



**B.Sc. Biochemistry Course Structure under CBCS
(For the candidates admitted from the academic year 2016-2017 onwards)**

Sem	Part	Course	Title	Inst. Hours/Week	Credit	Exam	Marks		Total
						Hours	Int	Ext	
I	I	Language Course-I (LC) – Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course - I (ELC)		6	3	3	25	75	100
	III	Core Course-I (CC)	Biomolecules	6	6	3	25	75	100
		Core Practical – I (CP)	Biomolecules (P)	3	-	-	-	-	-
		First Allied Course-I (AC)	Chemistry I	4	4	3	25	75	100
		First Allied Practical –II (AP)	Chemistry (P)	3	-	***	-	-	-
	IV	Value Education	Value Education	2	2	3	25	75	100
Total				30	18				500
II	I	Language Course-II (LC)– Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course-II (ELC)		6	3	3	25	75	100
	III	Core Course-II (CC)	Human Physiology	6	6	3	25	75	100
		Core Practical – I (CP)	Biomolecules (P)	3	3	3	40	60	100
		First Allied Practical-II (AP)	Chemistry (P)	3	3	3	40	60	100
		First Allied Course-III (AC)	Chemistry II	4	2	3	25	75	100
	IV	Environmental Studies	Environmental Studies	2	2	3	25	75	100
Total				30	22				700
III	I	Language Course – III (LC)– Tamil*/Other Languages ** #		6	3	3	25	75	100
	II	English Language Course-III (ELC)		6	3	3	25	75	100
	III	Core Course – III (CC)	Biochemical Techniques	6	6	3	25	75	100
		Core Practical – II (CP)	Biochemical Techniques and Instrumentation (P)	3	-	-	-	-	-
		Second Allied Course – I (AC)	Biology - I	4	4	3	25	75	100
		Second Allied Practical-II (AP)	Microbial, Plant and Cell Biology (P)	3	-	***	-	-	-
	IV	Non Major Elective I - for those who studied Tamil under Part-I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Health and diseases	2	2	3	25	75	100
Total				30	18				500

IV	I	Language Course –IV (LC) - Tamil*/Other Languages ** #		6	3	3	25	75	100	
	II	English Language Course – IV (ELC)		6	3	3	25	75	100	
	III	Core Course – IV (CC)	Enzymes		5	5	3	25	75	100
		Core Practical – II (CP)	Biochemical Techniques - and Instrumentation (P)		3	3	3	40	60	100
		Second Allied Practical - II (AP)	Microbial, Plant and Cell Biology (P)		3	3	3	40	60	100
		Second Allied Course – III (AC)	Biology - II		3	2	3	25	75	100
	IV	Skill based elective - I	Skill based elective - I		2	2	3	25	75	100
		Non Major Elective II-for those who studied Tamil under Part I a) Basic Tamil for other language students b) Special Tamil for those who studied Tamil upto +2 but opt for other languages in degree programme	Hospital Management		2	2	3	25	75	100
	Total				30	23				800
	V	III	Core Course – V (CC)	Bioenergetics and Metabolism	5	5	3	25	75	100
Core Course – VI (CC)			Cell and Molecular biology	5	5	3	25	75	100	
Core Course – VII (CC)			Microbiology	6	5	3	25	75	100	
Core Practical – III (CP)			Food and Enzyme Biochemistry (P)	3	3	3	40	60	100	
Major Based Elective – I			Pharmaceutical Biochemistry	5	5	3	25	75	100	
IV		Skill based elective – II	Skill based elective - II		2	2	3	25	75	100
		Skill based elective - III	Skill based elective – III		2	2	3	25	75	100
		Soft Skills Development	Soft Skills Development		2	2	3	25	75	100
Total				30	29				800	
VI		III	Core Course – VIII (CC)	Immunology	6	6	3	25	75	100
	Core Course – IX (CC)		Clinical Biochemistry	6	6	3	25	75	100	
	Core Practical – IV (CP)		Haematology and Clinical Biochemistry (P)	5	4	3	40	60	100	
	Major Based Elective II		Endocrinology	6	6	3	25	75	100	
	Major Based Elective III		Basic Biotechnology	6	6	3	25	75	100	
	V	Extension Activities	Extension Activities		-	1	-	-	-	-
		Gender Studies	Gender Studies		1	1	3	25	75	100
	Total				30	30				600
Grand Total				180	140				3900	

List of Allied Courses

Allied Course I

Allied Course II

Chemistry

Biology

Language Part – I - 4

English Part –II - 4

Core Paper - 9

Core Practical	-	4	
Allied Paper	-	4	
Allied Practical	-	2	
Non-Major Elective	-	2	
Skill Based Elective	-	3	
Major Based Elective	-	3	
Environmental Studies	-	1	
Value Education	-	1	
Soft Skill Development	-	1	
Gender Studies	-	1	
Extension Activities	-	1	(Credit only)

* for those who studied Tamil upto 10th +2 (Regular Stream)

+ Syllabus for other Languages should be on par with Tamil at degree level

those who studied Tamil upto 10th +2 but opt for other languages in degree level under Part I should study special Tamil in Part IV

** Extension Activities shall be outside instruction hours

Non Major Elective I & II – for those who studied Tamil under Part I

- Basic Tamil I & II for other language students
- Special Tamil I & II for those who studied Tamil up to 10th or +2 but opt for other languages in degree programme

Note:

	Internal Marks	External Marks
1. Theory	25	75
2. Practical	40	60
3. Separate passing minimum is prescribed for Internal and External marks		

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks]

The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks]

The passing minimum for University Examinations shall be 40% out of 60 marks [i.e. 24 marks]

CORE COURSE I

BIOMOLECULES

Objectives:

To understand the basis of macromolecules and their structure.

Unit I

Carbohydrates: Classification - structural elucidation of glucose and fructose. Interconversion of sugars. Structure Properties and biological functions of mono, di, oligo and polysaccharides. Homoglycans and Heteroglycans.

Unit II

Amino acids: Structure, classification, physical and chemical properties. Peptides-peptide bond, peptide synthesis, biologically important peptides. Proteins: classification, physical and chemical properties, Biological importance. Primary structure, Secondary, tertiary and quaternary structure- forces stabilizing the structure of proteins.

Unit III

Lipids: Classification and Biological significance. Simple lipids: types of fatty acids, triglycerides, waxes. Compound lipids-structure and functions- Phospholipids, sphingolipids and glycolipids. Lipoproteins- classification and composition. Steroids and prostaglandins-structure and functions. Characterization of oils: Reichert-Meisel value, Iodine number, saponification value, acid number and determination of acetyl value.

Unit IV

Vitamins- Definition and classification. Source, Structure and biological role, daily requirement and deficiency manifestation of the fat soluble vitamins A,D,E & K. Water soluble vitamins-Ascorbic acid, thiamine, riboflavin, pyridoxine, niacin, pantothenic acid, lipoic acid, biotin, folic acid and vitamin B12.

Unit IV

Nucleic acids: Components of mono nucleotides- pyrimidines, purines, nucleosides, nucleoside. 5'diphosphates and 5' triphosphates. Polynucleotides: DNA and RNA- Composition, structure- and biological importance. Properties -hydrolysis of nucleic acids by acids, bases and enzymes. Denaturation and renaturation. Isolation, separation and purification of DNA and RNA

Reference Books:

1. Principles of Biochemistry – 7th edition Lehninger, Nelson Cox Macmillan worth Publishers, 2013.
2. Textbook of Biochemistry-West & Todd.4th edition, Macmillan, 1966.
3. Harper's Biochemistry 29th edition, McGraw Hill, 2012.
4. Fundamentals of Biochemistry –.11th edition Agarwal O.P., Goel Publishing House, 2008.
5. Essentials of Biochemistry –2nd edition A.I. Jain. S.Chand publications, 2004.
6. Chemistry of Biomolecules, S. P. Bhutani , 2010.
7. Fundamentals of biochemistry, J.L. Jain, 2005.
8. Introductory Experiments on Biomolecules and their Interactions, Robert K. 2015.

CORE PRACTICAL I

BIOMOLECULES

Objectives:

1. To understand principles, theory and calculations of each experiment.
2. To gain hands on preparation of all the solutions and to standardize solutions individually.

Qualitative analysis

1. Weighing of reagents, Preparations of Normal and Molar solutions.
2. Handling of Microscope
3. Qualitative analysis of carbohydrates (glucose, fructose, maltose, galactose, sucrose, lactose), Identification of both monosaccharides and disaccharides in mixtures.
4. Qualitative analysis of amino acids (Tryptophan, Tyrosine, Arginine, Proline and Histidine)
5. Qualitative analysis of Lipids-Solubility, acrolein test for unsaturation, Libermann Burchard test for cholesterol Quantitative analysis
6. Estimation of reducing sugar by Benedict's quantitative method.
7. Estimation of amino acid by formal titration
8. Estimation of ascorbic acid by titrimetric method using 2,6 - dichlorophenol indophenol.
9. Estimation of acid number of Edible oil.
10. Determination of saponification number of edible oil.
11. Estimation of Iodine value of oil.

Reference Books:

1. Manuals in Biochemistry – Dr. J. Jayaraman, New Age International Pub, Bangalore 2011.
2. Practical Biochemistry – Plummer, New Delhi: Tata Mcgraw Hill Publishing Company, 2000.
3. Biochemical methods – S.Sadasivam, V.A Manickam 2 ed New Age International Publishers, 2006.
4. Biochemical Tests – Principles and Protocols. Anil Kumar, Sarika Garg and Neha Garg. Vinod Vasishtha Viva Books Pvt Ltd, 2012.

CORE COURSE II

HUMAN PHYSIOLOGY

Objectives:

To understand fundamental mechanisms underlying normal function of cells, tissues, organs, and organ systems of the human body

Unit I

Body fluids: Extracellular fluid-plasma, interstitial fluid and transcellular fluid. Intracellular fluid: Lymph & Blood-composition, functions, osmolarity of the body fluids, ionic composition, electrolytes, body buffers. Blood cells, haemoglobin, haemopoiesis, blood coagulation and blood groups.

Unit II

Circulation: Structure of Heart and blood vessels, cardiac cycles, cardiac factors controlling blood pressure, electrocardiogram. Functions of heart. Respiration: Anatomy, and physiology of respiration, pulmonary surfactant, exchange of gases between lung and blood and between blood and tissues. Role of lung in acid-base balance.

Unit III

Digestive system: Anatomy of the digestive system, Salivary, Gastric and Biliary Secretions- composition and functions. Intestinal hormones, movements in Gastro intestinal tract, Secretion, digestion and absorption in the small intestine. Absorption in the large intestine; Digestion and absorption of carbohydrates, lipids and proteins.

Unit IV

Excretory system: Structure and functions of kidney. Urine- composition and formation. Renal regulation of acid-base balance. Muscle: Kinds of muscle, structure. Mechanism and theories of muscle contraction.

Unit V

Central nervous system- General organization. Functional units. Resting and action potential- conduction of nerve impulse. Synaptic transmission. Brain-chemical composition, metabolism, metabolic adaptation, neurotransmitters and cAMP. Biochemical aspects of learning and memory. Enkephalins and endorphins.

Reference Books:

1. Human Physiology: Vol I & II C.C. Chatterjee, 2016.
2. Functions of the Human body – Guyton A.C, 1974.
3. Human Physiology-Systemic & applied-Sahalya, 2009.
4. Human Nutrition and Dietetics – Swaminathan, Bangalore printing and Pulv. Co. Ltd, 1996.
5. Review of Medical Physiology – Ganong, Appleton and Lange, 2003.

CORE COURSE III

BIOCHEMICAL TECHNIQUES

Objectives:

1. To enable the students to have a deep knowledge on the techniques for measurement of biophysical factors in living organisms.
2. To enable the students to get an insight on the usage of various techniques and their applications in industry and R&D.

Unit I

Colorimetry: Beer Lambert's Law, Light absorption and its transmittance, Absorption Spectroscopy - Principle, instrumentation and applications of colorimetry and UV-Vis spectrophotometer. Emission Spectroscopy – Spectrofluorimeter - Principle, instrumentation and applications. Flame photometry - principle and applications.

Unit II

Chromatographic Techniques: Chromatography - Principle, method and applications of paper, thin layer, ion exchange, affinity chromatography, gel permeation chromatography and Gas liquid chromatography.

Unit III

Centrifugation Techniques: Cell disruption and homogenization-Media for homogenization, methods of cell disruption. Centrifugation - principle-sedimentation coefficient, RCF. Types of centrifuges and rotors. Preparative centrifugation differential, density gradient centrifugation. Analytical ultracentrifugation – instrumentation and applications- Determination of molecular weight.

Unit IV

Electrophoretic techniques: Electrophoresis - Principles and applications of electrophoresis, Factors affecting electrophoretic mobility. Types of electrophoretic techniques – zonal, capillary, paper and agarose gel. PAGE- Native- PAGE and SDS PAGE. (Staining method used in electrophoretic technique.) Isoelectric focusing.

Unit V

Radio isotopic techniques: Types of radioactive decay, rate of radioactive decay, decay constant, Units of radio activity, measurement of radioactivity based on ionization- GM counter and excitation- Scintillation counter. Autoradiography. Applications of radioisotopes in biology. Hazards of radioactivity.

Reference Books:

1. Principles and Techniques of Practical Biochemistry, Keith Wilson & John Walker, Cambridge University Press, India. 2005.
2. Textbook of Biochemistry, West, E.S. and Todd, W.R., MacMillan, Germany, 1985.
3. Biophysical Chemistry (Principles and Techniques) 4th Edition, Avinash Upadhyay, Kakoli Upadhyay and Nirmalendu Nath, Himalaya Publishing House, India, 2014.
4. Bioanalytical Techniques, Abhilasha Shourie and Shilpa S Chapadgaonkar, The Energy and Resources Institute, TERI, India, 2015.
5. Research Methodology, Methods and Techniques, 2nd ed, C.R. Kothari, New Age International Publishers. India, 2004.
6. Introduction to Instrumental Analysis, Braun, R.P. Tata McGraw Hill, India, 1987.
7. Research Methodology, Methods and Techniques 2nd Edition, C.R. Kothari, New Age International Publishers. New Delhi, 2004.
8. Fundamentals of Bio Analytical Techniques and Instrumentation, Ghosal Sabari and Srivastava A. K., PHI Learning Pvt. Ltd. India, 2009.
9. Introduction to Spectroscopy. 3rd Edition. Pavia *et al*, Brooks/Cole Pub Co., New Delhi, India, 2000.
10. Basic Instrumentation, K. K. Machve, Neha Publishers & Distributors, India 2010.

CORE PRACTICAL II

BIOCHEMICAL TECHNIQUES AND INSTRUMENTATION

Objectives:

1. To study the techniques used in understanding the biological process
2. To understand the principle and application of Bioinstrumentation.

Practical:

1. Preparation of buffers and measurement of pH.
2. Titrable acidity of amino acids
3. Measurement of BP
4. Calculate BMI
5. Handling of Colorimeter and Spectrophotometer
6. Estimation of RNA by orcinol method.
7. Estimation of DNA by Diphenylamine method.

Demonstration

8. Paper chromatography for separations and detections of simple sugars and amino acids.
9. Separation of plant pigments by column chromatography.
10. Thin layer chromatography of amino acids.

Reference Books:

1. Methods in Enzymology Vol. I and II by S.P. Colowick and N.O. Kaplan eds. New York: Academia Press 1955.
2. A Textbook of Practical Biochemistry by David Plummer. Tata McGraw-Hill Education, 1988.
3. Laboratory Manual in Biochemistry by J. Jayaraman. New Age International Publishers. 2nd Edn. 1981.
4. Varley's Practical Clinical Biochemistry by Alan H Gowenlock, published by CBS Publishers and distributors, India Sixth Edition, 1988.

SECOND ALLIED COURSE I

BIOLOGY - I

Objective:

The study of biology aims to increase understanding of living systems and to consider the systems in relationship to the self and other organisms in the natural environment.

UNIT I

Molecular Biology - Structure of atoms, molecules and chemical bonds. Composition, structure and functions of biomolecules: carbohydrates, proteins, lipids and nucleic acids. Stabilizing interactions: Vanderwaals, electrostatic, hydrogen bonding and hydrophobic interactions.

UNIT II

Cell Biology – Membrane: structure of membrane, lipid bilayer, osmosis, ion channels, and membrane pumps, active transport, electrical properties of membranes.

UNIT III

Cell Biology – Structure and function of cellular organelles – cell wall, nucleus, mitochondria, golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, chromosomes, chromatin, mitosis and meiosis and cell cycle.

UNIT IV

Developmental Biology – Animal: Production of gametes, zygote formation, blastula, gastrula and formation of germ layers in animals, embryogenesis. Programmed cell death, ageing and senescence.

UNIT V

Developmental Biology – Plants: Double fertilization in plants, seed formation, germination, organization of shoot and root apical meristem, shoot and root development, flowering.

Reference Books:

1. General, organic and Biochemistry, 2nd edition, Ira blei & George Odian, W.H. Freeman Company, New York 2006.
2. Molecular Biology of the cell- 4rd ed. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. New York: Garland Science; 2002.
3. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, P.S.Verma & V.K. Agarwal, S. Chand & Company Ltd, New Delhi, 2004
4. Environmental Biology (Principles of Ecology) P.S. Verma & V.K. Agarwal, S. Chand & Company Ltd, New Delhi, 2012.
5. Cell Biology, C.B. Powar, Himalaya Publishing House, 2010.
6. Plant Biochemistry, 4th ed, Hans-walter Heldt, Academic press, Elsevier Publications, 2010.
7. Plant Physiology 4th ed, SN Pandey, BK Sinha, Vikas Publishing House, New Delhi, 2009.
8. Introductory Modern Biology, S.Sundara Rajan, Anmol Publications Pvt. Ltd, New Delhi.
9. Text Book of Plant Physiology, V. Verma, Ane Books Pvt. Ltd, New Delhi, 2011.
10. Essentials of Modern Bology, R.C. Sobti, V.L. Sharma, Ane Books India, 2009.

SECOND ALLIED PRACTICAL II

MICROBIAL, PLANT AND CELL BIOLOGY (P)

Objective:

To identify, study and analyses the microbial, plant and animal specimens.

Practical:

1. To learn use of microscope, principle of fixation and staining.
2. Study of various plant cell types.
3. To carryout gram staining for identifying bacteria.
4. To prepare squash mounts of onion root tips to study mitosis.
5. To study meiosis through permanent slides.
6. Separation of chloroplast pigments by paper chromatography.
7. To study the cytochemical distribution of nucleic acids and mucopolysaccharides within cells/tissues from permanent slides.
8. To raise the culture of E.coli and estimate the culture density by turbidity method. Draw a growth curve from the data.
9. Observation of various stages of chick embryo.
10. Measurement of Physico – Chemical parameters in aquatic environment.
 - A. Dissolved Oxygen
 - B. Salinity
 - C. pH (Using pH paper (or) pH meter or Lovidbond Comparator). Free Carbon –di-oxide, carbonates and bicarbonates.

Reference Books:

1. Biology, 8th edition, Campbell, N.A. and Reece, J. B. Pearson Benjamin Cummings, San Francisco (2008).
2. Biology 7th edition, Raven, P.H et al Tata McGraw Hill Publications, New Delhi (2006).
3. Introduction to Genetic Analysis, 9th edition, Griffiths, A.J.F, W.H. Freeman & Co. NY (2008).
4. Introductory Microbiology (Bell and Howell Co, London), Ross, F.C. (1986).
5. Practical Cytology, Taylor, R.G.W, Academic Press, London (2005).

NON MAJOR ELECTIVE I

HEALTH AND DISEASE

Objective:

To understand the biochemistry and disorders of various diseases commonly affecting human beings.

Unit I

Specimen collection and processing (blood, urine and faeces). Anti coagulants and preservatives for blood and urine. A brief review of units and abbreviations used in expressing concentrations, standard solutions and clinical values. Electrolytes and acid base balance. Maintenance of acid base balance by respiratory and renal mechanism. Acidosis and alkalosis.

Unit II

Disorders of Carbohydrate metabolism: Diabetes mellitus, glucose tolerance test, sugar levels in blood, renal threshold for glucose, factors influencing blood glucose level.

Unit III

Disorders of Lipids and Proteins: Plasma lipoproteins, cholesterol, triglycerides and phospholipids in health and diseases. Hyperlipidemia, hyperlipoproteinemia, abetalipoproteinemia. Abnormalities in nitrogen metabolism uremia, hyperuricemia, coma.

Unit IV

Disorders of liver, kidney and heart: Jaundice, fatty liver, functions of liver and kidney. Diagnostic enzymes – enzymes in health and diseases. Renal calculi, Cardiac arrest and management, atherosclerosis.

Unit V

Cancer – properties of cancer cells, etiology of cancer, carcinogenic agents, biochemistry of metastasis, tumor markers. Gall stones, Prenatal diagnosis and postnatal diagnosis, duodenal ulcer, diseases of hyper and hypothyroidism.

Reference Books:

1. Textbook of Medical Biochemistry, Chatterjea, MN and Rana Shinde. Jaypee Brothers, New Delhi, 7th edition, 2007.
2. The Biochemistry of Clinical Medicine, William S. Hoffman, Year Book Medical publishers, 1964.
3. Clinical Medicine (A Textbook of Clinical Methods and Laboratory Investigations), KV Krishna Das (Editor in Chief), 2013, Jaypee Brothers Medical publishers, New Delhi.
4. Clinical Chemistry Interpretation and techniques, 4th edition, A.Kaplan, R. Jack, K.E. Opheim, B. Toivola, A.W. Lyon, Williams and Wilkins, USA, 1995.
5. Clinical Chemistry in Diagnosis and treatment, J.F. Zilva and P.R. Pannall the d., G Publishing pvt limited, 1984.
6. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, Carl A. Burtis , Edward. Ashwood and David E. Bruns, Elsevier2012.
7. Biochemistry with clinical Correlation, T.M. Devlin, 7th edition, Wiley Publications2010.

CORE COURSE IV

ENZYMES

Objectives

1. To understand the basic concepts of enzymes.
2. To study the enzyme kinetics and applications.

Unit I

Enzymes- Definition, nomenclature and classification of enzymes, Properties, Structure and functions of coenzymes. Metallo enzymes and metal activated enzymes. Units of enzyme activity, turn over number. Non protein enzymes - ribozymes and abzymes.

Unit II

Isolation and purification of enzymes: Isolation – Localization and Extraction of Free and membrane bound enzymes. Methods of purification. Separation procedures based on molecular size, solubility difference and electric charge and selective adsorption. Criteria of purity of enzymes.

Unit III

Enzyme kinetics: Factors influencing enzyme activity, Derivation of Michaelis-Menton equation, Line weaver-Burk plot, activators, Inhibitors kinetics - Types of inhibition - Competitive, noncompetitive, uncompetitive, feedback inhibition and allosteric inhibition.

Unit IV

Mechanism of enzyme action- active site Characteristics, Lock and Key model, induced fit hypothesis. Mechanism of enzyme catalysis, enzyme-substrate complex formation, mechanism of bisubstrate reactions. Mechanism of action of chymotrypsin, lysozyme and carboxypeptidase.

Unit V

Multienzyme complex- pyruvate dehydrogenase, Isoenzymes of lactate dehydrogenase. Immobilized enzymes- principles and applications: Enzymes as a marker in clinical diagnosis. Industrial applications of enzymes.

Reference Books:

1. Introduction to Biomolecules Enzymes, Renuka Harikrishnan, Indrajai Pub, 1995.
2. Understanding Enzymes-Fourth Edition, Trevor Palmer, New Delhi: Prentice Hall of India Foster, Nature of Enzymology, Croom Helm, 1979.
3. Fundamentals of Enzymology, Nicholas C Price, Oxford University Press 1989.
4. Enzymes, Samuel Devlin Sarup & Sons, 2005.
5. Biochemistry – 4th Edition, Stryer 1995.
6. Fundamentals of Biochemistry. (6th ed.) J.L. Jain, Sanjay Jain and Nitin Jain. New Delhi: S. Chand & company Ltd. 1997.
7. Biochemie (German Edition) Jeremy M. Berg and Lubert Stryer, 2013

SECOND ALLIED COURSE III

BIOLOGY - II

Objective:

The study of biology aims to increase understanding of living systems and to consider the systems in relationship to the self and other organisms in the natural environment.

UNIT I

Taxonomy – Concepts of species of hierarchical taxa, biological nomenclature, classical and quantitative methods of taxonomy, classification of plants, animals and microorganisms.

UNIT II

Inheritance Biology – Mendelian principle, allele, multiple allele, pseudo allele, codominance, incomplete dominance, pleiotropy, linkage and crossing over, sex linkage, sex limited and sex influenced characters. Inheritance of Mitochondrial and chloroplast genes, maternal inheritance.

UNIT III

Plant Physiology – Photosynthesis, C₃, C₄ pathway, photorespiration, nitrate and ammonia assimilation, plant hormones, Phytochemicals; alkaloids, flavonoids, saponins, quinones, terpenes, phenols, nitrogenous compounds - functions.

UNIT IV

Environmental Biology – Physical environment, biotic and abiotic, Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement energy flow and mineral cycling in ecosystem. Terrestrial and aquatic ecosystem.

UNIT V

Evolutionary Biology – Lamarck; Darwin–concepts of variation, adaptation, struggle, fitness and natural selection; Spontaneity of mutations; the evolutionary synthesis. The evolutionary time scale; Eras, periods and epoch; Origins of unicellular and multi cellular organisms; Hardy – Weinberg law.

Reference Books:

1. General, organic and Biochemistry, 2nd edition, Ira Blei & George Odian, W.H. Freeman Company, New York 2006.
2. Molecular Biology of the cell- 4th ed. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. New York: Garland Science; 2002.
3. Cell Biology, C.B. Powar, Himalaya Publishing House, 2010.
4. Plant Biochemistry, 4th ed, Hans-walter Heldt, Academic press, Elsevier Publications, 2010.
5. Plant Physiology 4th ed, SN Pandey, BK Sinha, Vikas Publishing House, New Delhi, 2009.
6. Environmental Biology (Principles of Ecology) P.S. Verma & V.K. Agarwal, S. Chand & Company Ltd, New Delhi, 2012.
7. Introductory Modern Biology, S. Sundara Rajan, Anmol Publications Pvt Ltd, New Delhi.
8. Text Book of Plant Physiology, V. Verma, Ane Books Pvt Ltd, New Delhi, 2011.
9. Essentials of Modern Biology, R.C. Sobti, V.L. Sharma, Ane Books India, 2009.
10. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, P.S. Verma & V.K. Agarwal, S. Chand & Company Ltd, New Delhi, 2004.

NON MAJOR ELECTIVE II

HOSPITAL MANAGEMENT

Objective:

To study the basic principles of hospital management.

Unit I

Introduction to Hospital management: Eligibility and personal skills required for Hospital management. Job opportunities in Hospital management. Important hospital management Institutes in India and around the World.

Unit II

Hospital management system: Benefits and Modules of Hospital management systems. Interfacing of analyzer. Pathology lab management. Radiology, Blood Bank, Pharmacology, management softwares.

Unit III

Health Care Services: Health and Hospitals Services, Classification and Characteristics of Service Organizations, , Healthcare Revolution, Dimensions of Health, Indicators of Health- Composition of Health Sector, Types of Care, Pyramidal Structure of Health Services, Hospitals, Types of Hospitals and Role of Hospital in Healthcare

Unit IV

Health care Facilities: Functioning of modern hospitals & changing need of patients Hospitality in Hospital Care, Invasive and non-invasive diagnostic facilities in modern hospital Care offered in Specialty and Super specialty Hospitals.

Unit V

Health and Management: Current Issues in Healthcare Accreditation-Tele medicine-Health Tourism-Health Insurance and Managed Care-Disaster Management-Hospital Wastes Management

Reference Books:

1. Grant's Method of Anatomy: A Clinical Problem-solving Approach (BI Waverly Pvt. Ltd., New Delhi) John V. Basmajian and Charles E. Slonecker, ISBN 81-7431-033-9, 1989.
2. Anatomy and Physiology for Nurses by, Watson, Roger, ISBN 9780702043581, 2013.
3. Textbook of Preventive and Social Medicine (M/S Banarsidas Bhanot Elaine La Monica, J.E. Park and K. Park, Management in Health Care (Macmillan Press Ltd, London) 2011.
4. Principles of Hospital Administration and Planning (Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi), B.M. Sakharkar, 2009.
5. Hospital Administration (Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi), C.M. Francis and et al., 2004.
6. Management Process in Health Care (Voluntary Health Association of India, S. Srinivasan (ed.), New Delhi), 1992.

CORE COURSE V

BIOENERGETICS AND METABOLISM

Objectives:

To understand the energy transformation and metabolic pathways in living organism.

Unit I

Bioenergetics: Free energy and entropy changes in biological system, coupling of endergonic and exergonic processes. High energy phosphate compounds-Structure and importance of ATP. Biological oxidation-Enzymes involved in oxidation and reduction- oxidases, dehydrogenases, hydroperoxidase and oxygenases. Cytochrome P-450 monooxygenases system.

Unit II

Mechanism of oxidative phosphorylation- Chemiosmotic theory, ATPases. Oxidative phosphorylation – uncouplers, inhibitors, ionophores. Electron transport chain. Inhibitors of ETC. Malate and glycerophosphate shuttles.

Unit III

Carbohydrate metabolism: Glycolysis and its energetic. gluconeogenesis, oxidation of pyruvate to acetyl CoA, TCA cycle and its energetics -anaplerotic reactions; Hexose monophosphate pathway, glycogenesis and glycogenolysis, glucuronic acid cycle; glyoxalate cycle; metabolism of galactose and fructose.

Unit IV

Lipid metabolism: Biosynthesis of fatty acids- biosynthesis and catabolism of triglycerides, phospholipids and glycolipids. Oxidation of fatty acids - α , β and γ oxidation; Cholesterol- synthesis and degradation. Ketogenesis; plasma lipoproteins.

Unit V

Protein, nucleic acid and porphyrins metabolism: catabolism of amino acids - Deamination, decarboxylation, transamination-Glycogenic and ketogenic amino acids, urea-biosynthesis. Metabolism of purine and pyrimidine nucleotides. Biosynthesis and degradation of porphyrins, Heme.

Reference Books:

1. Principles of Biochemistry – 7th edition, Lehninger, Nelson & Cox, Macmillan worth Publishers, 2013.
2. Biochemistry 29th edition Robert Harper's, McGraw Hill, 2012.
3. Biochemistry, 5th edition, Stryer W.H Freeman. Donald Voet, J.G. Voet, John Wiley, J O H N WI VP & *Publisher* Kaye Pace, 2005.
4. General Biochemistry – Weil (Wiley Eastern, India).
5. Essentials of Biochemistry – A.I. Jain. 2nd edition. S.Chand publications, 2004.
6. Primer for the Exercise and Nutrition Sciences: Thermodynamics, Bioenergetics, Metabolism, Christopher B. Scott. 2010.
7. Bioenergetics (Biochemistry Research Trends), Jeffrey W. Berkin, 2011.
8. Bioenergetics: Energy Conservation and Conversion (Results and Problems in Cell Differentiation), Günter Schäfer, 2008.

CORE COURSE VI
CELL AND MOLECULAR BIOLOGY

Objectives:

1. To study the structural and functional organization of cells
2. To acquire basic fundamental knowledge and explore skills in molecular biology and become aware of the complexity and harmony of the cells

Unit I

An Overview of cells: Origin and evolution of cells. Cell theory, Classification of cells – Prokaryotic and Eukaryotic cells. Comparison of prokaryotic and eukaryotic cells. Cell Membrane – Fluid mosaic model of membrane structure and its composition. Cell cycle.

Unit II

Cell differentiation in plants and animals - Structure and function of cell membranes and organelles- Endoplasmic reticulum, Ribosomes, Mitochondria, Chloroplast, lysosomes, Golgi apparatus- structure and their functions.

Unit III

DNA as a genetic material: Identification of DNA as genetic materials- Griffith, Hershey –Chase experiment. DNA replication in Prokaryotes and Eukaryotes - enzymes and accessories proteins involved in DNA replication - Types of DNA damage and repair (Direct enzymatic repair, Base excision repair, Nucleotide excision repair, Mismatch repair- Double-strand break repair Non-homologous end joining Homologous recombination)

Unit IV

Transcription: prokaryotic and eukaryotic transcription, RNA polymerase, general and specific transcription factors, regulatory elements and mechanisms of transcription and regulations -Post transcriptional modification-Capping, polyadenylation, splicing, RNA editing.

Unit V

Translation: Protein synthesis in prokaryotic and eukaryotes- activation, initiation, elongation and termination of protein synthesis. Inhibitors of protein synthesis, Post translational modification, Gene regulation- Operon model – lac and trp operons, transposons and their functions.

Reference Books:

1. The cell: Molecular approach, 5th Edition. Cooper, G.M., Hausman, R.E., American Society of Microbiology press, USA 2009.
2. Cell and Molecular biology. Gupta. P.K., Rastogi Publications, India 2005.
3. Cell and Molecular Biology: Concepts and Experiments. 5th Edition. Karp, G. John Wiley and Sons, USA 2007.
4. Essential Cell Biology. 3rd Edition. Alberts, B., Bray, D., Hopkin, K., Johnson, A. D., Johnson, A., Lewis, J., Raff, M., Roberts, K., Walter, P. Garland science, USA 2009.
5. Molecular Biology of the Cell, 5th Edition, Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., Walter, P. Garland Science, USA 2008.
6. Molecular cell biology, 5th Edition. Lodish, H. Berk, A., Matsudaira, P., Kaiser, C. A., Krieger, M., Scott, M.P. Lawrence Z., Darnell, J. W. H. Freeman, USA 2003.
7. Cell and Molecular Biology, 3rd Edition. Rastogi, S.C. New age International Publishers, India 2012.
8. Biochemistry, 3rd Edition. Sathyanarayana U, New Central Book Agency (p) Ltd 1999.

CORECOURSE VII

MICROBIOLOGY

Aim: To provide basic knowledge on microbiology subject

Objective: To understand the structure of different kinds of micro organisms and their isolation and characterization it helps the student to gain basic information about microbiology

Unit I

Bacteria. Eubacteria, cyanobacteria, Archaeobacteria, Bergey's classification scheme for bacteria. Staining of bacteria. Size and shape of bacterial cells. Modes of reproduction, enumeration, bacterial growth curve, synchronous growth, physical and chemical methods of controlling bacterial growth. Cultivation of bacteria. Nutritional requirements. Types of media. Factors affecting growth of microbes. Choice of media and conditions of incubation. Isolation and maintenance of pure cultures.

Unit II

Fungi, Algae and viruses. Fungi- classification, cultivation and morphology of yeasts and molds. Control of fungal growth. Algae- occurrence, characteristics, classification and biological, importance. Viruses of bacteria, bacteriophages, general characteristics.

Unit III

Food Microbiology- Food spoilage, food preservation, fermented foods. Infected foods and human illness- botulism, Clostridium welchi poisoning, Staphylococcus poisoning, Salmonella- infection. Dairy microbiology- contamination of milk by bacteria. Bacterial count. Reactions occurring in milk. Pasteurization and sterilization, fermented milk products, cheese.

Unit IV

Medical Microbiology. Infection- sources and transmission of infection. Types of infection and factors influencing infection. Harmful microbes - endo and exotoxins. Antimicrobial agents. Sterilization and disinfection.

Unit V

Microscopical examination of microorganism-Bright field, Dark field principle and applications of fluorescent and phase contrast, scanning electron microscope and transmission microscopy.

Reference Books

1. Michael Microbiology, Pelczar, Jr., 2001.
2. Microbiology – Essential and applications, Larry K. McKane and Judith Kande. 1995.
3. Text book of Microbiology, Ananthanarayanan and Paniker Orient Long, 2009.
4. Review Of Medical Microbiology and Immunology, Twelfth Edition, Warren E. Levinson 2012
5. Microbiology – Lederberg, Encyclopedia, Academic Press, 1992.
6. Textbook of Microbiology, Ananthanarayan, Paniker and Arti Kapil Ananthanarayan and Paniker's , 2013.
7. Text Book of Microbiology, P. C. Trivedi, 2010.
8. Text Book of Microbiology, PHBS Sarma, 2013.

CORE PRACTICAL III

FOOD AND ENZYME BIOCHEMISTRY (P)

Objective:

To enhance the production, nutritional value, safety, tastes of foods. This course emphasizes techniques in food analysis.

Practical:

1. Moisture content of food materials
2. Ash Content of food materials.
3. Estimation of carbohydrate by anthrone method in food samples.
4. Estimation of protein by Lowry's method in food samples.
5. Estimation of fat content in food samples (wheat, rice flour, gram flour and milk)
6. Estimation of nitrogen, iron, phosphorus and calcium
7. Determination of specific activity, pH and temperature of alkaline phosphatase and amylase

Reference Books:

1. A Textbook of Practical Biochemistry, David Plummer, McGraw-Hill Education, 1988.
2. Laboratory Manual in Biochemistry, J. Jayaraman, New Age International Publishers. 2 nd Edn. 1981.
3. Introductory Practical Biochemistry, S.K. Sawhney, Randhir Singh. Narosa publishing house, 2000.
4. Textbook of Clinical Chemistry, 3rd ed, WB Saunders, Burtis & Ashwood, TietZ, 1999.

MAJOR BASED ELECTIVE I

PHARMACEUTICAL BIOCHEMISTRY

Objectives:

1. To make a detailed study about action of drugs on living systems.
2. To understand the ADMET (Absorption, Distribution, Metabolism, Excretion and Toxicity) properties of drugs.

Unit I

Pharmacodynamics and Kinetics: History of Drugs, Classification of drugs, routes of drug administration, absorption and distribution of drugs, factors influencing drug absorption and elimination of drugs. Toxicity assessment: acute, sub chronic, chronic exposure, determination of ED₅₀ and LD₅₀ values.

Unit II

Drug- Receptor interactions: Receptor- definition, Agonist and antagonist. Types of receptor - G-protein coupled receptor, Receptors with intrinsic ion channel, Enzymatic receptors, receptors regulating gene expression, involvements of binding forces in drug receptor interaction, drug action not mediated by receptors.

Unit III

Drug metabolism: Phase I reactions - role of Cytochrome P450. Microsomal and Non microsomal reactions. Phase II reactions-Conjugation reactions. Physiological importance of xenobiotic metabolism.

Unit IV

Chemotherapy: Basic concept. Mode of action of antimicrobial drugs- antibacterial, antifungal, antiviral and antimalarial drugs. Cancer chemotherapy: Cancer and principles of cancer chemotherapy. Mode of action of anticancer drugs- antimetabolites, antibiotics, alkylating agents and other agents.

Unit V

Drugs acting on various systems: CNS-sedative- hypnotic, GI tract- drugs for peptic ulcer, diarrhea and constipation. Miscellaneous drugs - antiseptic, disinfectant, chelating agents. Adverse drug reactions and drug induced side effects, biological effects of drug abuse and drug dependence, drug tolerance and intolerance.

Reference Books:

1. Essentials of Medical Pharmacology, (7th Edition), K. D. Tripathi, Jaypee Publishers, 2010.

2. A Textbook of Pharmaceutical Chemistry (3rd edition). Jayashree Ghosh, S.Chand & Company Ltd., New Delhi, 2010.
3. Introduction to Drug Metabolism (3rd edition). Gordon Gibson, G. and Paul Skett. Nelson Thornes. UK, 1999.
4. Pharmacology and Pharmacotherapeutics, Vol I & II. Popular Prakasam Pvt. Ltd., Satoskar, R. S and Bhandarkar, S. D, New Delhi, 1993.
5. Harper's Biochemistry. (25th edition), Robert K. Murray, Daryl K. Granner, Peter A. Mayer and Victor W. Rodwell, Mc Graw Hill, New York, 2006.
6. Medicinal Chemistry (7th edition), Thomas L. Lemke, David A. Williams, Victoria F. Roche and S. William Zito, Foye's Wolters Kluwer, 2012.
7. Basic and Clinical Pharmacology, (12th edition), Bertram Katzung, Lange Publishers, 2012.
8. Fundamentals of Medicinal Chemistry - Gareth Thomas, Wiley Blackwell Publishers, 2003.
9. Biopharmaceuticals: Biochemistry and Biotechnology, Gary Walsh, 2nd Edition, Wiley-Blackwell Publishers, 2003.
10. Essentials of Pharmaceutical Chemistry, 4th edition, Pharmaceutical Press, Donald Cairns, 2012.

CORE COURSE VIII

IMMUNOLOGY

Objectives:

To study about immune response and immunological techniques

Unit I

The Immune system- Primary and Secondary Lymphoid organ, Lymphocytes- their origin and differentiation, NK cells. Antigen presenting cells-macrophages, dendritic cells, langerhans cell- their origin and function. Mechanism of phagocytosis. Complement –characteristic features- biological function-activation, types of immune responses, immune tolerance.

Unit II

Immunity: Types of immunity- Innate immunity- classification- mechanism of nonspecific immunity. Acquired immunity- active and passive, vaccine-active immunization, passive immunization. Immunity to infection- bacteria, virus and protozoa. Immune response. Humoral and cell mediated immunity –induction-mechanism-cytokines -interleukins- Interferon-their role in immune response.

Unit III

Immunoglobulins- Structure, types, biological functions - generation of diversity. Antigen- Types –factors determining antigenicity. Antigen- antibody interactions-agglutination, complement fixation - opsonization, bacteriolysis and precipitation-Antitoxins.

Unit IV

Immunity to infection: Hypersensitivity reactions- types and mechanism-Transplantation-types-allograft rejection mechanism and prevention of graft rejection- immune-suppressive drugs. HLA-immune response genes- HLA molecules, Auto immune diseases- pathogenesis – treatment.

Unit V

Immunochemical techniques. Production of antisera- the precipitation reaction, immunodiffusion, immunoelectrophoresis, immunofluorescence, complement fixation test. Principle, technique and applications of RIA and ELISA. Hybridomas –monoclonal antibody production-uses.

Reference Books:

1. Immunology --8th edition, Ivan Roitt, - *Publisher* Wiley-Blackwell: 2012.
2. Immunology – Weir, Churchill Livingstone,. *Publisher*.; 8th edition (June 1997);
3. Donald M. Weir, Immunology, John Steward. Published by Harcourt *Publishers* Ltd; (1997).
4. Immunology –3rd ed Kuby,Freeman, 1997.
5. Immunology - Tizerd, Saunders College *Publishing*, 9th edition 2004.
6. Immunology- Dulsy Fatima and N. Arumugam, 2014.
7. Immunology- Male, with student Consult Online Access, 2012.
8. Immunology- C. Vaman Rao, 2007.

CORE COURSE IX
CLINICAL BIOCHEMISTRY

Objectives:

1. To know the clinical aspects of various metabolic disorders
2. To understand the significance of diagnostic bio chemistry

Unit I

Basic concepts of Clinical Biochemistry: A brief review of units and abbreviations used in expressing concentrations and standard solutions. Specimen collection and processing (Blood, urine, faeces). Anticoagulant preservatives for blood and urine. Transport of specimens.

Blood coagulation - disturbances in blood clotting - haemophilia A and haemophilia B. Blood groups, haemoglobin in anaemias, sickle cell anemia, thalassemia, Porphyrias and porphyrinurias. Blood banking.

Unit II

Homeostasis, Disorders of fluids, electrolyte balance and gastrointestinal system, disorder involving change in hydrogen ion concentration. Liver function tests, jaundice, haemolytic, hepatic and obstructive jaundice. Renal function tests, normal and abnormal constituents of urine.

Unit III

Disorders of carbohydrate metabolism: Sugar level in normal blood, maintenance of blood sugar concentration – endocrine influence on carbohydrate metabolism, hypoglycemia, glycosuria, renal threshold value, diabetes mellitus – classification, complications, glucose tolerance test (GTT), diabetic coma, diabetic ketoacidosis, glycogen storage diseases, fructosuria, galactosemia, and hypoglycemic agents.

Unit IV

Disorders of protein, amino acid and nucleic acid metabolism: plasma proteins, their origin, significance and variation in diseases. Nitrogen balance, proteinuria, multiple myeloma, Wilsons disease. Phenylketonuria, alkaptonuria, tyrosinosis, albinism, Hartnups disease. Fanconic syndrome, cystinuria, Gout.

Unit V

Disorders of lipid metabolism: lipid metabolism in liver and adipose tissue, plasma lipoproteins, cholesterol triglycerides and phospholipids in health and diseases, fatty liver, atherosclerosis, lipid storage diseases, hypolipoproteinemia and hyperlipoproteinemia.

Reference Books:

1. Clinical Chemistry in diagnosis and treatment, Philip, 6th ed ELBS. D. Mayne & Edward Arnold, 1994.
2. Textbook of Clinical Chemistry, 3rd ed, Burtis & Ashwood, TietZ WB Saunders, 1999.
3. Text book of Medical Biochemistry 2nd Edition, M.N. Chatterjee and Rana Shinde, Jaypee Brothers Medical publishers Private limited, New Delhi 1995.
4. Clinical Biochemistry – Metabolic & Clinical Aspects, William J.Marshall, Stephen K. Bansert, Churchill Livingstone, 1995.
5. Clinical Chemistry – Principles, procedures, correlations – Bishop, Lippincott.2000.
6. Fundamentals of Biochemistry - Ambika shanmugam, S.Chand, by Publishers 1986.

CORE PRACTICAL IV

HAEMATOLOGY AND CLINICAL BIOCHEMISTRY (P)

Objective:

To impart thorough knowledge about the biochemical basis of various diseases and Disorders.

Practical:

1. Collection of blood and urine, Types of preservative and anticoagulants
2. Blood grouping, hemoglobin content, PCV, TC/DC count and ESR
3. Qualitative tests of urine. Abnormal constituents- sugar, protein (albumin), ketone bodies, bile pigments and bile salts.
4. Quantitative estimation in blood
 - a. Glucose
 - b. Cholesterol
 - c. Calcium
 - d. Urea.
 - e. Iron
 - f. Bilirubin
 - g. Uric acid
 - h. Creatinine
5. Quantitative estimations in urine
 - a. Glucose
 - b. Urea
 - c. Uric acid
 - d. Creatinine

Reference Books:

1. A Textbook of Practical Biochemistry- David Plummer, Tata McGraw-Hill Education, 1988.
2. Laboratory Manual in Biochemistry. J.Jayaraman, New Age International Publishers. 2 nd Edn. 1981.
3. Introductory Practical Biochemistry - S.K.Sawhney, Randhir Singh, Narosa publishing house, 2000.
4. Textbook of Clinical Chemistry, 3rd ed- TietZ , WB Saunders, Burtis & Ashwood, 1999.
5. Practical Clinical Biochemistry- Alan H Gowenlock, Varley's published by CBS Publishers and distributors, India Sixth Edition, 1988.
6. Practical clinical Biochemistry- Harold Varley, CBS Publishers & Distributors, 2006.

MAJOR BASED ELECTIVE II

ENDOCRINOLOGY

Aim:

To obtain sound knowledge in hormonal biochemistry

Objective:

Clinical endocrinology plays a vital role in clinical biochemistry and metabolism. This syllabus substantiates understanding other subject.

Unit I

Thyroid hormones- definition, classification, biosynthesis and circulation in blood. Mechanism of hormone action. Plasma membrane receptors. Adenylate cyclase, Role of G-proteins. Protein kinases, tyrosine, kinase, Inositol phosphate. Calcium, calmodulin. Mechanism of steroid hormone receptors- Mechanism of action of steroid hormone.

Unit II

Hormones of the thyroid Biosynthesis and biological actions of thyroid hormones. Antithyroid agents. Thyroid disease- thyrotoxicosis, Goiter, Grave's disease, Hashimoto's thyroiditis. Parathyroid hormone- Biological actions regulation of calcium and phosphorous metabolism. Calcitonin. Calcitriol- Biosynthesis and functions. Hyper and hypocalcemia. Hyperparathyroidism, hypoparathyroidism, Paget's disease. Ricket's and osteomalacia.

Unit III

Hypothalamus and pituitary hormones: Vasopressin and oxytocin- synthesis and biological effects. Hypothalamic releasing factors. Anterior pituitary hormones- actions. Growth promoting and lactogenic hormones. Glycoprotein hormones the POMC family. Endorphins, MSH. Gigantism, Acromegaly, Dwarfism and Diabetes insipidus.

Unit IV

Pancreatic hormones- Insulin- Biosynthesis, regulation of secretion and biological actions. Mechanism of action of insulin. Glucagon, somatostatin and pancreatic polypeptide. Insulin like growth factors.

Unit V

Adrenal hormones - Glucocorticoids, Mineralocorticoids- synthesis and biological effects. Catecholamines: biosynthesis and biological effects. Gonadal hormones- Androgens and estrogens. Ovarian cycle. Abnormal secretion of adrenal hormones- Addison's disease. Cushing's syndrome, congenital adrenal hyperplasia, pheochromocytoma.

Reference Books:

1. Textbook of Endocrinology –8th edn. Wilson and Foster, 1998.
2. Principles of Biochemistry – Mammalian Biochemistry – Smith et al, Mc Graw Hill, 1982.
3. Mechanisms of Hormone Action, Estelle Jones, Hardcover - 2015
4. Harper's Biochemistry – Murray et al. 26th ed. McGraw Hill, 2003.
5. Principles of Biochemistry – Mammalian Biochemistry – Smith et al. McGraw Hill 7th ed.
6. Textbook of Endocrinology- Williams et al, 2015.

MAJOR BASED ELECTIVE III

BASIC BIOTECHNOLOGY

Objective:

To understand the technological aspect applied to molecular and microbial biology.

Unit I

Fermentation Biotechnology –Biotechnology – scope and importance, Basic principles of microbial growth, Bioreactor- batch and continuous bioreactor, fermentation culture medium, downstream processing. Fermentation production of penicillin and vitamin B₁₂.

Unit II

Food and Industrial Biotechnology – Fermentation production of yoghurt and cheese. Production of single cell protein; spirulina: cultivation and uses. Biofertilizers – blue green algae: cultivation and uses. Production of amylase and protease.

Unit III

Molecular Biotechnology - Basic principles of cloning, Introduction of foreign DNA in to host by particle bombardment gun, electroporation and microinjection. Basic Polymerase Chain Reaction (PCR), applications, Micro arrays, the human genome project.

Unit IV

Animal and Plant Biotechnology – Elementary details of Animal cell and tissue culture, medium, transfection, targeted gene transfer, transgenic animals. Plant cell and tissue culture, medium, totipotent, pluripotent cells, protoplast culture, artificial seeds, and transgenic plants.

Unit V

Environmental Biotechnology – Biological fuel generation- ethanol and methane from biomass. Sewage treatment. Bioremediation: oil spill cleanup, bioleaching, IPR, Biosafety and hazards of environmental engineering.

Reference Books:

1. Molecular Biotechnology: Principles and Applications of Recombinant DNA- B.R. Glick & J.J. Pasterak, ASM Press, Washington, D.C., 2010
2. Gene cloning and DNA analysis: an introduction / T.A. Brown.—6th ed. Brown, T.A. (Terence A.) Wiley-Blackwell. 2010.
3. Elements of Biotechnology- P.K.Gupta, Rastogi Publications, 2nd edition 3rd reprint, 2015-2016.
4. A text book of Biotechnology- R.C.Dubey, S.Chand Publications, 2014
5. Industrial Microbiology- A.H.Patel, Macmillan , India Ltd, 2012
6. Animal Cell Culture and Technology, Michael Butler Garland Science/BIOS Scientific Publishers, Second Edition, London and New York. 2004.
