasia - different types.

Text Books

- Devlin, Wiley-Liss; “*Biochemistry (with clinical correlation)*”, 6th edition, 2005.

- Wilson and Foster,” *Endocrinology*”, 4th edition, W.B. Saunders Co, 2005.

Reference Books

- R.K. Murray et al. “*Harper’s Biochemistry*”, 27 edition, McGraw-Hill Medical, 2006.
- Austin and Short,prema Jaypee brothers, “*Mechanism of hormone action*”, 3rd edition, 2005.
- Sembulingam.K and Sembulingam, “*Essential of Medical Physiology*”, 4th Edition, Prema Jaypee brothers, Delhi, 2006.

PBCR101/202 ANALYTICAL BIOCHEMISTRY

Semester	:II	Credit	: 4
Category	:Core Practical II	Hours/week:	6
Class & Major:	I M.Sc. Biochemistry	Total Hours:	78

Objectives

To enable the students

- Carry out biochemical analysis.
- Attain technical competence in the specific discipline.

Experiments

1. Preparation of buffers and measurements of pH.
2. Titrable acidity of aminoacids.
3. Paper chromatography of sugars & 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.

PBCX201 MUSHROOM CULTIVATION

Semester	:II	Credit	: 1
Category	:Core IX	Total Hours:	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.

UNIT – I INTRODUCTION **8 Hrs**

Definition, Edible & Poisonous mushroom, Nutritive & Medicinal value of mushroom. Composting - Importance in waste recycling.

UNIT - II GROWTH CHARACTERISTICS OF MUSHROOM **8 Hrs**

Growth & substrate for volvariella species, Pleurotus species, Agaricus species, Calcybe species & Lentinus species of mushroom.

UNIT – III CULTIVATION OF MUSHROOM **8 Hrs**

Conditions for tropical & temperate countries, isolation, spawn production, growth media, spawn running and harvesting of mushroom.

UNIT - IV DISEASE & POST HARVEST TECHNOLOGY **8 Hrs**

Insect pest, nematodes, Mites, Viruses, Fungal competitors & other important diseases. Post harvest technology, freezing, dry freezing, drying, canning etc. entrepreneurship

UNIT - V FEED BACK & RESULT FROM SOCIETY **8 Hrs**

Evaluation of results, Mushroom yield, Income through mushroom cultivation, Feedback- oral & written from villagers. Activity: Cultivation of mushroom for commercial purposes.

Text books

- Nita Bahl, “*Hand book of Mushroom*”, 4th edition, Vijay prmlani for oxford Publication Co.Pvt Ltd, New Delhi, 2002.
- “*Hand Book of Mushroom Cultivation*”, 3rd edition, TNAU Publications, 2003.

Reference Books

- Chang.T.S. & Hayes. W.A, “*The biology and Cultivation of Edible Mushrooms*”, 2nd edition, Academic Press, New York, 2001.
- Nair M.C & Gokulapalan. C and Lulu das, “*Topics on Mushroom Cultivation*”, 3rd edition, Scientific Publishers, Jodhapur, India, 2001.
- Ignacimuthu.S, “*Applied Plant Biotechnology*”, 3rd edition, Oxford & IBH Publishing Co.Pvt.Ltd, New Delhi, 2002.

PBCE101/201 PHARMACEUTICAL BIOCHEMISTRY

Semester	:II	Credit	: 4
Category	:Non-Major Elective I	Hours/week:	5
Class & Major:	I PG	Total hours:	65

Objectives:

To enable the students

- Study the general metabolism of drugs.
- Evaluate their clinical importance and effects by bioassays.

UNIT – I ABSORPTION, DISTRIBUTION AND METABOLISM OF DRUGS **15Hrs**

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. Antiparasitic drugs, Antiviral, Antitubercular, Antimalarial, Anticancer, Antiamoebic drugs. Diagnostic agents.

UNIT – II BIOMEDICAL IMPORTANCE OF DRUGS **12Hrs**

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 TOXICOLOGY **15 Hrs**

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. Their Bioassays.

UNIT – IV BIOPHARMACEUTICALS **11 Hrs**

Development, manufacturing standards, labeling, packing as per the pharmacopoeal requirements, storage of different dosage forms and new drug delivery systems. Biopharmaceuticals and Pharmacokinetics and their importance in formulation.

UNIT – V PHYTOPHARMACEUTICALS **12 Hrs**

Chemistry, tests, isolation, characterization and estimation of phytopharmaceuticals belonging to the group of Alkaloids, Glycosides, Terpenoids, Steroids, Bioflavonoids, Purines, Guggul lipids. Pharmacognosy of crude drugs which contain the above constituents. Standardisation of raw materials and herbal products. WHO guide lines. Quantitative microscopy including modern techniques used for evaluation. Biotechnological principles and techniques for plant development tissue culture.

Text Books

- Devin., “*Text Book of Biochemistry with clinical correlation*”, 1992
- Donald Voet., “*Biochemistry*”, 2004
- Harper’s., “*Illustrated Biochemistry*”, 2006

Reference Books

- Alfred Burger., “*A guide to chemical basis of drugs design*”, John Wiley & Sons.
- Goodman and Gilman’s., “*The Pharmacological Basis of Therapeutics*”, 8th edition Pergamon Press.
- John Smith and Haywel Williams., “*Introduction to the principles of drug design*”, Wright PSG.
- Manfred E Wolff., “*Burgers Medicinal chemistry – The basis of Medicinal Chemistry*”. Part – I. John Wiley & Sons.

PBCE102/202 REPRODUCTIVE BIOLOGY AND DISORDERS

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

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

Objectives

To enable the students

- Study on biological aspects of human reproduction
- Discussion about birth control, infertility and sexually transmitted diseases

UNIT - I INTRODUCTION OF REPRODUCTIVE SYSTEM 15 Hrs

Reproduction – Definition, Structure and function of male and female reproductive system. Endocrine control of reproductive function.

UNIT – II REPRODUCTIVE CYCLE 10 Hrs

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 Hrs

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 Hrs

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 Hrs

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, *Endocrinology and Reproductive biology*, Rastogi publications.
- Sachdeva R.K, *A guide to obstetrics and gynaecology*, Jaypee brother publications.

Reference books

- Richard. E. Jones., Kristin H. Lopez. *Human reproductive biology*, Third edition.
- Taylor, J., Green N.P.O., Stout G.W. *Biological sciences 1 & 2*, Third edition.

PBCE103/203 MODERN LIFESTYLE AND ASSOCIATED DISEASES

Semester :II

Category :NME

Class & Major:I PG

Credit : 4

Hours/week: 5

Total Hours: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

15 Hrs

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

15 Hrs

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

15Hrs

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

15 Hrs

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

15 Hrs

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.

Textbooks

- *"Guide to prevention of lifestyle diseases"*. M Kumar, R Kumar. Publication: Deep and Deep Publications, 2004.

Reference books

- Tudith stern, Alexendra Kuzaks. *"Obesity: a reference handbook"*. ABC-CLIO, 2009.
- Mindori Hiramatsu, Toshikazu Toshikawa, Lister Packer. *"Molecular interventions in lifestyle related diseases"*. CRC Press, 2009,
- David L Katz, *"Diseases Proof"*. Plume, 2014.

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	Assignment	Culture preparation	
	Core IV	PBCM204/106	Molecular Biology	Assignment	Seminar	
II	Core V	PBCM201	Metabolism and Regulation	Assignment	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

COURSE PROFILE M.Phil. (Biochemistry)

M.Phil BIOCHEMISTRY PROGRAMME SPECIFIC OUTCOME

PSO1 :Understand the issues of environmental contexts and sustainable development of green research in Biochemistry

PSO2 :Apply contemporary research methods to conduct independent inquiry in a chosen scientific discipline

PSO3: Develop the ability to understand and practice the ethics surrounding scientific Research.

PSO4: Realize the impact of Lifescience in society and plan to pursue research.

Semester	Category	Course code	Course Title	Hours per week	Credit	
					Min	Max
I	Core 1	MBCM101	Research Methodology	6	5	5
	Core II	MBCM102	Advanced Analytical Techniques	6	5	5
	Core III	MBCM103	Special area study	6	5	5
II	Core IV	MBCM201	Dissertation and viva voce	30	15	15
TOTAL				48	30	30
<ul style="list-style-type: none"> Paper presentation (minimum one) and / or publication of articles in journals (minimum one) are mandatory for submission of dissertation. 						

MBCM101 RESEARCH METHODOLOGY

Semester : I
Category : Core I
Class & Major: M.Phil Biochemistry

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

Objectives

To enable the students

- Enhance the knowledge on research and its methodologies.
- Apply and integrate the techniques and test the hypothesis using research tools.
- Compose quality control, error sources, documentation and storage of experimental data.

UNIT- I INTRODUCTION TO RESEARCH METHODOLOGY 15 Hrs

Definition of Research, Objectives of research - motivation of research, Basic and applied research, Steps in Research and its significance, Defining a research problem, Experimental design. Sampling techniques- sampling theory, types of sampling, steps in sampling-sampling and non sampling error- sample size- advantages and limitations of sampling. Data collection methods - data collection, Primary Data- Secondary data - assembly, analysis and interpretation of experimental data.

Methods versus methodology - Research in scientific methods - Research process - Criteria for good research. Problems encountered by research in India- Funding agencies and IPR.

UNIT-II DATA PRESENTATION 16 Hrs

Data types - Processing and presentation of data -Techniques of ordering data, Data presentation Tabular, graphical and diagrammatic representation of data. Use of simple, semilog & double graph paper in data representation. The uses of library and internet in research - search engines ,virtual libraries , software's for documentation and presentation. Introduction to Presentation Tools- Features and functions, Creating presentation, master page, adding animation, Customizing presentation, showing presentation, printing handouts.

UNIT- III STATISTICAL APPROACHES IN RESEARCH METHODOLOGY 16 Hrs

Statistical analysis of data - Averages, Mean Deviation & Standard deviation, - Correlation, regression, coefficient of variation. levels of significance, - Comparison of sets of data - Chi square test, students test (t), (f) test ,ANOVA and uncan's new multiple range test. Characteristics of probability distribution - Binomial, Poisson and normal distribution Measurement of errors - Types and sources of errors - Determination and control of errors, Advanced Clinical software and statistic calculations -SPSS, SAS, and R

UNIT- IV – BIOINFORMATICS TOOLS IN RESEARCH 16 Hrs

Nucleotide -Sequence submission Methods and tools (Genbank- EMBL- DDBJ, Sequin, Sakura, Bankit)- Sequence retrieval systems (Entrez & SRS)- Sequence File Formats and Conversion tools- Protein (Swiss-prot, PIR, Expasy)- Structural Databanks (PDB and NDB)- Protein Structure Classification (SCOP, CATH and FSSP)- Metabolic Pathway database (KEGG)- Specialized db (IMGT, Rebase, COG). Molecular Sequence Alignment- Pair wise Alignment- Global Alignment- Local Alignment- Visual Alignment- Dynamic Programming- Heuristic approach- Scoring Matrices and Affine Gap costs- Database Search methods.

Molecular Modeling and Drug Designing: Introduction to Protein Structure Prediction- Rational drug discovery- Recent advances in drug design methodologies- Structure-based drug design- Drugreceptor N interactions- Structure-Activity Relationships.

UNIT- V RECENT TREND IN LIFE SCINCE

15 Hrs

Overview of - Cancer Biology, Toxicology, Environmental Biochemistry, Bioinformatics, Neuroscience, Biotechnology and plant Biochemistry, Nanotechnology, Ethics and authorship Software for detection of Plagiarism.

Text Books

- Kothari.C.R, "*Research Methodology, Methods and Techniques*", Wishwa Prakasam Publications, 2018
- Day.R.A, "*How to write and publish a scientific paper*", Cambridge University Press, 2013
- Attwood T.K and D.J Parry, "*Introduction to Bioinformatics*", Pearson Education Ltd., New Delhi 2014.

Reference Books

- Robert Ross," *Research: An introduction*", Harper and Row Publications, 2010.
- Snedecor.G.W and Cocharan.W, "*Statistical methods*", Oxford and IBH, New Delhi, 2011
- Andreas D Baxevanis and Francis Quellette B F, "*Bioinformatics- A Practical guide to the analysis of genes and proteins*", Willey publication, New Delhi 2016.

MBCM102 ADVANCED ANALYTICAL TECHNIQUES

Semester :I

Credit : 5

Category :Core II

Hours/ week: 6

Class & Major:M.Phil Biochemistry

Total Hours:78

Objectives

To enable the students

- Develop analytical skills.
- Analyze the principles and concepts of technical systems involved in scientific research.
- Perform research experiments to assess the biological samples.

UNIT- I BIOSAFETY AND LABORATORY PRACTICES

15 Hrs

General Biosafety: Biosafety - guidelines, Biosafety levels, regulations - Biosafety and Bioethics committees for the Institutions. Safety and containment equipments –Shipment and containment procedures for GMOs, DNA, vectors. –Handling guidelines for the usage of antibiotics in research labs -Facility design considerations, Protective Equipments –Types and purpose, Documentation and work culture in Research labs -Ethics in Research and Medical labs –Data Audit -Good lab practices .

UNIT- II CHROMATOGRAPHY AND ELECTROPHOROSIS TECHNIQUES 16Hrs

Fundamentals of Chromatography - Principle and Classification, Types of Chromatography - Adsorbtion, Partition, TLC, Ion – exchange chromatpography, Gel filtration chromatography HPLC, GLC,GC, LC. Detectors and Types . Scientific and Industrial Applications.

Fundamentals of Electrophoresis - Principle and Classification, Types of Electrophoresis- Horizontal and Vertical Gel Electrophoresis Systems, Agarose Gel Electrophoresis, Polyacrylamide Gels, Sodium Dodecyl Sulphate-Polyacrylamide Gel Electrophoresis, Capillary Electrophoresis, Cellulose Acetate Electrophoresis, Isoelectric Focusing and Two-Dimensional Gel Electrophoresis and Microchip Electrophoresis. Scientific and Industrial Applications.

UNIT- III SPECTROSCOPIC TECHNIQUES

16 Hrs

Introduction to spectroscopy- Beer lamberts Law, scattering of light, reflection and refraction. Flurimetry, CDS,UV-Vis spectroscopy, Atomic spectroscopy, Fluroscence spectroscopy, X-Ray spectroscopy, Mass spectroscopy, Raman, spectroscopy IR spectroscopy, NMR spectroscopy, FT-IR, ICPMS, MALDI- TOF- principle and applications.

UNIT-VI RADIOISOTOPIC MANOMETRIC TECHNIQUES AND MICROBIAL ASSAY TECHNIQUE

16Hrs

Radioisotopes- definition and uses, Radioactivity and units of measurement. Nature detection and measurements of radioactivity. GM counter, scintillation counter ,pulse height analyserisotope dilution analysis, autoradiography- principle and applications.

Introduction and types of manometry, Warburg constant volume, Oxygen electrode, Warburg manometer and its applications.

Microbial Assay Technique for Vitamins: Thiamin, Niacin, Riboflavin, Mutant methodology and its application.

UNIT- V MOLECULAR BIOLOGY AND IMMUNOLOGY TECHNIQUES

15 Hrs

Introduction, Recombinant DNA techniques, PCR, Microarrays, Gene markers, FACS-Cell cycle analysis, FISH, CISH, RFLP, SSLP, Clonning, Analysis of Ancient DNA, DNA fingerprinting- Applications.

Introduction, production of antisera and precipitation reaction, RIA, ELISA- types, Immunofluorescence, Immunoelectrophoresis, Blotting techniques, Immunohistochemistry- Applications.

Text Books

- Keith Wilson and John Walker, "*Principles and techniques of practical Biochemistry*". Cambridge University Press, Cambridge, 2010
- Sateesh.M. K, "*Bioethics and Biosafety*", I. K International Pvt Limited, Publishers, India. 2009.
- Sambrook.J & Russell.D.W , "*Molecular cloning: a laboratory manual Vol 1, 2 & 3*", CSHL Press 2012.

Reference Books

- Douglas Skoog, Donald West, James Holler, Stanley Crouch, "*Fundamentals of Analytical Chemistry*". Saunders College Pub. Prentice Hall, New Jersey, USA, 2014.
- Darnell, Lodish and Baltimore. "*Molecular Cell Biology*", Scientific American Publishing Inc, 2016.
- Kuby "*Immunology*". 6th ed., W. H. Freeman & Company, 2013.