



SACRED HEART COLLEGE (AUTONOMOUS)

Tirupattur – 635 601, Tamil Nadu, S.India

Resi : (04179) 220103

College : (04179) 220553

Fax : (04179) 226423

Ready for
Every Good Work

A Don Bosco Institution of Higher Education, Founded in 1951 * Affiliated to Thiruvalluvar University, Vellore * Autonomous since 1987

Accredited by NAAC (4th Cycle – under RAF) with CGPA of 3.31 / 4 at 'A+' Grade

B.Sc. BIOCHEMISTRY SYLLABUS UNDER CBCS (With effect from 2021-2022) PROGRAMME STRUCTURE

SEM	Sub Code	Title of the Subject	Hours	Credit	E-Hrs	CA	SE	Total
I SEMESTER	LT114	Tamil-I	5	3	3	50	50	100
	LE115AT	English-I	5	2	3	50	50	100
	LE115AP	English Lab-I	-	1	-	-	-	-
	BC106	Cell Biology	3	3	3	50	50	100
	BC107	Biomolecules	4	4	3	50	50	100
	PBC102	Main practical- I	3	3	3	50	50	100
	ACH110	Allied Chemistry-I	4	3	3	50	50	100
	PACH209	Allied Chemistry Lab Work	2	-	-	50	50	100
	SK104	Communication Skills	2	1	-	-	-	-
	VE105A/B	Religion/Value Education-I	2	1	-	-	-	-
	CE103	Communicative English-I	-	1	-	-	-	-
TOTAL			30	22	-	-	-	-
II SEMESTER	LT214	Tamil-II	5	3	3	50	50	100
	LE215AT	English-II	5	2	3	50	50	100
	BC206	Plant Biochemistry	3	3	3	50	50	100
	BC207	Human physiology	4	4	3	50	50	100
	PBC205	Main practical-II	3	3	3	50	50	100
	ACH210	Allied Chemistry-II	4	3	3	50	50	100
	PACH209	Allied Chemistry Lab Work	2	2	3	50	50	100
	SK204	Leadership skills	2	1	-	-	-	-
	VE205A/B	Religion/Value Education-II	2	1	-	-	-	-
	CE203	Communicative English-II	-	1	-	-	-	-

	TOTAL		30	23	-	-	-	-
III SEMESTER	LT312	Tamil-III	5	3	3	50	50	100
	LE309T	English-III	5	2	3	50	50	100
	BC306	Microbiology	3	3	3	50	50	100
	BC307	Biophysical chemistry	4	4	3	50	50	100
	PBC302	Main practical-III	3	3	3	50	50	100
	AM310C	Allied Biostatistics-I	6	5	3	50	50	100
	SK304	Technical Skills-I	2	1	-	-	-	-
	VE306	Human Rights	2	1	3	50	50	100
	LE309P	English Lab-III	-	1	-	-	-	-
		OUTREACH	-	-	-	-	-	-
	SHELTERS	-	-	-	-	-	-	
	TOTAL		30	23	-	-	-	-
IV SEMESTER	LT411	Tamil-IV	5	3	3	50	50	100
	LE409T	English-IV	5	2	3	50	50	100
	BC407	Microbial Biochemistry	3	3	3	50	50	100
	BC408	Analytical Biochemistry	4	4	3	50	50	100
	PBC405	Main practical-IV	3	3	3	50	50	100
	AM409C	Allied Biostatistics-II	6	5	3	50	50	100
	SK404	Employability Skills	2	1	-	-	-	-
	VE406	Environmental Science	2	1	3	50	50	100
	LE409P	English Lab-IV	-	1	-	-	-	-
		OUTREACH	-	2	-	-	-	-
		SHELTERS	-	2	-	-	-	-
		Internship		1*	-	-	-	-
	TOTAL		30	27+1*	-	-	-	-
V SEMESTER	BC522	Enzymology	4	4	3	50	50	100
	BC523	Intermediary metabolism	5	5	3	50	50	100
	BC524	Endocrinology	4	4	3	50	50	100
	BC525	Genetics	4	4	3	50	50	100
	PBC502	Main practical-V	5	4	6	50	50	100
	BC526A/B/C	<ul style="list-style-type: none"> • Biomedical Instrumentation • Medical laboratory technology • Pharmacology (one out of three)	6	4	3	50	50	100
	SSP-I	Health Management	-	1*	-	-	-	-
	NBC504	NME –Energy Builders	2	1	3	50	50	100
	TOTAL		30	26 + 1*	-	-	-	-
VI SEMESTER	BC620	Molecular Biology	5	5	3	50	50	100
	BC621	Immunology	4	4	3	50	50	100
	BC622	Medical Biochemistry	4	4	3	50	50	100
	PBC606	Main practical-VI	5	4	6	50	50	100
	BC623A	Subject Skill-I Biotechnology	5	5	3	50	50	100
	BC623B	Subject Skill-II Bioethics	5	5	3	50	50	100

	SSP-II	Nutritional Biochemistry	-	1*	-	-	-	-
	NBC604	NME – Health care and Disease management	2	1	3	50	50	100
		Certificate Courses NPTEL/MOOCs	-	1*	-	-	-	-
		Project	-	2*	-	-	-	-
	TOTAL		30	28 + 4*	-	-	-	-

TOTAL HOURS = 180 Hours

TOTAL CREDITS = 148 + 2* (SSP) + 1* (Internship) + 1* from other Department Certificate Courses/NPTEL/MOOCs online courses + 2* from Project.

Regulation for Theory

1. Evaluation Scheme for Continuous Assessment (50)

Written tests (CA) (2) : 30 marks
Attendance : 05 marks
Other Components : 15 marks

Other Components

MCQ : 10 marks
Assignment : 5 marks

2. Question Paper Pattern for CA

The question paper shall have three sections with the maximum of 50 marks with the following break-up:

Section-A

Section A shall contain 6 short answer questions without choice drawn from two units
Each question shall carry 2 marks. (6 x 2 = 12 marks)

Section-B

Section B shall contain 3 either or questions drawn from two units.
Each question shall carry 6 marks. (3 x 6 = 18 marks)

Section-C

Section C shall contain 3 questions from two units.
Two questions out of the three are to be answered each carrying 10 marks.
(2 x 10 = 20 marks)

3. Question Paper Pattern for Semester Examinations

The question paper shall have three sections with the maximum of 100 marks with the following break-up:

Section - A

Section A shall contain 10 short answer questions drawn from all the units on the basis of minimum two from units. All ten are to be answered each carrying 2 marks.
(10 x 2 = 20 marks)

Section - B

Section B shall contain 5 either or questions drawn from all the five units.
Each question shall carry 7 marks. (5 x 7 = 35 marks)

Section - C

Section C shall contain 5 questions drawn one each from the five units.

Three questions out of the five are to be answered each carrying 15 marks.
(3 x 15 = 45 marks)

Regulation for Practical Examinations

Question paper pattern for Core Practical Examination

Total: 100 Marks

The practical papers consist of the internal assessment (50 marks) and semester examination (50 marks)

Internal Assessment (50)

Lab Work - 25 marks

Model exam - 25 marks

Semester Examination (50)

Evaluation Pattern for SSP (Health Management/Nutritional Biochemistry)

- Submission of Assignment
- One MCQ test covering the syllabus

Evaluation Pattern for Internship

Submission of Internship report with certificate of attending 15 days training before IV Semester from the concerned lab – 1* credit.

Evaluation Pattern for Project

Submission of project report with Viva-2* credits.

Semester-I

Course Objectives:

- To understand the structure of prokaryotic and eukaryotic cellular organization and to know the fluid mosaic model and membrane transport mechanism.
- To learn about the chemical composition and functions of endoplasmic reticulum, golgi apparatus and lysosomes.
- To have in-depth understanding of the Structure, Chemical composition and functions of Mitochondria and Ribosomes.
- To learn the functions of peroxisomes and glyoxysomes and composition of cytoskeleton and extracellular matrix.
- To acquire knowledge on nucleus–structure, composition and functions of chromosomes cell cycle, cell division and cell death mechanisms.

Course Outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Develop an understanding of the structure of cell and its difference between prokaryotes and eukaryotes	K6,K2
CO-2	Define and understand the fluid mosaic model and membrane transport	K1, K2
CO-3	Categorize the chemical composition and functions of endoplasmic reticulum, golgi apparatus and lysosomes.	K4
CO-4	Broad knowledge on the structure, chemical composition and functions of mitochondria, ribosomes, peroxisomes and glyoxysomes.	K3, K6
CO-5	Demonstrate a clear understanding of the composition of cytoskeleton and extracellular matrix.	K2
CO-6	Evaluate the mechanism of cell division with reference to mitosis and meiosis	K5

UNIT-I: Cell and its Theory, Structure of Plant and Animal cell. Cells-Prokaryotes and Eukaryotes, Difference between Prokaryotes and Eukaryotes.

UNIT-II: Membrane structure-Fluid Mosaic model, chemical composition and physical properties. Membrane Transport-Diffusion, Active and Passive.

UNIT-III: Structure, Chemical composition and functions of Endoplasmic Reticulum, Golgi apparatus and Lysosomes.

UNIT-IV: Structure, Chemical composition and functions of Mitochondria and Ribosomes. Functions of Peroxisomes and Glyoxysomes. Cytoskeletons.

UNIT-V: Nucleus-Structure, composition and functions of Chromosomes. Cell cycle and Cell divisions-Mitosis and Meiosis.

Text Books:

1. P.S Verma and V.K.Agarval (2016) Cytology (Cell Biology, Biomolecules and Molecular Biology), S.Chand Publishing, New Delhi.
2. Geoffrey M. Cooper and Robert E. Hausma (2015)The Cell: A Molecular Approach, Seventh Edition, Sinauer Associates, Inc.

References:

1. J.M. Bery, J.L. Tymoezko and L. Stryer (2008) Biochemistry, 6th Ed., W.H. Freeman and Company, New York.
2. D.L.Nelson, and M.M. Cox (2008) Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company, New York.
3. T.D.Pollard and W.C. Earnshaw (2002), Cell Biology, Saunders Publishing and Co, New York.
4. C.B. Powar (1994), Cell Biology, Second edition, Himalayan publishing house, Mumbai.

Semester-I**Sub. Code: BC107****BIOMOLECULES****4 Hours/4****Credits**

Course Objectives:

- To study the structure and functions of large biological macromolecules.
- To understand the organic chemical principles in life processes.
- To introduce the knowledge of lipid and their importance.
- To provide in-depth understanding of Nucleic acids and its structure.
- To categorize the source, applications of vitamins and minerals.

Course outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Understand the knowledge of carbohydrates and their classifications in detail	K2, K3
CO-2	Acquire the basic knowledge on the classification and structure of amino acids and classify proteins based on its physical and chemical properties	K3
CO-3	Discuss the importance, classification and functions of lipids	K2
CO-4	Enumerate the structure and properties of nucleic acids and its types	K1
CO-5	Explore and recommend the source, applications of vitamins and minerals	K4, K5
CO-6	Compile the basic information on the sources, mechanism and applications of macro and micro elements	K6

UNIT-I: Classification of Carbohydrates. Isomers, Anomers, epimers, enantiomers and mutarotation. Ring and linear structure (Haworth projection formula). Structure, Properties and Functions of Monosaccharides, Structure and Functions of Oligo (Di-Maltose, Lactose and Sucrose) and Polysaccharide (Homo-Starch, Glycogen & Cellulose; Hetero-Proteoglycan).

UNIT-II: Classification and structure of Amino acids. Essential and Non-essential amino acids. Properties of amino acids–Physical and Chemical, Zwitter ion. Classifications of Proteins based on solubility, shape, composition and biological function. Structure of Proteins. Denaturation and Renaturation of Proteins.

UNIT-III: Classification of Lipids, Essential fatty acids, Structure, Types and Functions of Phospholipids. Structure and functions of Glycolipids and Cholesterol.

UNIT-IV: Structure of purine and pyrimidine nucleotides. Structure and Properties of DNA–Tm, Denaturation and Renaturation, Hypo & Hyperchromicity and Types of RNA.

UNIT-V: Vitamins–**Fat and Water Soluble Vitamins, Chemical name, Sources, Daily requirements, Functions and Deficiency disorders. Minerals-Micro (Fe, Zn, Cu, I, F, Mn, Mo) and Macro elements (Na, Mg, Cl, Ca, P, K, S)–source, biological importance and Deficiency disorders.**

Text Books:

1. A.C. Deb (2001), Fundamentals of Biochemistry, New Central Book Agency Pvt., Ltd., Calcutta.
2. Murray, R. K., D. K. Granner, P. A. Mayes and D. W. Rodwell. 2006. Harper's Biochemistry, 25th edition, Prentice Hall, New Jersey.
3. J.L Jain., (2005). Fundamentals of Biochemistry. S.Chand Publishing, New Delhi.
4. D.L.Nelson, and M.M. Cox (2008) Lehninger Principles of Biochemistry, 5th Ed, W.H. Freeman and Company, New York.

References:

1. R.K. Murray, D.K. Granner, P.A. Mayes, D.W. Rodwell (2006), Harper's Biochemistry, twentyfifth edition, Prentice Hall, New Jersey.
2. D. Voet, and G.Voet (2006), Biochemistry, John Wiley and Sons, New York.
3. G.L Zubay (1999) Biochemistry, 4th Ed, WCB, McGraw-Hill, New York.
4. Ambika Shanmugam (1998). Fundamentals of Biochemistry for Medical Students.
5. U. Satyanarayana., (2006) A textbook of Biochemistry, Books & Allied, Kolkata.

Semester-I

Sub. Code: PBC102

MAIN PRACTICAL-I

3 Hours/3

Credits

I. Qualitative analysis of carbohydrate

Arabinose, Glucose, Fructose, Maltose, Lactose, Sucrose and Starch.

II. Qualitative analysis of Amino acid

Arginine, Cysteine, Tyrosine, Tryptophan, Histidine and Methionine.

Semester-I

Course Objectives:

- To develop skill and acquire knowledge in fundamentals of Chemistry, Biology and will develop disciplinary theory and practical knowledge in the diversified areas of Biochemistry.
- To enable the students to understand the various perspectives of applied sciences that benefits mankind.
- To give fundamental knowledge about the course and encouraged to become unique by allowing them to perform experiments their areas of interest.
- To enable the students to equip themselves with the basic practical training in different areas of Biochemistry ranging from Metabolism, Nutrition, Plant Biochemistry, Enzymology, Clinical Biochemistry, Molecular Biology to Genetic Engineering, Biotechnology, etc.
- To help the students to take up further specialized Master level courses in these areas or to take up suitable assignments/jobs in Biotech/Biochemical industries.

Course Outcomes:

S.No.	Description	Cognitive level (K level)
CO-1	Help learners to define and understand the objectives of studying Biochemistry	K1, K2
CO-2	Analyze and understand the basic concepts of biochemical reactions that occurs in living systems	K4
CO-3	Provide students with learning experiences that help in still deep interests in learning biochemistry	K3
CO-4	Develop broad and balanced knowledge and understanding of biomolecules, key biochemical concepts, principles and theories related to biochemistry	K6
CO-5	Equip students with appropriate tools of analysis and with theoretical, technical and analytical skills to tackle issues and problems in the field of biochemistry	K4
CO-6	Recommend students to a wide range of careers that combine biology, plants and medicine.	K5

UNIT-I: Carbohydrates-Definition and Classification of carbohydrates, linear and ring forms (Haworth formula)–Glucose and Fructose. Physical properties–Mutarotation. Chemical properties-Oxidation, Reduction, Osazone formation. Disaccharide-Sucrose and Lactose, Polysaccharides-Starch and Cellulose–Sources and Functions.

UNIT-II: Amino acids-Definition and classification of amino acids, Physical Properties-Amphoteric nature, Isoelectric point, Isoelectric pH and Zwitter ion. Proteins–Classification, shape and size, solubility and functions. Structure of protein– Primary, Secondary, Tertiary and Quaternary.

UNIT-III: Lipids-Definition, classification and functions. Occurrence and biological functions- simple lipids, compound lipids (e.g. phospholipids) and derived lipids: steroids (e.g. Cholesterol). Fatty acids–Saturated and Unsaturated.

UNIT-IV: Nucleic acids-Nucleoside, Nucleotides, Types of Nucleic acids, DNA- Double helical model of DNA and its biological functions. RNA–Structure, Occurrence, chemistry and its biological functions of tRNA, mRNA and rRNA.

UNIT-V: Enzymes-Definition, classification of enzymes with one example. Mechanism of enzyme action. Lock and key mechanism, Induced fit theory. Biological functions of enzymes. Factors affecting enzyme activity–pH, temperature and substrate concentration. Michaelis-Menton equation.

Text Books:

1. A.C. Deb (2001), Fundamentals of Biochemistry, New Central Book Agency Pvt., Ltd., Calcutta.
2. Ambika Shanmugam. 1998. Fundamentals of Biochemistry for Medical Students.
3. Satyanarayana, U. 2006. A textbook of Biochemistry, Books & Allied, Kolkata.

References:

1. Chatterjee, N and Rana Shinde. 2012. Textbook of Medical Biochemistry, 8th edition, Jaypee publication, New Delhi.
2. Jain, J. L. 2005. Fundamentals of Biochemistry. S. Chand Publishing, New Delhi.
3. Murray, R.K., D.K. Granner, P.A. Mayes and D.W. Rodwell. 2006. Harper's Biochemistry, 25th edition, Prentice Hall, New Jersey.
4. Voet, D and G. Voet. 2006. Biochemistry, John Wiley and Sons, New York.

Semester-I

Sub. Code: PABC201 ALLIED BIOCHEMISTRY PRACTICAL-I 2 Hours/1 Credit

I. Qualitative analysis of Carbohydrates

Glucose, Fructose, Sucrose, Maltose and Starch.

II. Qualitative analysis of Amino acids

Tyrosine, Tryptophan, Cysteine, Methionine and Arginine.

III. Volumetric estimation (Demonstration)

Estimation of Ascorbic acid and Oxalic acid.

Semester-II

Sub. Code: BC206 PLANT BIOCHEMISTRY 3 Hours/3 Credits

Course Objectives:

- To provide the basic knowledge of plant cell and water absorption mechanism.
- To get familiar with photosynthetic mechanism and starch production cycle.
- To acquire knowledge about NPK cycle and its biological significance.
- To give detail idea about seed germination, primary and secondary metabolites.
- To explore the information about plant hormones and their physiological effects.

Course Outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Understand the basic knowledge of plant cell and water absorption mechanism.	K2, K3

CO-2	Acquire knowledge on photosynthetic mechanism and starch production cycle.	K3
CO-3	Discuss about NPK cycle and its biological significance.	K2
CO-4	Describe about seed germination, primary and secondary metabolites.	K1
CO-5	Explore the information about plant hormones and their physiological effects.	K4
CO-6	Assess the in-depth principle and speculate the mechanism of plant life cycle	K5, K6

UNIT-I: Plant cell-Structure and Functions, Plant cell wall, Transpiration-Types, Mechanism and Factors affecting transpiration, Mechanism of Water Absorption–Passive and Active.

UNIT-II: Photosynthesis–photosynthetic pigments and chloroplast. Light reaction–Photosystems, Cyclic and non-cyclic photophosphorylation, Calvin cycle, Hatch-Slack cycle.

UNIT-III: Cycles of Elements-N₂ cycle, Biochemistry of symbiotic and non-symbiotic N₂ fixation, Sulphur cycle and Phosphorous cycle.

UNIT-IV: Biochemistry of seed dormancy, seed germination, fruit ripening and Senescence, Primary and Secondary metabolites in Plants–Definition and Function.

UNIT-V: Plant growth regulators-Physiological effects of Auxins, Gibberellins, Cytokinins, ABA and Ethylene.

Text Books:

1. H.S. Srivastava (2006), Plant Physiology, Biochemistry and Biotechnology, Rastogi Publications, Meerut.
2. V. Verma, Plant Physiology, (2001) 7th revised edition. Emkay publications.
3. V.K. Jain, (2000) Fundamentals of Plant Physiology, S.Chand Publishing, New Delhi.

References:

1. N.C. Gautam (2006), Plant Biotechnology, Shree Publishers.
2. Heldt HW (2005), 3rd Edition, Plant Biochemistry, Elsevier Academic Press Publication, USA.
3. A.J. Lack (2001).Plant Biology. Viva Books, New Delhi.
4. P.J. Lea and R.C. Leegood (1999), 2nd Edition, Plant Biochemistry and Molecular Biology, Wiley and Sons, New York.
5. Andrew Lack (2001) Plant Biology, Taylor & Francis, New York.

Semester-II

Sub. Code: BC207

HUMAN PHYSIOLOGY

4 Hours/4

Credits

Course Objectives:

- To understand the anatomy and physiology, various levels of organizations basic homeostatic mechanism.
- To elucidate and describe the composition, function of various body fluids like blood and lymph, their significance and related disorders

- To explain the morphology, physiology of circulatory, respiratory and digestive system and classify the structure of lungs, transport of gases between lungs and tissues. Explain the morphology, functions of kidney and nephron and their role in urine formation.
- To categorize the Structure and functions of nerve cells, conduction of nerve impulses, the role of neurotransmitters and reflex action.
- To speculate the physiology of muscle contraction in co-ordination with the joints, their articulation and skin.

Course Outcomes:

S.No.	Description	Cognitive Level (K-Level)
CO-1	Define and explain the anatomy and physiology, various levels of organizations basic homeostatic mechanism.	K1, K2
CO-2	Explain and determine the composition, function of various body fluids like blood and lymph, their significance and related disorders	K2, K3
CO-3	Explain and sketch the morphology, physiology of circulatory, respiratory and digestive system.	K2, K4
CO-4	Categorize the structure of lungs, transport of gases between lungs and tissues. Explain the morphology, functions of kidney and nephron and their role in urine formation.	K2, K4
CO-5	Evaluate the structure and functions of nerve cells, conduction of nerve impulses, the role of neurotransmitters and reflex action.	K5
CO-6	Speculate the physiology of muscle contraction in co-ordination with the joints, their articulation and skin.	K6

UNIT-I: Components of Blood, Morphology and functions of blood cells. Blood groups and Rh factor. Lymphatic system and Composition of lymph. Circulatory system - Heart anatomy, Pace maker, Cardiac cycle and ECG.

UNIT-II: Structure of Lungs, Transport of gases between lungs and tissues. Structure and functions of Kidney and Nephron. Mechanism of urine formation.

UNIT-III: Structure and functions of digestive system. Digestion and Assimilation of Carbohydrate, lipids, proteins and nucleic acid. Mechanism of HCl secretion in stomach. Role of hormones involved in digestion.

UNIT-IV: Structure and functions of nerve cells, Conduction of nerve impulse in myelinated and non-myelinated sheath. Neurotransmitters, Reflex action, Sleep and awake.

UNIT-V: Muscles- Types, structure and functions. Ultra structure of skeletal muscle- light band, dark band, Sarcomere, Filaments–Thick (myosin) and Thin (actin, tropomyosin and troponin). Contraction and relaxation of skeletal muscle via Ca²⁺ pump.

Text Books:

1. N. Arumugam (2001) Animal Physiology, Saras publication.
2. Sembulingam K and Sembulingam P (2010). Essentials of medical physiology. 5th ed. Jaypee Brothers Medical Limited. pp. 85-89.
3. R.A. Agarwal, Anil. K, Srivastava, KaushalKumar (1986), Animal physiology and Biochemistry-3rd edition. S.Chand Publishing, New Delhi.

References:

1. J. Brachet and A. E. Mirsky (1963), The Cell-Biochemistry, physiology and morphology, Academic Press.
2. William. F. Ganong. (2005), Review of Medical Physiology McGraw-Hill Medical; 22 edition.
3. Guyton (1996) Human Physiology and Mechanisms of Disease. Saunders Publications; 6th edition.
4. A.C. Guyton and J.E. Hall (2000), Text Book of Medical Physiology. Harcourt Asia.
5. Anne Waugh and Allison Grant (2018). Ross & Wilson anatomy and physiology in health and illness. Edinburgh: Elsevier, 2018.

Semester-II

Sub. Code: PBC205

MAIN PRACTICAL-II

3 Hours/3

Credits

I. Titrimetric methods

1. Estimation of Ascorbic Acid
2. Estimation of Glucose by Benedict's Method
3. Estimation of Glycine by Sorensen's Formal Titration method
4. Estimation of Calcium from Milk

II. Preparations

1. Preparation of Starch from potato
2. Preparation of Casein from Milk
3. Preparation of Albumin from Egg
4. Mitosis and Meiosis of Onion root tip.

Semester-II

Sub. Code: ABC202

ALLIED BIOCHEMISTRY-II

4 Hours/3

Credits

Course Objectives:

- To develop the skill to understand and acquire knowledge in the functioning of principal organs in human body.
- To emphasis on the major organs and the process they govern like circulation, heart function, muscle function, respiratory, Nervous, digestive and excretory system.
- To develop an ability to relate various interrelated physiological and metabolic events in systems physiology, building knowledge on basic physiological principles established in the Physiology of Organisms.
- To expand the practical biological skills in the Physiology of Organisms.
- To create the ability to think laterally and in an integrating manner and develop interdisciplinary approach. Overall knowledge of the avenues for research and higher academic achievements in the field of biochemistry and allied subjects.

Course Outcomes:

S.No.	Description	Cognitive level (K level)
CO-1	Observe and describe the structure of major human organs and explain their role in the maintenance of healthy individuals	K1, K2

CO-2	Explain the interplay between different organ systems and how organs and cells interact to maintain biological equilibrium in changing environment	K2
CO-3	Understand and gain insights into the functions of important physiological systems including the cardio-respiratory, nervous, digestive and excretory systems	K2
CO-4	Analyze how these separate systems interact to yield integrated physiological responses such as exercise, fasting and ascent to high altitude	K4
CO-5	Evaluate and report on experiments and observations in the physiology of the system clinically	K5
CO-6	Validate the experimental design to understand the responses of different organ system	K6

UNIT-I: Circulatory system: Components of Blood, Morphology and functions of blood cells. Lymphatic system and Composition of lymph. Circulatory system-Heart anatomy, Cardiac cycle and ECG.

UNIT-II: Nervous system: Structure and functions of Brain, Structure and functions of nerve cells, Conduction of nerve impulse in myelinated and non-myelinated sheath. Neurotransmitters, Reflex action.

UNIT-III: Respiratory system: Structure and functions of Lungs, Mechanism of breathing, Ventilation, Artificial ventilation, Regulation of respiration, Transport of gases, Anoxia, Hypoxia, Non-respiratory functions of the lungs.

UNIT-IV: Digestive system: Structure and functions. Digestion and absorption of Carbohydrate, lipids, proteins and nucleic acid. Mechanism of HCl secretion in stomach. Role of hormones involved in digestion.

UNIT-V: Excretory system: Structure and functions of Kidney and Nephron, Mechanism of urine formation–Filtration, Reabsorption and Secretion, Composition of urine, Dialysis.

Text Books:

- 1.N. Arumugam (2001) Animal Physiology, Saras publication.
- 2.A.C. Guyton and J.E. Hall (2000), Text Book of Medical Physiology. Harcourt Asia.
- 3.Anne Waugh and Allison Grant (2018). Ross & Wilson anatomy and physiology in health and illness. Edinburgh: Elsevier, 2018.
- 4.Sembulingam K and Sembulingam P (2010). Essentials of medical physiology. 5th ed. Jaypee Brothers Medical Limited. pp. 85-89.

References:

- 1.J. Brachet and A. E. Mirsky (1963), The Cell - Biochemistry, physiology and morphology, Academic Press.
- 2.William. F. Ganong. (2005), Review of Medical Physiology McGraw-Hill Medical; 22 edition.
- 3.Guyton (1996) Human Physiology and Mechanisms of Disease. Saunders Publications; 6th edition.
- 4.R.A. Agarwal, Anil. K, Srivastava, KaushalKumar (1986), Animal physiology and Biochemistry-3rd edition. S.Chand Publishing, New Delhi.

Semester-II

Sub. Code: PABC202 ALLIED BIOCHEMISTRY PRACTICAL-II 2 Hours/1 Credit

I. Urine Analysis

Qualitative analysis of Normal and pathological (abnormal) urine.

II. Haematology

1. Estimation of Haemoglobin content by Sahli's method.
2. Determination of ESR.

Semester-III

Sub. Code: BC306 MICROBIOLOGY 3 Hours/3 Credits

Course Objectives:

- To learn and impart the basic knowledge on Microbiology.
- To understand the various types of microscopes and its applications.
- To understand the overview of bacteria, fungi, Algae and protozoa.
- To create awareness on viruses and bacteriophages.
- To know the various methods in microbial techniques.

Course outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Acquire broad knowledge of history, importance and scope of microbiology.	K3
CO-2	Describe and identify the various types of microscopes and its applications.	K1
CO-3	Assess the various types of microorganisms based on their ultrastructure.	K5
CO-4	Classify on viruses, Lytic and Lysogenic cycle and bacteriophage.	K2
CO-5	Examine the theory and practice of sterilization and staining techniques.	K4
CO-6	Compose the information on microorganisms and its techniques.	K6

UNIT-I: Microbiology–History, Branches and Scope. Spontaneous generation–Abiogenesis and Biogenesis; Contributions of Leeuwenhoek, Louis Pasteur, Robert Koch, and Alexander Fleming.

UNIT-II: Microscopy–Principles and applications of Bright field; Dark field; Phase contrast microscope and Fluorescence microscope; Principles and Applications of Electron Microscopy–SEM and TEM.

UNIT–III: Bacteria–Ultra structure; Classification (Gram positive and Gram negative); Shape and arrangement; Cell wall polysaccharides; Growth curve and Factors affecting microbial growth. Fungi (Mold and Yeast), Algae and Protozoa - Ultra structure, Characteristics and Economic importance.

UNIT–IV: Virus - General properties, Structure and Classification; Plant (TMV & CMV) and Animal viruses (Dengue & Corona); Viroids and Prions; Bacteriophage–Structure, Lytic and Lysogenic cycle.

UNIT–V: Sterilization–Dry heat, Moist heat, Filtration and Radiation; Disinfection and Disinfectants; Culture medium, Staining techniques–Gram staining and Acid fast staining; Antibiotic sensitivity test.

Text Books:

1. M.J. Pelczar Jr, E.C.S. Chan and N.R. Kreig (2006). “Microbiology”- 5th Edition Mc Graw Hill Inc. New York.
2. Park William Halock (2001) Pathogenic Microorganisms, Leafebiger, Philadelphia.

References:

1. R. Ananthanarayan and C.K. Jayaram Paniker (2000). Text book of Microbiology. 6th Edition, Orient Longman Limited, Chennai.
2. P. Chakraborty (2003). A Text book of Microbiology. 2nd Edition, Published by New Central Book Agency (P) Ltd., Kolkata.
3. R.C. Dubey and D.K. Maheswari, (2010). A Text book of Microbiology. 3rd Edition, S. Chand Publishing, New Delhi.
4. H.Frobisher, R.D.Hinsdil, K.T.Crabtree and D.R.Goodhert (2005). Fundamentals of Microbiology, Saunder and Compa
5. C.B. Powar and H.F. Daginawala, (2008). General Microbiology. Volume: II. Himalaya Publishing House.

Semester-III

Sub. Code: BC307

BIOPHYSICAL CHEMISTRY 4 Hours/4

Credits

Course Objectives:

- To understand about the measurement of solutes in solution and learn the basic concepts in biophysical chemistry.
- To learn the regulation of pH the various buffer systems.
- To acquire in-depth understanding on the principles of electrochemical techniques, instrumentation and applications of reference electrodes.
- To learn the laws of thermodynamics, reversible and irreversible process and their applications.
- To acquire knowledge on viscosity coefficient, surface tension and their applications.

Course outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Develop an understanding on the measurement of solutes in solutions namely normality, molality and molarity.	K6
CO-2	Define and understand osmosis, diffusion and its various applications	K1
CO-3	Categorize acids with bases and functions of various buffer systems.	K4
CO-4	Determine the principles of electrochemical techniques, instrumentation and applications of reference electrodes.	K3
CO-5	Demonstrate a clear understanding of thermodynamics, reversible and irreversible processes.	K2
CO-6	Evaluate the mechanism of surface tension and their applications.	K5

UNIT-I: Units of measurement of solutes in solution, normality, molality, molarity, and milliosmol, Percentage solution examples for this concept. Ionic strength, Isotonic, hypertonic and hypotonic solution. Diffusion, Osmosis and its applications.

UNIT-II: Acid and bases, Arrhenius, Lowry & Bronsted concept, Lewis concept–conjugated pairs. pH, pOH, buffer, buffering capacity, common ion effect. Henderson–Hasselbalch equation. Buffer systems–Bicarbonate, Phosphate, Protein & Haemoglobin buffers.

UNIT-III: Principles of electrochemical techniques, Reference electrodes – Silver and Calomel electrode. Determination of pH using pH indicator, Universal indicators, pH paper & pH meter- Instrumentation and applications, Hydrogen electrode and glass electrodes.

UNIT-IV: First law of thermodynamics, Work, heat, free energy, enthalpy and entropy, exothermic and endothermic reactions, Reversible & irreversible process, isothermal and adiabatic process, Hess’s law and its applications, Kirchoff’s equation, relations between C_p & C_v .

UNIT-V: Definition and determination of viscosity coefficient. Poiseuille’s equation, Stoke’s law and terminal velocity. Surface tension: Definition, determination of surface tension, temperature effect. Equilibrium constant, Le-Chatelier’s principle and applications.

Text Books:

1. B.R. Puri, L.R. Sharma, M.S. Pathania (2016), Principles of Physical Chemistry. 47th Ed., Vishal Publishing Co.
2. K.Wilson and J. Walker (2006), Practical Biochemistry – Principles and techniques of Biochemistry and Molecular Biology, sixth Edition, Cambridge University Press, New York, USA.

References:

1. Upadhyay, K. Upadhyay and N. Nath (2007), Biophysical chemistry, Third revised edition, Himalaya publishing House, Mumbai.
2. Vasantha Pattabhi and Gautham, (2002), Biophysics, second reprint 2005. Narosa Publishing House PVT Ltd, New Delhi.
3. R. Gurdeep, Chatwal and Sham K. Aanand. (2006). Instrumental Methods of Chemical Analysis, Himalaya publishing House, New Delhi.
4. David Freifelder (1976)., Physical biochemistry, applications to biochemistry and molecular biology, second edition. W.H.Freeman & Co Ltd.
5. M.L Srivastava (2008)., Bioanalytical Techniques., Narosa, Chennai.

Semester-III

Sub. Code: PBC302

MAIN PRACTICAL-III

3 Hours/3

Credits

I. Preparation

a).Preparation of Buffer

1. Phosphate buffer
2. Tris buffer
3. Citrate buffer.

b).Solution preparation

1. Normality and Molarity solution
2. Saturated solution, Percentage solution, Sucrose gradient solution and dilute solution.

II. Techniques

a).Colorimetry

1. Estimation of Amino acids by Ninhydrin method.
2. Estimation of Protein by Biuret method.
3. Estimation of Protein by Lowry's method.
4. Estimation of Phosphorus by Fiske and Subbarow method.

Semester-IV

Sub. Code: BC407

MICROBIAL BIOCHEMISTRY

3 Hours/3

Credits

Course Objectives:

- To learn the principle involved in food preservation and its application.
- To study the various diseases caused by pathogenic microorganisms.
- To know the processes of microbial fermentation and fermenters.
- To understand the role of microbes in solid and liquid waste management.
- To learn the use of microorganisms in biofertilizers and vermicomposting.

Course outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Apply the microbial metabolism for the benefit of mankind	K3
CO-2	Evaluate the various infectious diseases, their diagnosis and treatment	K5
CO-3	Compare the differences between microbial fermentation and Industrial fermentation.	K2
CO-4	Correlate the use of microorganisms in waste management	K4
CO-5	Denote the implications of microbes in the environment.	K1
CO-6	Validate the use of nutrients for mankind, vermicomposting and organic farming.	K6

UNIT-I: Food preservation-Principles and Preservatives; Dairy products–Cheese and Yoghurt; Baker’s yeast (Bread making) and Alcoholic beverages (Beer & Wine production). SCP-Cultivation and Applications.

UNIT-II: Bacterial diseases – Typhoid, Anthrax, Tuberculosis and Leprosy; Fungal diseases- Candidiasis, Aspergillosis and Dermatophytes; Viral diseases-AIDS, Covid-19, Dengue, Rabies and Hepatitis.

UNIT-III: Microbial fermentation and Fermentor; Industrial fermentation–Penicillin, Streptomycin, Ethanol, Vitamin B₁₂, Glutamic acid, Protease, Amylase and Lipase.

UNIT-IV: Solid and Liquid Wastes, Solid waste management–Saccharification, Gasification and Composting; Liquid waste management–Aerobic and Anaerobic methods; Bioremediation and *Biodeterioration* of wastes.

UNIT-V: Biofertilizers-Characteristic features of bacterial biofertilizers, types and uses. Biopesticides–Scope, Classification and Importance. Composting and Vermicomposting and Organic farming.

Text Books:

1. M.J. Pelczar Jr, E.C.S. Chan and N.R. Kreig (2006). “Microbiology”- 5th Edition Mc Graw Hill Inc. New York.
2. M.J. Waites (2007). Industrial Microbiology. Blackwell Publishing Company. UK.

References:

1. R. Ananthanarayan and C.K. Jayaram Paniker (2000). Text book of Microbiology. 6th Edition, Orient Longman Limited, Chennai.
2. R.M. Atlas and R. Bartha (1992). Microbial ecology. Fundamentals and applications. 3rd Edition. Red Wood City. C.A. Benjamin
3. W.C. Frazies and D.C. Westhoff (1988). Food microbiology. 4th Edition. McGraw Hill NY.
4. U. Satyanarayana (2005). Biotechnology. 1st Edition, Books and Allied (P) Ltd., Kolkata.
5. N.S. SubbaRao (1995) Soil microorganisms and plant growth Oxford and IBH publishing co. Pvt. Ltd. NewDelhi.

Semester-IV**Sub. Code: BC408****ANALYTICAL BIOCHEMISTRY****4 Hours/4****Credits****Course Objectives:**

- To learn the basic knowledge of centrifugation and its applications.
- To study the working principle of chromatography.
- To understand the principle and instrumentation of electromagnetic radiation.
- To learn the principle, instrumentation and applications of colorimeter.
- To understand the basic mechanism and applications of radioisotopes.

Course outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Understand the basic knowledge on centrifugation and its applications	K2
CO-2	Acquire the basic knowledge on different types of centrifuges	K3
CO-3	Summarize the principle and application of chromatography	K5
CO-4	Discriminate the Principles, instrumentation and applications of Spectroscopy	K4
CO-5	List out the types and applications of electrophoresis	K1
CO-6	Integrate the basic mechanism and applications of radioisotopes and radioactivity	K6

UNIT-I: Basic principles-Sedimentation rate, Svedberg unit, different types of rotors. Types of centrifuges, Different types of centrifugation –Analytical and preparative, Differential, density gradient, isopycnic and equilibrium centrifugation and its applications.

UNIT-II: General principles (partition and adsorption), instrumentation and Applications of chromatography–Paper Chromatography, Thin layer chromatography, Affinity Chromatography, Ion Exchange Chromatography, Gel filtration chromatography, Gas Liquid chromatography and HPLC.

UNIT-III: General principles, factors affecting the migration rate-sample, electric field, buffer and supporting medium. Paper electrophoresis, Tiselius moving boundary electrophoresis, Agarose gel electrophoresis, SDS-PAGE and Immunoelectrophoresis.

UNIT-IV: Basic principles of electromagnetic radiation. Energy, wavelength, wave number and frequency. Absorption and emission spectra. Beer–Lambert’s law, light absorption and its transmittance. Principles, instrumentation and applications–Colorimeter, UV-visible, Flame Emission and Atomic Absorption Spectrophotometer.

UNIT-V: Atomic structure, radiation, types of radioactive decay, half-life, and units of radioactivity (Roentgen, Rad, Rem, Let). Detection and measurement of radioactivity–methods based upon ionization (GM counter), methods based upon excitation (Liquid and solid scintillation counter), Autoradiography, Applications of radioisotopes, Radiation hazards and safety measures.

Text Books:

1. P. Asokan (2001), Analytical Biochemistry. Chinnaa Publications.
2. M K. Wilson and J. Walker (2006), Practical Biochemistry–Principles and techniques of Biochemistry and Molecular Biology, sixth Edition, Cambridge University Press, New York, USA.

References:

1. A. Upadhyay, K. Upadhyay and N. Nath (2007), Biophysical chemistry, Third revised edition, Himalaya publishing House, Mumbai.
2. Vasantha Pattabhi and Gautham, (2002), Biophysics, second reprint 2005. Narosa Publishing House PVT Ltd, New Delhi.
3. R. Gurdeep, Chatwal and Sham K. Aanand. (2006). Instrumental Methods of Chemical Analysis, Himalaya publishing House, New Delhi.
4. David Freifelder., (1976), Physical biochemistry, applications to biochemistry and molecular biology, second edition. W.H.Freeman & Co Ltd.

Semester-IV**Sub. Code: PBC405****MAIN PRACTICAL-IV****3 Hours/3****Credits****I. Electrophoresis**

1. Separation of serum protein by SDS-PAGE
2. Separation of DNA by Agarose gel electrophoresis.

II. Chromatography

1. Paper chromatographic separation and detection of amino acids
2. Separation of carbohydrates and amino acids by TLC

III. Microbiology

1. Preparation of liquid and solid media.
2. Isolation of bacteria from Air, soil and water.
3. Isolation and maintenance of organisms by plating and streaking methods. Slants and swab culture.
4. Gram's staining method.
5. Antibiotic sensitivity test

Semester-V**Sub. Code: BC522****ENZYMOLGY****4 Hours/4****Credits****Course Objectives:**

- To gain a broad knowledge about the classification of enzymes.
- To acquire knowledge about the mechanism of enzyme action.
- To learn the structure and functions of cofactors and coenzymes.
- To study the different enzyme inhibitory mechanism.

- To gain skill and knowledge about the purification and commercial applications of enzymes.

Course outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Describe the classification of enzymes and its nomenclature.	K1
CO-2	Determine the mechanism action of enzymes.	K3
CO-3	Compile the structure and functions of cofactors and coenzymes	K6
CO-4	Explain in-depth insights about various enzyme inhibition mechanisms.	K2
CO-5	Outline the mechanism involved in the regulation of Allosteric enzymes	K4
CO-6	Perceive the enzyme purification methods in industrial applications	K5

UNIT-I: Enzymes-Definition, Nomenclature and IUBMB classification, and enzyme units (IU, Katal, turnover number and specific activity). Metalloenzymes and metal activated enzymes. Multi-enzyme systems–PDH and FAS. Non-protein enzymes, Cofactor, Coenzymes, prosthetic group, apoenzyme and holoenzyme.

UNIT-II: Active site–General characteristics; Mechanism of action of enzyme – Lock and Key theory and induced fit theory. Structure and functions of coenzyme reaction involving nucleotides-NAD/NADP, FMN/FAD and Coenzyme-A, Biotin, Folate, Lipoate. Isoenzymes (LDH and CK).

UNIT-III: Enzyme Kinetics–Reaction rate, energy of activation, enzyme catalysis and factors affecting enzymatic reactions. Michaelis-Menton equation, Line-Weaver Burk plot, Eadie–Hofstee plot and Hanes-Woolf plot.

UNIT-IV: Enzyme inhibition–Reversible: Competitive, Non-competitive and uncompetitive and irreversible inhibitions (kinetics and derivations not required). Feedback inhibition, Allosteric enzymes and its regulation.

UNIT-V: Isolation and purification of enzymes: Salting in and out, Dialysis, Chromatography and electrophoretic techniques. Criteria of purity of enzymes. Enzyme immobilization- Methods and applications.

Text Books:

1. Trevor Palmer (2004). Enzymes-Biochemistry, Biotechnology, Clinical Chemistry. First Edition, East West Press, New Delhi.
2. J.M. Bery, J.L. Tymoezko and L. Stryer (2008) Biochemistry, 6th Ed, W.H. Freeman and Company, New York.

References:

1. U. Sathyanarayanan (2002), Essentials of Biochemistry Books and allied (p) Ltd.
2. D.L.Nelson, and M.M. Cox (2008) Lehninger Principles of Biochemistry, 5th Ed, W.H. Freeman and Company, New York
3. D. Voet, and G.Voet (2006), Biochemistry, John Wiley and Sons, New York.
4. G.L Zubay (1999) Biochemistry, 4th Ed, WCB, McGraw-Hill, New York.

5. R.K. Murray, D.K. Granner, P.A. Mayes, D.W. Rodwell (2006), Harper's Biochemistry, twenty fifth edition, Prentice Hall, New Jersey.
6. T.M. Devlin (2002), Textbook of Biochemistry with Clinical correlations, 5th edition, John Wiley & Sons Inc, Publications.
7. A.C. Deb (2001), Fundamentals of Biochemistry, New Central Book Agency Pvt., Ltd., Calcutta.
8. S.M. Bhatt (2011), Enzymology and Enzyme Technology. (2011), S. Chand Publishing, New Delhi.

Semester-V

Sub. Code: BC523 INTERMEDIATORY METABOLISM

5 Hours/5

Credits

Course Objectives:

1. To gain knowledge about the major pathways of carbohydrate metabolism.
2. To gain insights about the various components and metabolic steps involved in ETC.
3. To acquire knowledge about the various pathways involved in lipid metabolism.
4. To understand the catabolic pathway of amino acid metabolism.
5. To understand the different biosynthetic and biodegradable pathway of nucleotides.

Course outcomes:

S.No.	Description	Cognitive Level (K-level)
CO1	Determine the major pathways of carbohydrate metabolism	K3
CO2	Outline the various components and metabolic steps involved in ETC	K4
CO3	Compare the various pathways of lipid metabolism	K2
CO4	Describe the different catabolic pathway of amino acid metabolism	K1
CO5	Perceive the different biosynthetic and biodegradable pathway of nucleotides	K5
CO6	Integrate the various metabolic pathways of Biomolecules	K6

UNIT-I: The basic metabolic pathways-anabolic, catabolic and amphibolic pathways. Aerobic and Anaerobic glycolysis and its energetics. Citric acid cycle-Pyruvate Dehydrogenase Complex and its energetics. Gluconeogenesis. Glycogenesis, Glycogenolysis and Pentose phosphate pathway.

UNIT-II: Electron Transport Chain-Components of ETC. Role of ETC-Oxidative Phosphorylation-Chemiosmotic Hypothesis, Uncouplers and High Energy Compounds (ATP and GTP).

UNIT-III: Biosynthesis and β -Oxidation of Fatty Acids, Biosynthesis of Triacyl Glycerol and Phospholipids and Cholesterol.

UNIT–IV: Catabolism of Amino acids–Transamination, Oxidative Deamination and Non-Oxidative Deamination, and Urea Cycle. Formation of Creatine Phosphate and Creatinine, Methylation and Decarboxylation.

UNIT–V: Nucleic Acid Metabolism–Biosynthesis and Degradation of Purine and Pyrimidine Nucleotides–Denovo Synthesis and Salvage Pathway.

Text Books:

1. Fundamentals of Biochemistry. (2005), J.L Jain S. Chand Publishing, New Delhi.
2. R.K. Murray, D.K. Granner, P.A. Mayes, D.W. Rodwell (2012), Harper’s Biochemistry, twenty eighth edition, Prentice Hall, New Jersey.

References:

1. D.L.Nelson, and M.M. Cox (2008) Lehninger Principles of Biochemistry, 5th Ed, W.H. Freeman and Company, New York
2. J.M. Bery, J.L. Tymoezko and L. Stryer (2008), Biochemistry, 6th Ed, W.H. Freeman and Company, New York.
3. Trevor Palmer (2004). Enzymes-Biochemistry, Biotechnology, Clinical Chemistry. First Edition, East West Press, New Delhi.
4. A.C. Deb (2001), Fundamentals of Biochemistry, New Central Book Agency Pvt., Ltd., Calcutta.
5. D. Voet, and G.Voet (2006), Biochemistry, John Wiley and Sons, New York.
6. U. Sathya Narayanan and U. Chakrapani. (2007), Text book of Biochemistry, 3rd edition, Pvt Ltd.
7. Fundamentals of Biochemistry for Medical Students,(1998) Ambika Shanmugam.

Semester-V

Sub. Code: BC524

ENDOCRINOLOGY

4 Hours/4

Credits

Course Objectives:

- To learn the basic aspects of hormones and endocrine glands.
- To provide in depth knowledge about the pituitary hormones.
- To study about the thyroid hormones and their regulation.
- To know about adrenal glands and its biological functions
- To learn about gonadal hormones and their regulation.

Course outcomes:

S.No.	Description	Cognitive Level
CO-1	Demonstrate the basic aspects of hormones, classification and functions.	K2
CO-2	Examine the role of pituitary hormones and their regulation	K1
CO-3	Acquire knowledge on the thyroid hormones and their regulation	K3
CO-4	Correlate between adrenal hormones and their homeostasis.	K4
CO-5	Perceive the role of gonadal hormones and their regulation	K5

CO-6	Compile the chemistry, secretion, functions and regulations of various hormones	K6
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UNIT-I: Hormones–Definition, Chemical nature and classification. Mechanism of action of Group I and Group II hormones, Signal transduction and introduction to Hormonal receptors (Tyrosine receptors). Positive and negative feedback regulation of endocrine system.

UNIT-II: Hypothalamus and hypothalamic releasing factor. Pituitary hormones- Chemistry, Secretion, Functions and Regulation. Anterior Pituitary hormones–GH, Pituitary tropic hormones (LH, FSH, TSH, ACTH and Prolactin) and Posterior Pituitary hormones (Vasopressin and Oxytocin).

UNIT–III: Thyroid and Parathyroid Hormones–Chemistry, Synthesis, Secretion, Functions and Regulations. Pancreatic Hormones-Chemistry, Secretion, Functions and Regulations (Insulin and Glucagon).

UNIT–IV: Adrenal gland hormones-Chemistry, Secretion, Functions and Regulations of Adrenal Cortex hormones (glucocorticoids and mineralocorticoids) and Adrenal Medullary hormones (Epinephrine and Nor-Epinephrine). Renin-angiotensin system.

UNIT–V: Chemistry, Secretion, Functions and Regulations of Gonadal hormones– Testosterone, Estrogen and Progesterone. Ovarian cycle and its regulation.

Text Books:

1. R.K. Murray, D.K. Granner, P.A. Mayes, D.W. Rodwell (2006), Harper’s Biochemistry, twenty fifth edition, Prentice Hall, New Jersey.
2. Guyton (1996) Human Physiology and Mechanisms of Disease. Saunders Publications; 6th edition.

References:

1. Williams Textbook of Endocrinology. (2011)., ShilomoMelmed., Elsevier, New Delhi.
2. K.V. Krishnadas (1996), Textbook of Medicine, Jaypee publication, New Delhi.
3. N.Chatterjee and Rana Shinde (2012) Textbook of Medical Biochemistry - eighth edition, Jaypee publication, New Delhi.
4. D.L.Nelson, and M.M. Cox (2008) Lehninger Principles of Biochemistry, 5th Ed, W.H. Freeman and Company, New York
5. D. Voet, and G.Voet (2006), Biochemistry, John Wiley and Sons, New York.
6. G.L Zubay (1999) Biochemistry, 4th Ed, WCB, McGraw-Hill, New York.

Semester-V

Sub. Code: BC525	GENETICS	4 Hours/4 Credits
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Course Objectives:

- To learn the Premendelian concepts of heredity in genetics.
- To understand the Mendelian inheritance and laws of probability.
- To know about linkage, crossing over and Morgan’s law.
- To understand the Chromosomal Mutations, Ploidy and its types.
- To explain the Population Genetics and Hardy Weinberg Law.

Course Outcomes:

S.No.	Description	Cognitive Level (K-level)
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CO-1	Define the features of Premendelian concepts of heredity and genetic maps	K1
CO-2	Explain the Mendelian inheritance and laws of probability with examples	K2
CO-3	Construct the knowledge on different types of linkage and its Significance	K3
CO-4	Connect the basic concepts of crossing over, types and its significance.	K4
CO-5	Perceive the key concepts on chromosomal mutations with specific examples.	K5
CO-6	Develop a thorough understanding of the population genetics and gene frequency.	K6

UNIT-I: Genetics-Introduction; Premendelian concepts of heredity– Fluid theory, Reproductive blood theory, Preformation, Epigenesis, Inheritance of acquired characters, Theory of Pangenesis and Germplasm theory; Rediscovery of Mendel’s original work, Genotype and Phenotype; Heredity; Gene, Genome, Trait, Genetic material and Genetic maps.

UNIT-II: Mendelian Inheritance and laws; Laws of Probability–Rule of addition and rule of multiplication; chi-square analysis, Pedigree analysis; Incomplete and Co-dominance; Multiple alleles; Lethal alleles; Epistasis; Pleiotropy; Sex linked inheritance.

UNIT-III: Linkage and Crossing over; Morgan’s Law; complete and incomplete linkage; Back and Test cross; Types of linkage; gene mapping–cross over, gene mapping for two point and three point crosses; Interference and Coefficient of Coincidence.

UNIT-IV: Chromosomal Mutations–Deletion, Duplication, Inversion and Translocation; Ploidy–Euploidy, Aneuploidy and Polyploidy. Down Syndrome, Turner syndrome and Klinefelter syndrome.

UNIT-V: Population Genetics, Hardy Weinberg Law–Gene Frequency, Factors affecting gene frequency, Eugenics, Euphenics and Euthenics.

Text Books:

1. A.V.S.S Sambamurty, (2007), Molecular Genetics, Narosa, Chennai.
2. P.J. Russell (2009). Genetics- A Molecular Approach. III Edition. Benjamin Cummings.

References:

1. E.J. Gardner, M.J.Simmons and D.P. Snustad (2008). VIII ed. Principles of Genetics. Wiley India.
2. D.P. Snustad M.J. Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc.
3. W.S. Klug, M.R. Cummings, C.A, Spencer, C.A. (2009). Concepts of Genetics. XI Edition. Benjamin Cummings.
4. B.R. Glick, J.J Pasternak (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
5. Gurbachan S Miglani (2006), Developmental Genetics, IK. International, New Delhi.

Semester-V

Sub. Code: PBC502

MAIN PRACTICAL-V

5 Hours/5

Credits

I. Colorimetric Estimation

1. Estimation of Creatinine by Jaffe's Method.
2. Estimation of Urea by Diacetyl Monoxime Method.
3. Estimation of DNA by Di Phenyl Amine method.
4. Estimation of RNA by Orcinol method.
5. Estimation of glucose by O-Toluidine method.
6. Estimation of Cholesterol by Zak's method.

II. Urine Analysis

Qualitative analysis of Normal and pathological (abnormal) urine.

Semester-V

MAJOR ELECTIVE-I

Sub. Code: BC526A BIOMEDICAL INSTRUMENTATION

6 Hours/4

Credits

Course Objectives:

- To learn the basic concepts in biomedical equipment.
- To understand the mechanism of bioelectrodes.
- To understand the biosensor-mechanism and types.
- To study the trouble shooting and maintenance of biomedical instruments.
- To understand the therapeutic instruments and patient monitoring system.

Course Outcomes:

S.No	Description	Cognitive Level (K-Level)
CO-1	Describe the basic concepts in biomedical equipment.	K1
CO-2	Explain the mechanism of bioelectrodes and their uses.	K2
CO-3	Determine the biosensor-mechanism and its types.	K3
CO-4	Analyze the trouble shooting and maintenance of biomedical instruments.	K4
CO-5	Perceive the information on therapeutic instruments	K5
CO-6	Speculate the various patients monitoring system.	K6

UNIT-I: Classification of Biomedical Equipment–Diagnostic, therapeutic and clinical laboratory equipment. Applications of endoscope, laparoscope and cardioscope. Transducers for biomedical application.

UNIT-II: Bioelectric signals, recording and their characteristics, Bioelectrodes–types, electrodes for ECG, EMG, EOG and ERG, electrodes tissue interface, contact impedance and effects of high contact impedance.

UNIT-III: Biosensor-mechanism and types. Autoanalyzer-Types and application. Automatic tissue processing and application of microtome. Pulse oximetry. Magnetic resonance imaging system, NMR components and its biological applications.

UNIT-IV: Measurement of Heart rate, pulse rate, respiration rate and blood pressure. X- Ray Machine–Basic components, types, dental image intensifier system, trouble shooting and maintenance.

UNIT-V: Therapeutic instruments–Introduction, types, classification, power source and electrodes of cardiac pacemaker. Computer application in medicine-computerized catheterization laboratory, computerized patient monitoring system.

Text Books:

1. Arumugam, (2002) Biomedical Instrumentation, Anuratha Agencies Publishers, 2nd edition.
2. Mandeep singh, (2014) Introduction to biomedical instrumentation, Paperback publishers.

References:

1. Edward J. Bukstein, (2001) Introduction to Biomedical electronics, Sane and Co. Inc. USA.
2. Goddes and Baker, (2002) Principles of applied biomedical instrumentation, John Wiley.
3. R.S. Khandpur, (2003) Hand book of Medical instruments, TMH, New Delhi, 644pp.
4. Cromwell, (2007) Biomedical instrumentation, Prentice Hall of India, New Delhi.
5. John G. Webster (2007) Medical instrumentation, John Wiley.
6. Carr and Brown (2009) Biomedical instrumentation and measurement, Pearson.
7. R.S Khandpur (2014) Handbooks biomedical instrumentation, 3rd edition McGraw Hill Education (India) Private Limited.

Semester-V

MAJOR ELECTIVE-II

Sub. Code: BC526B MEDICAL LABORATORY TECHNOLOGY 6 Hours/4

Credits

Course Objectives:

- To understand the basic knowledge on the collection and preservation of samples
- To acquire a broad knowledge on haematological parameters
- To know the normal and abnormal constituents of urine and feces
- To learn the different histopathological techniques and its uses.
- To know the types of culturing organisms from various specimens

Course Outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Understand the basic knowledge on the collection and preservation of samples	K2
CO-2	Acquire a broad knowledge on haematological parameters	K3
CO-3	Outline the normal and abnormal constituents of urine and feces	K4
CO-4	Enumerate the different histopathological techniques	K1
CO-5	Justify the types of culturing organisms for different specimens	K5
CO-6	Compile the normal and abnormal values of biochemical parameters.	K6

UNIT-I: Specimens–Collection and preservation of Blood, Urine, Feces, Sputum, Semen, Throat swab, Amniotic fluid and CSF. Smears–types, preparation and maintenance. Good laboratory practices.

UNIT-II: Blood–Blood pressure, Clotting time, Bleeding time, Hemoglobin Estimation, RBC count and WBC count, Differential count, Erythrocyte Sedimentation Rate, Packed cell volume and platelet counting.

UNIT-III: Urine–Composition, Preservation, Microscopic and Macroscopic Examination (Physical and Chemical examination). Feces–Composition, Macroscopic and Microscopic Examination, Chemical examination–Occult blood and Steatorrhea.

UNIT-IV: Histopathology–Tissue cutting, fixation, embedding, tissue slicing by microtome, slide mounting and staining.

UNIT-V: Culturing of organism from various specimens (Pus, Urine, Blood, Sputum and Throat Swab). Gram’s staining and Acid-fast staining. Antibiotic sensitivity test.

Text Books:

1. D.Sahu (1997), Critical approach to clinical medicine, Vikas Publishing, Noida.
2. Devlin, T.M. (2002), Textbook of Biochemistry with Clinical correlations, 5th edition, John Wiley & Sons Inc, Publications.
3. Ramnik Sood (2009), Medical Laboratory Technology: Methods and Interpretation. JPB; Sixth edition.
4. Kanai L. Mukherjee and [Anuradha Chakravarthy](#) (2017), Medical Laboratory Technology, Procedure Manual for Routine Diagnostic Tests - Vol. 1. McGraw Hill Education; Third edition.

References:

1. P.D. Mayne (1994), Clinical chemistry in diagnosis and treatment. A Hodder Arnold Publication; 6th Revised edition.
2. W.J. Marshall and S.K. Bangeit, (1995), Clinical biochemistry - Metabolic concepts and clinical aspects, Churchill Livingstone.
3. K.V. Krishna Das, Text Book of Medicine, (1996), Jaypee publication, New Delhi.
4. A.C. Guyton and J.E. Hall, (2000), Text Book of Medical Physiology Harcourt Asia.
5. Guyton (1996) Human Physiology and Mechanisms of Disease. Saunders Publications; 6th edition.
6. N.Chatterjee and Rana Shinde (2012) Textbook of Medical Biochemistry - eighth edition, Jaypee publication, New Delhi.
7. K. Sampath (1999), Hospital and Clinical Pharmacy, Vikas Publishing. Noida.

Semester-V

MAJOR ELECTIVE-III

Sub. Code: BC526C

PHARMACOLOGY

6 Hours/4

Credits

Course Objectives:

- To learn the basic information on history and classification of drugs.
- To study on the basic information on drug and drug receptor mechanisms.
- To learn about the phase I and phase II drug metabolisms.
- To understand the mode of action of anti-cancer drugs and other agents.
- To gain knowledge about adverse drug reactions and intolerance.

Course Outcomes:

S.No.	Description	Cognitive Level (K- level)
CO-1	Acquire knowledge on the basic information on history and classification of drugs.	K3
CO-2	Gain thorough knowledge about the different drug receptors and their actions.	K1
CO-3	Understand the basic mechanism of drug and drug receptors	K2
CO-4	Focus in-depth insights about the mode of action of drugs used in different diseases	K4
CO-5	Adapt knowledge about the study of different chemotherapeutic value of anti-cancer drugs.	K6
CO-6	Assess the insight knowledge about the adverse effects of drugs	K5

UNIT-I: Drugs-Sources, routes of drug administration, dosage and dosage forms. Classification, Absorption, Distribution, Metabolism and Elimination of drug.

UNIT-II: Drug-Receptor interactions involvements of binding forces in drug receptor interaction, Receptor mediated and non-mediated interactions.

UNIT-III: Drug metabolism-Phase I and II enzyme reactions and biochemical importance of xenobiotic metabolism.

UNIT-IV: Cancer-Definition and types, Chemotherapy–anticancer drugs, antimetabolites, antibiotics and alkylating agents. Radiation therapy.

UNIT-V: Vaccination against infection. Adverse drug reactions, biological effects of drug abuse and drug dependence, drug tolerance and intolerance. Assay of drug potency-Bioassay and Immunoassay.

Text Books:

1. Chatwal G R (1996) Pharmaceutical Chemistry–Inorganic., Himalaya, Bombay
2. Bentley (1969) Bentley and Driver's Text Book of Pharmaceutical Chemistry Oxford and IBH, New Delhi.

References:

1. Burger, D. J. Abraham (2003) Oxford textbook, of Clinical pharmacology and drug therapy. D.G. Burger's medicinal Chemistry & Drug Discovery.
2. K. D. Tripathi (2004) Essentials of Medical Pharmacology. 5th edition, Jaypee, New Delhi.

3. Richard A. Harvey, Pamela C. Champe, Richard Finkel, Luigi Cubeddu, Michelle A. Clarke (2008) Pharmacology (Lippincott Illustrated Reviews Series), 4th edition, Wolters kluwer.
4. William, O. and Foge, B.I. (2008) Principles of medicinal chemistry, Waverks Pvt Ltd., New Delhi.
5. Bhandarkar (2010) Pharmacology and Pharmacotherapeutics, 10th edition Elsevier.
6. Satoskar (2015) Pharmacology and Pharmacotherapeutics, 24th edition, Elsevier.
7. R.S.Satoskar. S.D. Bhandhakar and S.S. Anilapure (2015) Pharmacology and Pharmacotherapeutics, Elsevier.

Semester-V **SSP-I: HEALTH MANAGEMENT** **1* Credit**

Course Objectives:

- To learn the safeguards to health, physical fitness and diet.
- To know the first aid for accidents and emergency situations.
- To handle medical emergencies like heart attack, allergies and insect bites.
- To recognize the causes, symptoms and preventions of diseases.
- To explain the specific diseases like cataract, cancer, etc.

Course outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Perceive to learn about the Safeguards to health, physical fitness and diet.	K5
CO-2	Build knowledge on types of foods, merits and demerits of taking foods.	K3
CO-3	Develop an understanding of first aid for accidents and emergency situations	K6
CO-4	Recognize the importance of handling emergencies like heart attack, allergy, etc.	K1
CO-5	Point out the causes, symptoms and preventions of diseases.	K4
CO-6	Explain the treatment to various diseases like cataract, cancer and AIDS.	K2

UNIT-I: Safe guards to health–Physical fitness and Normal weight, Diet–Normal diet, BMI, Classification of foods, Merits and Demerits of taking foods.

UNIT-II: First Aid for Accidents–Wounds, Burns, Snake Bites, Hiccup, Shock, Poisoning, Vomiting and Drowning.

Unit-III: Handling Emergencies–Heart attack, Allergy–Food and Insect bite, Diabetic conditions, Unconsciousness, Asthma and Sprain.

UNIT-IV: General Diseases–Causes, symptoms and preventions of Constipation, Diarrhea, Itching, Dental caries and Obesity.

UNIT-V: Specific Disease -Cataract, Cancer, AIDS, Ulcer and Appendicitis.

Text Books:

1. DevendraVora. (1995), Health in Your Hands. Navneet Pub., Mumbai.
2. Harrison's principles of internal medicine–Vol-I & II, (2015), McGraw Hill Education; 19th edition.

References

1. H.K Bakhru (1990), Herbs that Heal: Natural Remedies for Good Health, Orient, Delhi.
2. K.V. Krishna Das, (2008), Text book of medicine, 5th edition.
3. S.S. Purohit, H.N. Kakrani and A.K. Saluja (2003) Pharmaceutical Biotechnology, Student edition publications, Jodhapur.
4. M.J. Mycek, A.R.Harve and P.C.Champe (1997), Lipincott's Illustrated Reviews: Pharmacology, 2nd edition, Lipincotts Williams and Wilkins publishers.
5. R.S. Satoskar, S.D.Bhandarkar and S.S. Annapure (1999), Pharmacology and Pharmocotherapeutics., Popular Prakashan, Mumbai.
6. ShashiGoyal (2012), Food,Nutrition and Health. S. Chand Publishing, New Delhi.

Semester-V

Sub. Code: NBC504 NON-MAJOR ELECTIVE: ENERGY BUILDERS 2 Hours/1 Credit

Course Objectives:

- To understand the energy providing macromolecules of the body.
- To learn about the biological importance of proteins and its classifications.
- To study about human diseases related to the lipid metabolism.
- To gain the basic knowledge on fat and water soluble vitamins.
- To know about the types of minerals and its biological significance.

Course Outcomes:

S.No.	Description	Cognition level (K-level)
CO-1	Identify the role of energy providing macromolecules of the body	K1
CO-2	Distinguish the proteins by their shape, size, functions and physical properties.	K2
CO-3	Determine the human diseases caused by the defects in lipid metabolism.	K3
CO-4	Categorize the different types of vitamins based on their solubility.	K4
CO-5	Evaluate the biological importance of minerals and its deficiency syndromes.	K5
CO-6	Schematize a complete diet schedule on the individual's requirement.	K6

UNIT-I: Carbohydrates–Introduction, source, classification and biological importance. Disease conditions-Diabetes Mellitus and Hypoglycemia.

UNIT-II: Proteins–Introduction, source, classification and biological importance. Disease conditions-Kwashiorkor and Marasmus.

UNIT-III: Fats–Introduction, source, classification and biological importance. Disease conditions-Obesity and Atherosclerosis.

UNIT-IV: Vitamins–**Fat and Water Soluble Vitamins, Sources, Daily requirements, Functions and Deficiency disorders.**

UNIT-V: Minerals-Micro (Fe, Zn, Cu, I, F, Mn, Mo) and Macro elements (Na, Mg, Cl, Ca, P, K, S)–Source, biological importance and Deficiency disorders.

Text Books:

- 1.J.L.Jain., Nitin Jain and Sunjay Jain (1979) Elementary Biochemistry, S. Chand Publishing. New Delhi.
- 2.Nitin Jain., Sunjay Jain and J.L.Jain, (2007) Fundamentals of Biochemistry, S. Chand Publishing. New Delhi.

References:

- 1.R.K. Murray, D.K. Granner, P.A. Mayes, D.W. Rodwell (2006), Harper’s Biochemistry, twenty fifth edition, Prentice Hall, New Jersey.
- 2.D.L.Nelson, and M.M. Cox (2008) Lehninger Principles of Biochemistry, 5th Ed, W.H. Freeman and Company, New York.
- 3.Sathyanarayanan.U (2002), Essentials of Biochemistry Books and allied (p) Ltd.
- 4.D. Voet, and G.Voet (2006), Biochemistry, John Wiley and Sons, New York.
- 5.G.L Zubay (1999) Biochemistry, 4th Ed, WCB, McGraw-Hill, New York.
- 6.Ambika Shanmugam (1998), Fundamentals of Biochemistry for Medical Students.

Semester-VI

Sub. Code: BC620	MOLECULAR BIOLOGY	5 Hours/5
Credits		

Course Objectives:

- To learn the basic information about genetic material and central dogma.
- To understand the process of DNA replication involving the roles of various DNA polymerases in prokaryotes and eukaryotes.
- To study the types of RNA and its synthesis.
- To acquire knowledge on various steps in protein synthesis and its modification.
- To recognize knowledge related to mutation, DNA repair and operon hypothesis.

Course Outcomes:

S.No.	Description	Cognitive Level (K-Level)
CO-1	Observe the basic information on molecular genetics, genetic material and central dogma	K2
CO-2	Analyze the processes involved in replication and various DNA polymerases involved in DNA synthesis.	K4

CO-3	Determine the transcription mechanism, post-transcriptional modifications and reverse transcription	K3
CO-4	Justify the role of peptides and protein molecules during translation process	K5
CO-5	Recognize the role of proteins during gene expression, and its regulations.	K1
CO-6	Integrate the gene regulation mechanism in molecular biology.	K6

UNIT-I: Organization of Genes, Chromosome Structure, Types and Functions. DNA as Genetic Material - Evidence and Central Dogma, Satellite DNA.

UNIT-II: Replication-Types, Evidence for Semi-Conservative Replication. Replication in Prokaryotes and Eukaryotes. Inhibitors of Replication.

UNIT-III: Transcription: RNA Polymerases in Prokaryotes, Role of Sigma Factor, Steps-Initiation, Elongation and Termination (Rho-dependant and independent). Inhibitors. Post-Transcriptional Modifications and Reverse Transcription.

UNIT-IV: Translation: Genetic code–Codon Dictionary and Salient Features of Genetic Code. Composition of Prokaryotic and Eukaryotic Ribosomes, Structure of RNA, Role of signal peptide. Steps-Activation of Amino Acids, Initiation, Elongation and Termination of protein synthesis in prokaryotes. Post-Translational Modifications. Inhibitors of Protein Synthesis.

UNIT-V: Gene Mutation: Types–Point Mutation (transition and transversion), Frame Shift Mutation- Insertion and Deletion, Suppressor Mutation–Nonsense and Missense suppression. Mutagens–Physical and Chemical Mutagens. DNA Repair Mechanism–Base Excision, UV repair, Recombination repair and SOS. Gene Regulation–operon concept (Lac operon).

Text Books:

1. P.S Verma and V.K.Agarval (2016) Cytology (Cell Biology, Biomolecules and Molecular Biology), S. Chand Publishing. New Delhi.
2. D.L.Nelson, and M.M. Cox (2008) Lehninger Principles of Biochemistry, 5th Ed, W.H. Freeman and Company, New York.

References:

1. Rastogi, S.C. (2003), Cell and Molecular Biology, 2nd edition, New Age International Publishers.
2. Benjamin Lewin (2004) Genes VII, Pearson Education Limited, New York.
3. G.Karp.John (2002), Cell and Molecular biology – 3rd edition Wiley and Sons N.Y.
4. David Freifelder (1976), Physical biochemistry, applications to biochemistry and molecular biology, second edition. W.H. Freeman & Co Ltd.
5. R.K. Murray, D.K. Granner, P.A. Mayes, D.W. Rodwell (2006), Harper’s Biochemistry, twenty fifth edition, Prentice Hall, New Jersey.

Semester-VI

Sub. Code: BC621

IMMUNOLOGY

4 Hours/4

Credits

Course Objectives:

- To understand the basic concept of immune system and gain insight knowledge about T & B cell mediated immune response.

- To acquire sufficient knowledge about antigen and its properties apart from structure of antibody and its sub-classes.
- To understand and gain insight about antigen-antibody reactions and complement system.
- To acquire in-depth knowledge about the hypersensitivity and Transplantation-types.
- To gain appropriate knowledge about Immunization and Immunological techniques.

Course Outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Establish the basic concept of immune system; T & B cell mediated immune response.	K3
CO-2	Differentiate antigens, antibodies and sub-classes of Immunoglobulins	K2
CO-3	Denote the antigen-antibody reactions and complement system.	K1
CO-4	Evaluate the different types of hypersensitivity reactions.	K5
CO-5	Compile the different types of Transplantation and concepts of plastic surgery	K6
CO-6	Outline the information on various immunological techniques.	K4

UNIT-I: History of Immunology-Edward Jenner and Louis Pasteur with their experiments. Immunity-Innate and Acquired immunity. Immune Response-Antibody and Cell Mediated response. Cells of the immune system, Organs of the immune system–primary and secondary lymphoid organs.

UNIT-II: Antigen-Properties, Cross reactivity, Antigenicity, Immunogenicity, antigen determinants, Haptens, Adjuvants, Self-antigen (MHC) an outline only. Antibodies - Properties and Structure of classes and subclasses of Immunoglobulins.

UNIT-III: Antigen–Antibody interaction–Precipitation and Agglutination, Complements and their activation pathway, Cytokines and their functions.

UNIT-IV: Hypersensitivity–type I, II, III and IV and their clinical manifestations. Transplantation-types, Mechanism of Allograft rejection, Immuno suppressor agents, Tissue and organ transplantation. Basic concepts of plastic surgery.

UNIT-V: Immunization-Passive and Active, Vaccines-Recombinant vaccines, DNA vaccines, Benefits and adverse effects of vaccination. Principle and applications of RIA, ELISA, Immunofluorescence and Complement fixation test. Monoclonal Antibody production and its applications.

Text Books:

1. Annadurai. B (2008), A textbook of Immunology and Immunotechnology, 1st Edition, S.Chand & Co, Ltd, New York.
2. J. Kuby, R.A.Goldsby, T.J. Kindt and B.A. Osborne, B.A. (2007), Immunology, 4th edition, W.H.Freeman and Company, New York, USA.

References:

1. J. Kuby (2002), Immunology, 5th edition, W.H.Freeman and Company, New York.

2. Ian R. Tizard (2000), Immunology: An Introduction., 4th edition, W.B. Saunders Co., Philadelphia.
3. Murphy Kenneth (2008), Janeway's Immunobiology, Garland Science Publishers, New York.
4. Peter J. Delves, Ivan Maurice Roitt,, Seamu J. Martin and Deninis Burton (2006), Roitt's Essential Immunology, 11th edition, Blackwell Scientific Publications, London.
5. Rajasekaran Pandian (2007), Immunology and Immunotechnology, Panima Publishers, Chennai.
6. I. Roitt, J. Brostoff and DMale (2002), Essential Immunology, 8th edition, English Language Book Society, London.

Semester-VI

Sub. Code: BC622

MEDICAL BIOCHEMISTRY

5 Hours/4

Credits

Course Objectives:

- To learn the information on diseases of carbohydrate metabolism.
- To analyze the role of diseases of amino acid metabolism
- To learn liver functions tests and its interpretation.
- To acquire knowledge on kidney function tests.
- To know the basic information on gastric and pancreatic function tests.

Course Outcomes:

S.No.	CO Statement	Cognitive Level
CO-1	Observe the basic concepts on diseases of carbohydrate metabolism	K2
CO-2	Analyze the role of diseases associated with amino acid metabolism	K4
CO-3	Determine the role of liver functions tests	K3
CO-4	Outline kidney function tests and its interpretation	K5
CO-5	List out the role of gastric and pancreatic function tests	K1
CO-6	Integrate various diseases and their pathophysiology	K6

UNIT-I: Blood sugar level–Definition, Types and Normal Values, Renal threshold of Glucose, Regulation of blood glucose- Hormonal action. Hypo and Hyperglycemia–Causes, Diagnosis and Treatment. Diabetes mellitus, Glycosuria, Fructosuria, Galactosemia, HbA_{1C}, ketoacidosis, Glycogen Storage Disease, GTT.

UNIT-II: Diseases related to amino acid-Clinical manifestation of Phenylketonuria, Cystinuria, Albinism, Fanconi syndrome, Tyrosinemia and Alkaptonuria. Lipoproteins-Hyperlipoproteinemia, Hypolipoproteinemia, Atherosclerosis, Myocardial infarction, Ischemic Heart Disease and Obesity.

UNIT-III: Liver–Functions, Liver function test, Metabolism of Bilirubin, Jaundice–classification, causes and differential diagnosis. Liver disorders–Causes, Symptoms, Diagnosis and Treatment for Acute and Chronic Hepatitis, Cirrhosis, Fatty Liver, Gall Stones.

UNIT-IV: Kidney–Functions, Renal function test, Clearance test–Urea, Creatinine, Inulin, PAH test, Concentration and Dilution test. Renal disorders: Causes, symptoms, Diagnosis and Treatment–Glomerulonephritis, Diabetes Insipidus, Nephrotic syndrome, Renal failure and UTI.

UNIT-V: Gastric function test- Collection of gastric content, Examination of gastric residium, FTM, Alcohol Stimulation test, Tubeless gastric analysis. GI tract disorders-Peptic ulcer, Gastric carcinoma, Zollinger-Ellison syndrome. Pancreatic function test- Composition of pancreatic juice. Disorders-Acute and Chronic pancreatitis and Steatorrhoea. Intestinal function test.

Text Books:

- 1.N.Chatterjee and Rana Shinde (2012) Textbook of Medical Biochemistry- eighth edition, Jaypee publication, New Delhi.
- 2.T.M. Devlin (2002), Textbook of Biochemistry with Clinical correlations, 5th edition, John Wiley & Sons Inc, Publications.

References:

1. Carl A. Burtis, Edward.R. Ashwood, David E Bruns, Tietz Text book of clinical chemistry and molecular diagnostics, (5th edition). Elsevier, St. Louis, USA, [2012].
2. Harrison, T.R. Fauci, Branunwalad and Isselbaeher, Principles of Internal Medicine [1998] McGraw Hills.[Vol-I & II]
3. Joan F. ZilvaA, PR Pannall, Clinical Chemistry in Diagnosis and Treatment, Liyods–Luke [Medical Books] Ltd., London [1975].
4. K.V. Krishnadas, Textbooks of Medicine [1996], Jaypee Brothers.
5. W.J. Marshall and S.K. Bangert, Clinical Chemistry [1995]

Semester-VI

Sub. Code: PBC606	MAIN PRACTICAL-VI	5 Hours/4
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Credits

I. Experiments on Enzymes by Colorimetry

1. Effect of pH, temperature and substrate concentration on salivary amylase
2. Effect of pH, temperature and substrate concentration for urease
3. Assay of Serum Transaminases (SGOT) & (SGPT)

II. Haematology

1. Collection of Blood and Blood grouping
2. Measurement of BP
3. Enumeration of Total RBC count
4. Enumeration of Total WBC Count
5. Estimation of Haemoglobin content by Sahli's method
6. Determination of ESR
7. Differential Counting
8. Bleeding and Clotting time
9. PCR (demonstration)

Semester-VI

Credits**Course Objectives:**

- To learn the basic concepts in Recombinant DNA technology and its tools.
- To know the methods of gene transformation, recombinant selection and screening methods.
- To understand the molecular techniques namely southern, northern, western, PCR and DNA sequencing.
- To understand the plant tissue culture and applications of transgenic plants.
- To gain knowledge on animal tissue culture and applications of transgenic animals.

Course Outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Discuss the basic tools in Recombinant DNA technology.	K2
CO-2	Acquire knowledge of gene transformation, Recombinant selection and screening methods.	K3
CO-3	Develop a clear understanding of blotting techniques.	K6
CO-4	Analyze a thorough knowledge about PCR and DNA Sequencing.	K4
CO-5	Recognize and gain insight into Plant tissue culture techniques.	K1
CO-6	Justify the knowledge of animal tissue culture and applications of transgenic animals	K5

UNIT-I: Recombinant DNA technology and its tools-Isolation of gene, Cloning vectors: plasmid, cosmid, phage, YAC, BAC, HAC, binary vector, shuttle vector and expression vectors, rDNA formation. Ligation, Use of linkers and adapters.

UNIT-II: Methods of gene transformation. Recombinant selection and screening methods-Insertional inactivation, Hybridization and Immunological methods.

UNIT-III: Molecular techniques-Southern, Northern and Western blotting and its applications. PCR – Types and its applications, DNA sequencing methods-Maxam-Gilbert.

UNIT-IV: Plant tissue culture-Media composition, nutrients, growth regulators, initiation and differentiation. Callus and suspension culture, Micro propagation, Somatic embryogenesis and Somoclonal variation. Applications of Transgenic plants.

UNIT-V: Animal tissue culture-substrate, culture media and culture procedures, Primary culture and cell lines, tissue culture- slide, flask and test tube culture. Applications of transgenic animals.

Text Books:

1. R.C. Dubey (1993) A textbook of Biotechnology, S. Chand Publishing, New Delhi.
2. A.K. Srivastava, R.K. Singh and M.P. Yadav (2005), Animal Biotechnology, Oxford and IBH.

References:

1. N Channarayappa, (2006), Molecular biotechnology University Press, Hyderabad
2. R.C.Dubey (2014) Advanced Biotechnology, S. Chand Publishing, New Delhi.
3. H.D. Kumar (1997), Molecular Biology & Biotechnology Vivas publishing house Pvt. Ltd.
4. Bernard, R. Glick Jack.J. Pasternak, (2003) Molecular biotechnology–Principle and application of recombinant DNA, 3rdedition Library of Congress.
5. S. B. Primrose (1994), Molecular Biotechnology, 2nd Ed. Blackwell Scientific publishers, Oxford.
6. [V. Kumaresan](#) and [N. Arumugam](#) (2016) Fundamentals of Biotechnology-Saras Publications.

Semester-VI

Sub. Code: BC623B

SS2: BIOETHICS

5 Hours/5

Credits

Course Objectives:

- To understand the basic concepts in Bioethics, Biotechnology and research innovation.
- To learn about the **biosafety guidelines in India and genetically modified organisms**.
- To have in-depth understanding of principles governing research in human genetics.
- To learn the composition of institutional ethical committee and CPCSEA guidelines.
- To acquire knowledge on patents and intellectual property rights (IPR).

Course Outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Develop an understanding of the basic concepts in bioethics, Biotechnology and research innovation.	K6
CO-2	Define and understand the biosafety guidelines in India and genetically modified organisms	K1
CO-3	Categorize the principles governing research in human genetics and stem cell research.	K4
CO-4	Determine the composition of institutional ethical committee and ethics in animal experimentation.	K3
CO-5	Demonstrate a clear understanding of the CPCSEA guidelines for animal care in research.	K2
CO-6	Evaluate the application process of patents and intellectual property rights (IPR).	K5

UNIT-I: Bioethics-Definition, Ethics in scientific research. Biomedical waste-Source, handling and disposal. Animal Incineration methods. **General Laboratory Practices.**

UNIT-II: Ethical concerns of Biotechnology research and innovation, **Biosafety levels-Genetically modified organisms and its release-Genetically modified foods, Biosafety guidelines in India.**

UNIT-III: Genetics and Genomics Research-Defining risks and benefits-principles governing research in human genetics–informed consent in genetic research, ethical issues in genetic testing and stem cell research.

UNIT-IV: Composition of institutional Ethical Committee (IEC). Ethics in animal experimentation. CPCSEA guidelines for Animal care in research.

UNIT-V: Biotechnological inventions. Patentable subjects and protection in biotechnology. Principles and general requirements for patenting. Methods of application of patents. Intellectual property rights (IPR).

Text Books:

- 1.The Cambridge Textbook of Bioethics by Singer, Peter, A. and Viens A.M. Cambridge University Press, 2008.
- 2.**Biotechnology by U. Sathyanarayana. Books and Allied (p) Ltd., 2009.**
- 3.**Biotechnology by Singh, B.D. kalyani publishers, 2009.**

References:

1. **Shalesha A. Stanley, Bioethics, Wisdom educational service, 2008, Wisdom Educational Service.**
2. Indian Council of Medical Research. Ethical guidelines for bio-medical research on human participants; Chapter VII. New Delhi (2006).
3. Designing Clinical Research: Stephen Hulley 4th Edition (2013).

Semester-VI **SSP-II: NUTRITIONAL BIOCHEMISTRY** **1* Credit**

Course Objectives:

- To know about the importance of nutrition and its associated health risks.
- To understand the various techniques of energy measurements.
- To acquire sound knowledge about different types of nutrients and its composition.
- To gain knowledge on fat and water soluble vitamins and its role in human metabolism.
- To study the uses of therapeutic diets in management of diseases.

Course outcomes:

S.No.	Description	Cognitive Level (K- level)
CO-1	Identify the nutritional aspects of various foodstuffs and its measurements.	K1
CO-2	Explain the different types of nutritional measurements.	K2
CO-3	Calculate dietary plan for different age groups and disease conditions.	K3
CO-4	Analyze the daily requirements and functions of water and fat soluble vitamins.	K4
CO-5	Perceive the information on therapeutic diets for disease conditions.	K5
CO-6	Formulate the nutritional status and design diet plans for various ailments.	K6

UNIT-I: Introduction and Definition of Food, Nutrition, and Diet. Classification of Food by Origin and Chemical Composition, Classes of Nutrients-Micro & Macro, Types of Nutrition. Food groups based on their functions-Energy yielding, Body building and Protective foods.

UNIT-II: Units of energy measurement-Calorie, Joule & BTU, measurement of food stuffs by Bomb Calorimeter, Calorific value of Proteins, Carbohydrates and Lipids. RQ of foods and BMR.

UNIT–III: Composition of balanced diet and RDA (for Indian)-for infant, children, adolescent and adult (male and female), pregnant & lactating women and old age. Protein Energy Malnutrition-Kwashiorkar and Marasmus.

UNIT–IV: Fat and Water Soluble Vitamins (Vitamin B complex & C)-Chemical name, Sources, Daily requirements and Deficiency disorders.

UNIT–V: Diet in peptic ulcer, High Blood Pressure, Renal calculi, Diabetes Mellitus, Constipation, Diarrhea, jaundice and Anemia.

Text Books:

1. B. Srilakshmi (2012), Nutrition Science, New Age, New Delhi, 2012.
2. M. Swaminathan (1986) Hand book of food and nutrition, Bangalore Printing & Publishers.

References:

1. R.K. Murray, D.K. Granner, P.A. Mayes, D.W. Rodwell (2006), Harper’s Biochemistry, twenty fifth edition, Prentice Hall, New Jersey.
2. D.L.Nelson, and M.M. Cox (2008) Lehninger Principles of Biochemistry, 5th Ed, W.H. Freeman and Company, New York.
3. U. Sathyanarayanan (2002)., Essentials of Biochemistry Books and allied (p) Ltd.
4. D. Voet, and G.Voet (2006), Biochemistry, John Wiley and Sons, New York.
5. G.L Zubay (1999) Biochemistry, 4th Ed, WCB, McGraw-Hill, New York.

Semester-VI

NON-MAJOR ELECTIVE

Sub. Code: NBC604 HEALTH CARE AND DISEASE MANAGEMENT 2 Hours/1 Credit

Course Objectives:

- To give awareness about physical fitness and normal diet.
- To gain the knowledge about first aid treatment for various accidents.
- To handle emergency situations and learn first aid treatment.
- To understand the mechanism underlying the development of general diseases.
- To study about the causes and treatment for specific diseases.

Course Outcomes:

S. No.	Description	Cognition level (K-level)
CO-1	Identify the health benefits of balanced diet.	K1
CO-2	Demonstrate the first aid care for wounds, poisoning, burns and vomiting.	K2
CO-3	Administer the methods to handle emergencies like heart attack, Blood pressure, diabetes and asthma.	K3
CO-4	Analyze the causes and prevention of common diseases such as cold, fever, cough and headache.	K4
CO-5	Perceive the information on diseases like cataract, dandruff, jaundice and ulcer.	K5
CO-6	Integrate the health and hygienic practices against various diseases	K6

UNIT–I: Safeguards to Health: Physical fitness, BMI, balanced diet, sleep quota and sleep disorders. Hygienic practices.

UNIT–II: First aid: Treatment for accidents, Wounds, Burns, dog bite, insect bite and stings, Poisoning, Fainting and Drowning.

UNIT-III: Handling Emergencies: Heart attack, blood pressure, hypoglycemia, epilepsy, foreign objects in the ear and nose, sprains.

UNIT–IV: General Diseases: Causes, symptoms and treatment for headache, fever, common cold and cough, constipation, diarrhea, itching, allergies and stomach aches.

UNIT–V: Specific Diseases: Cataract, Cancer, AIDS, Covid-19, Dengue, Jaundice, Ulcer and Kidney stone.

Text Books:

1. Shashi Goyal. (2012) Food, Nutrition and Health, S.Chand Publishing, New Delhi.
2. Devendra Vora. (1995) Health in Your Hands., Navneet Pub., Mumbai.

References:

1. H.K Bakhru, (1990). Herbs that Heal Natural Remedies for Good Health, Orient, Delhi.
2. Harrison's principles of internal medicine–Vol-I & II, (2015), McGraw Hill Education; 19th edition.
3. K.V. Krishna Das, (2008), Text book of medicine, 5th edition, K.V. Krishna Das, Text book of medicine, 5th edition.
4. Harold Shryock and Hubert O. Swartout, M.D., Dr. P.H (1970) You and Your health – (Vol-I, II & III), Pacific Press Publishing, California.

Semester - I
Human Physiology

Paper - I

6 Hrs
5 Credits

Aim

- To promote the student to understand human body, structure, various parts and function.

Unit -I:

Composition of blood, function, types of blood cells, morphology and function. Blood groups and Rhesus factors. Lymphatic system and Composition of lymph. Circulatory system - Heart anatomy, cardiac cycle & ECG.

Unit -II:

Structure of lungs, Role of hemoglobin in transport of O₂ & CO₂. Kidney & nephron structure and functions. Glomerular filtration rate (GFR), selective reabsorption (active and passive) of substance and secretion.

Unit -III:

Structure and functions of digestive system. Digestion and absorption of Carbohydrate, lipids, proteins and nucleic acid. Mechanism of HCl secretion in stomach. Role of bile salt in digestion and absorption. Role of hormones involved in digestion.

Unit -IV:

Structure of nerve cell- dendrons, axon, cell body, synapse. Conduction of nerve impulse in synapse- (electrical and chemical), neuro- transmitters- adrenergic and cholinergic. Reflex action. Structure and functions of brain and spinal cord

Unit -V:

Types of muscle, structure and their functions. Ultra structure of skeletal muscle, contraction and relaxation of skeletal muscle via Ca²⁺ pump. Structure and functions of Bone, Tendons and cartilage.

Text Book

1. N. Arumugam, Animal Physiology, Saras publication.
2. P.S.Verma, B.S. Tyagi and V.K.Agarwal, Animal physiology - S. Chand.

References

1. BJ Meyer, HS Mejj, AC Meyer, Human physiology, 2nd edition- AITBs publishers and distributors.
2. Giese, Cell physiology, 5th edition, W.B saunders company, TOKYO, Japan.
3. KA Goel, KV Sastri, Rastogi, A textbook of Animal physiology, S.chand&co.
4. NK. SaradhaSubramanyam, A Hand Book of Basic Human physiology- S.Chand&co., Ltd.
5. Y. Rajalakshmi, Guide to Physiology- S.Chand&co., Ltd.
6. RA Agarwal, Anil. K, Srivastava, KaushalKumar, Animal physiology and Biochemistry- S.chand& co, 3rd edition, 1986
7. Text book of medical physiology – Guyton.

Aim

- To give awareness about first aid, basic health issues, handling emergencies.

Unit – I:

Safe guards to health: Physical fitness and normal weight, normal diet, merits and demerits of taking foods and beverages, sleep quota and sleep disorders.

First Aid for Accidents, wounds, burns, bites, hiccup, shock, poisoning, vomiting, drowning and fainting.

Unit – II:

Handling Emergencies: Heart attack, blood pressure, hypo and hyper glycaemic condition unconsciousness, asthma, sprain and foreign body injury.

Causes and symptoms of headache, fever, common cold, cough, constipation, diarrhea, itching, dizziness and Obesity.

Unit – III:

Clinical features and treatment of Cataract, dandruff, hair fall, dental caries, cancer, AIDS, ulcer, appendicitis and hemorrhage

Unit – IV:

General health properties of herb, medicinal values of herbs used in food, herbal remedies for common cold, headache, fever, body pain, intestinal disorders and wound. Herbal dye and perfumes. Advantage and disadvantages of herb.

Unit - V:

Introduction to natural medicine: hydrotherapy, Aerotherapy, heliotherapy, climatotherapy, physiotherapy, dietotherapy (basic steps and uses).

Text Book

1. K.V. Krishna Das, Text book of medicine, 5th edition.
2. Harold Shryock and Hubert O. Swartout, M.D., Dr.P.H , You and Your health –(Vol-I, II & III)

References

1. Harold Shryock.M.D, Modern medical guide
2. Harrison's principles of internal medicine – Vol-I & II
3. RN Chopra, SL. Nayar and IC.Chopra Glossary of Indian medicinal plants
4. HK Bakhru, Herbs that heal- Natural Remedies for Good health
5. Vance Ferrell Natural Remedies Encyclopedia
6. Dr.ErnstSchneider.Healthy by Nature

Main Practical -I

Semester – I & II

Hrs

6

4 Credits

I Titrimetry

- Estimation of amino acids by formal titration
- Estimation of ascorbic acid by using 2,6 Dichlorophenol Indophenol
- Estimation of reducing sugar by Benedict's method
- Estimation of Calcium from biological fluids like blood, milk and urine
- Determination of Saponification Number of edible oil.

II Qualitative Analysis

- Reactions of simple sugars including glucose, fructose, galactose, mannose, pentose, maltose, sucrose, lactose and starch
- Colour reactions of amino acids like tryptophan, tyrosine, cysteine, arginine, methionine and histidine

Semester - III

Paper - III

Bio Analytical Instrumentation

6 Hrs

5 Credits

Aim

- To train and give the basic principles of biophysical and biochemical techniques used in life sciences.

Unit-I:

Principles of electrochemical techniques, reference electrodes. Determination of pH using pH meter, Hydrogen electrode and glass electrodes. Principles and applications of Clark Oxygen Electrode and ion selective electrode. Electrophoresis - General principles, factors affecting the migration rate, Paper electrophoresis, Tiselius moving boundary electrophoresis and SDS-PAGE.

Unit-II:

Basic principles - Sedimentation rate, Svedberg unit, different types of rotors. Different types of centrifugation - Differential, density gradient, isopycnic and equilibrium centrifugation. Preparative and analytical ultra centrifugation techniques.

Unit-III:

General principles of chromatography – partition and adsorption. Principles, operational procedure and applications of paper chromatography, Thin layer chromatography, Column chromatography, Ion - exchange chromatography, Molecular sieve chromatography & Affinity chromatography, Basic concept of Gas Liquid chromatography, immuno chromatography, HPTLC and HPLC.

Unit-IV:

Basic principle of electromagnetic radiation. Energy, wavelength, wave number and frequency. Absorption and emission spectra. Beer – Lambert's law, principles, instrumentation

and applications of Colorimeter, UV and visible spectrophotometer, Fluorescent probes, Principle, instrumentation and applications of Flame photometry, Atomic absorption Spectrophotometer.

Unit-V:

Atomic structure, radiation, types of radioactive decay, half life, and units of radioactivity (Roentgen, Rad, Rem, Let). Detection and measurement of radioactivity – methods based upon ionization (GM counter), methods based upon excitation (scintillation counter) and Autoradiography, Applications of radioisotopes, Biological hazards of radiation and safety measures in handling radio isotopes.

Text Book

1. Keith Wilson and John Walker, Principles and Techniques of Practical Biochemistry, 6th edition, 2008, Cambridge Press.
2. Chatwal and Anand, Instrumental Methods of Analysis, Himalayan Publication.

References

1. Keith Wilson and Kenneth Goulding, A Biochemical Guide to Principles and techniques of Practical Biochemistry, Cambridge Press.
2. R.B.Turner, Elsevier.N.Y., Analytical Biochemistry
3. Shawney, Ranshir Singh, Introduction to Practical Biochemistry, Narasa Pub, N.Delhi.
4. David Friefeilder Biophysical chemistry
5. Scoog, Instrumental biochemistry

Semester - IV Microbiology

Paper - IV

**6 Hrs
5 Credits**

Aim:

- To develop the students in the area of applied microbiology, classification and health importance of micro-organism

Unit – I:

Ultra structure of Bacteria, Types of bacteria, Bacterial growth curve and growth factors and Ultra structure of fungi, its types, characteristics and its importance

Unit – II:

Classification of viruses, structure of viruses. Lytic cycle and lysogeny. Retroviruses – Life cycle and mode of transmission, symptoms and treatment of HIV, H1N1 and dengue virus.

Unit – III:

Ultra structure and types of algae (spirillum) and protozoa – characteristics and its importance

Unit – IV:

Introduction – History of microbiology – Scope of microbiology, Microscopy – Basic principles. Types of microscope – Light microscope, Fluorescence microscope, Dark field microscope and Electron microscope.

Unit – V:

Sterilization, Disinfection, Staining techniques – Simple and Gram's staining, Media preparation and composition of nutrient agar medium, blood agar medium and chocolate agar medium and culturing, Vermicomposting and antibiotic sensitivity test (antibiogram).

Text Books

1. Ananthanarayanan and JeyaramPanicker, Text book of Microbiology, Universities Press, 7th edition, 2005
2. Michael J. Pelczar, JR., E.C.S. Chan., and Noel R. Krieg. Microbiology, TATA McGraw – Hill Edition

References

1. Brooks, et al. 1998. Jawetz, melnick and Adelberg's Medical Microbiology, Lange Med.
2. Davis, et al. 1989. Microbiology, 4th Ed. Lippincott Williams and Wilkins.
3. Bailey and Scott's – Diagnostics Microbiology – Finegole and Barbara
4. Joklik, et al. 1995. Zinsser's Microbiology, McGraw Hill Professional.
5. Madigan, et al. 2002. Brock of Microorganisms, 10th Ed. Prentice Hall.

Main Practical-II

Semester – III & IV

6 Hrs

4 Credits

I Preparation

i. Preparation of Buffer

Phosphate buffer, Tris buffer and Citrate buffer.

ii. Biological Preparation

- i) Preparation of starch from potatoes
- ii) Preparation of casein from milk
- iii) Preparation of albumin from egg

iii. Reagents preparation

Normal and molar solution, saturated solution, percentage solution and dilute solution

II Techniques

i. Colorimetry

- a. Estimation of inorganic phosphorus by Fiske and Subbarow method.
- b. Estimation of amino acids by Ninhydrin method.
- c. Estimation of protein by Biuret method.

ii. Electrophoresis

- a. Separation of protein by SDS-PAGE and Agarose

iii. Chromatography

- a. Paper chromatographic separation and detection of amino acids
- b. Separation of polar and non-polar compounds by TLC

III Microbiology

- i. Preparation of liquid and solid media for growth of microorganisms.
- ii. Isolation and maintenance of organisms by plating and streaking methods. Slants and swab culture.
- iii. Isolation of cultures from Air, soil and water
- iv. Antibiotic sensitivity test
- v. Microscopic examination of organisms by gram stain method

Semester - V

Intermediary Metabolism

Paper - V

4 Hrs

4 Credits

Aim

- To promote and understand chemical reactions, central metabolic pathways and kinetics of energy and homeostasis of metabolism

Unit – I:

The basic metabolic (anabolic & catabolic) pathways and amphibolic pathways. Glycolysis – aerobic and anaerobic, energetic, action of pyruvate dehydrogenase complex enzyme, Citric acid cycle and energetics, Glycogenesis, Glycogenolysis. Pentose phosphate pathway and gluconeogenesis.

Unit – II:

The electron transport chain – components and reactions of ETC. Role of ETC – oxidative phosphorylation – chemiosmotic hypothesis. Uncouplers of oxidative phosphorylation and high energy compounds (ATP and GTP).

Unit – III:

Biosynthesis and oxidation of fatty acids, triacyl glycerol. Biosynthesis of phospholipids. Metabolism of cholesterol and ketone bodies.

Unit – IV:

Catabolism of amino acids – transamination, oxidative deamination and non-oxidative deamination, decarboxylation and urea cycle, creatine and creatine phosphate formation and methylation.

Unit – V:

Nucleic acid metabolism – Biosynthesis and degradation of purine and pyrimidine nucleotides – De novo synthesis and Salvage pathway.

Text Book

1. Lehninger Principles of Biochemistry – David L. Nelson, Michael M. Cox, Macmillan Worth Publishers.
2. Harper's Biochemistry – Robert K. Murray, Daryo K. Grammer, McGraw- Hill, Lange Medical books. 25th edition.

References

1. Biochemistry, 4th edition - Lubert Stryer, W.H. Freeman and company, New York.

2. Enzyme Biochemistry – Trevor Plamer, First East-West publication 1st edition, 2004.
3. Fundamentals of Biochemistry – A.C. Deb, New Central Book Agency Pvt., Ltd., Calcutta.
4. Biochemistry – Voet and Voet. John Wiley and Sons (Asia) Pvt. Ltd-2006
5. Text book of Biochemistry – Sathya Narayanan U and U. Chakrapani – 3rd edition, Pvt Ltd, 2007.

Enzymes

4 Hrs
4 Credits

Paper - VI

Aim:

- The role of enzymes in basic biochemical reactions with structure, classes and naming

Unit – I:

Enzymes Introduction – chemical nature and general characterization – Nomenclature and IUB system of enzyme classification and specificity, enzyme units(IU,Katal, turnover number and specific activity) Extraction and purification of enzyme by chromatography and electrophoretic techniques. Criteria of purity of enzymes.

Unit – II:

Active site, Mechanism of action of enzyme – Lock and Key theory and induced fit theory, Coenzymes and multi-enzyme systems – coenzymes and co-factors, isoenzymes, Apoenzyme and holoenzyme. Structure and functions of coenzyme reaction involving nucleotide, NAD/NADP and FMN/FAD, coenzymes and co enzyme-A.

Unit – III:

Enzyme Kinetics – reaction rate, energy of activation, enzyme catalysis and factors influencing velocity of enzyme reaction. Michaelis-Menton equation, Line-Weaver Burk plot, Eadic – Hofstee plot.

Unit – IV:

Regulations of enzyme activity, Enzyme inhibition - competitive, non-competitive and uncompetitive inhibitors (kinetics and derivations not required) Allosteric enzymes and feed back inhibition.

Unit – V:

Applications of enzymes: Diagnosis, Therapeutic and Industrial application of enzymes, immobilized enzymes – Biosensors and Biochips, abzymes and ribozymes. Isoenzymes (LDH and CK).

Text Book

1. Trevor Palmer, Enzyme Biochemistry, First Edition, 2004 –West Publication
2. Sathya Narayanan, Text book of Biochemistry

References

1. Lubert Stryer, Biochemistry, 4th edition W.H. Freeman and company, New York.
2. David L. Nelson, Michael M. Cox, Lehninger Principles of Biochemistry, Macmillan worth Publishers.
3. Robert K. Murray, Daryo K. Grammer, Harper's Biochemistry McGraw- Hill, Lange Medical books. 25th edition.
4. A.C. Deb, Fundamentals of Biochemistry, New Central Book Agency Pvt., Ltd., Calcutta.
5. S.Devlin, Sarup and Som, Enzyme –New Publicatios
6. Voet and Voet- Biochemistry.

Plant Biochemistry

Paper - VII

4 Hrs

4 Credits

Aim

- To develop basic knowledge on plant cell, physiology and plant biochemistry

Unit-I:

Structure of Plant cell, root, stem and leaves of monocots and dicots. Cell Structure and Functions of sub cellular organelles of plants. Mechanism of water absorption, Ascent of sap, stomatal opening, Transpiration and types, Mechanism and factors affecting transpiration.

Unit-II:

Photosynthesis – photosynthetic pigments and photosynthetic apparatus. Light reaction - Cyclic and non-cyclic phosphorylation, Calvin cycle. Hatch slack cycle. Regulation of photosynthesis, Photorespiration.

Unit-III:

Cycles of elements-N₂ cycle, Biochemistry of symbiotic and non-symbiotic N₂ fixation, sulphur cycle and phosphorous cycle. Plant growth, Measurement of growth.

Unit-IV:

Plant growth regulators, chemistry and biosynthesis. Mode of action. Distribution and physiological effects of auxins, gibberellins and cytokinins. ABA and ethylene.

Unit-V:

Plant nutrition - Biological functions of Micro and Macro nutrients in plants and their deficiency symptoms. phytochromes, biochemistry of seed dormancy, seed germination, fruit ripening and Senescence.

Text Book

- Lea & Leagood, John Wiley and Sons. Plant Biochemistry and Molecular Biology
- V. Verma, Plant Physiology, Emkay publications, 7th revised edition 2001.

Reference

- Robert M. Devlin & Franies H., Plant Physiology – Witham CBS publishers & distributors.
- S.N. Pandey & B.K. Sinha, Plant Physiology, Vikas publishing House Pvt, Ltd. 3rd edition.
- V.K. Jain, Fundamentals of Plant Physiology, S.Chand and Co. 2000.

Immunology

Paper - VIII

**4 Hrs
4 Credits**

Aim:

- To give input on basic immunology, antigens, antibodies and mechanism of actions

Unit – I:

Introduction, inventions - Edward Jenner, Louis Pastuer. Immunity - Innate & Acquired immunity. Immune Responses – Antibody & cell mediated response. Cells of the immune system, organs of the immune system – primary and secondary lymphoid organs.

Unit – II:

Antigen: Properties, cross reactivity, antigenicity, immunogenicity, antigen determinants, haptens, adjuvants, self antigen (MHC) an outline only. Antibodies: Properties, classes and subclasses of immunoglobulins: structure, and functions, antigenic determinants on immunoglobulins.

Unit – III:

Antigen – Antibody interaction – precipitation and agglutination, Complements, Complement fixation test, cytokines and their functions.

Allergy and hypersensitivity – type I, II, III and IV their clinical manifestations.

Unit – IV:

Transplantation: Graft - types, Allograft rejection, Immuno suppressor agents, Tissue and organ transplantation. Basic concepts of plastic surgery.

Unit – V:

Vaccination: passive and active immunization, Recombinant vaccines, DNA vaccine, Benefits and adverse effects of vaccination. Principle and applications of RIA, ELISA and immuno fluorescence and immuno precipitation.

Text Book

1. Dulsy Fatima & Arumugam, Immunology.
2. Janis Kuby, Immunology, 4th edition, 2000, W.H. Freeman and Company.

References

1. Tizard. R., Immunology – An introduction, Jan 1995.
2. Geoffrey Zubay, Immunology, W.M.C. Brown publisher, 4th edition, 1992.
3. Paul, Fundamental of Immunology, LippincottPraven publications, 4th edition.
4. J.Kannan, Immunology, MJP Publishers, Chennai-5.
5. Anthanarayanan.K and JayaramanPanikaer, Textbook of microbiology, 1996.
6. Roitt, Immunology.
7. James T. Barrett, Textbook of Immunology, 4th edition.
8. C.V. Rao, Immunology.

Elective: I. Nutrition and Dietics

5 Hrs
5 Credits

Aim:

- To promote the nutritional importance, food items and their energy criteria's

Unit -I:

Introduction and definition of food and nutrition, basic food groups-energy yielding, body building and protective foods. Physiological role and nutritional significance of carbohydrates, lipids and proteins.

Unit-II:

Unit of energy measurement, measurement of food stuffs by bomb calorimeter, calorific value of proteins, carbohydrates and lipids. RQ of foods –BMR, its measurements, SDA of foods and single cell protein (SCP).

Unit – III:

Nutritive Value of Protein :Essential aminoacids, biological value of proteins (animal & plant proteins). Protein Malnutrition:Kwashiorkar and Marasmus, their preventive and curative measures. Balanced Diet for Different Age Groups: Composition of balanced diet and RDA (for Indian), for infant, children, adolescent and adult (male and female), pregnant & lactating women and old age.

Unit –IV:

Food Allergy : Diagnosis, Treatment of Allergy, Malabsorption Syndrome – (Treatment of Celiac disease, idopathistreatorrhea and tropical sprue). Therapeutic Diets: Diet in peptic ulcer, High Blood Pressure, Renal and vesicle calculi, GOUT and Diabetes Mellitus.

Unit –V:

Diets in various disorders: Diet in intestinal disorders- Ulcerative Colitis (Non specific), Constipation and Diarrhoea(acute and chronic) Diets in liver disorders in humanbeing – Cirrhosis of liver, jaundice and viral hepatitis. Diets in disease of the kidney and urinary tract – Nephritis (type 1 and 2) and Acute and chronic renal failure (Uraemia).Treatment of Anaemias (iron, folic acid and vitamin B12 deficiency).Introduction and health aspects of Food fibers, food additives, natural foods and food processing and its importance.

Text Book

- S.Ramakrishnan, S.VenkatRao, Nutrition biochemistry, T.R.Publication,Chennai.
- M. Swaminathan, Hand book of food and nutrition, Ganesh and Co., Chennai-17

References

- Robert.K.Murry,DarylK.Grammer, Harpers biochemistry, McGrawHill,Lange medical books.25th edition.
- Pamela,C.Chample,Richard.A.Harvey,J.B., Lippincotts illustrated biochemistry, lippincott company.
- KE. Elizabeth, Nutrition and child development, Paras Publishing.
- R.L.Nath.- Medicinal Biochemistry

Elective: II. Medical Laboratory Technology

5 Hrs
5 Credits

Aim:

- To train the students on basic test for diagnosis of disease, sample collection, storage and testing procedures

Unit- I:

Instrumentation to laboratory equipments and role of laboratory technician. Types of specimen collection and collection procedure- Blood, urine, feces, sputum, semen, throat swab, CSF. Reagent Preparation, Laboratory calculation, analytical and post analytical errors and Quality control [Internal Lab control and EQAC].

Unit-II:

Blood pressure (BP), Pulse, Clotting time, Bleeding time, Hemoglobin estimation, RBC count and WBC count, Differential WBC count, Erythrocyte Sedimentation Rate (ESR), Hematocrite value (Packed cell volume) and platelet counting.

Unit-III:

Composition, Preservation, Microscopic Examination, Macroscopic Examination- Physical Examination, Chemical examination of Urine. Examination of urine sedimentation – Ketone bodies, Bile pigment, hematuria, uric acid and sugar in urine. Pregnancy test.

Unit-IV:

Composition of faeces, Macroscopic and Microscopic Examination, Chemical examination – occult blood and steatorrhoea, pH interfering substance. Tissue cutting, fixation, embedding, slicing, mounting & staining.

Unit-V:

Culture media preparation, Culturing of organism from various specimens (Pus, Urine, Blood, Sputum, Throat Swab), antibiotic sensitivity test, Gram staining (acid fast, base & neutral). Safety procedure in Microbiological Techniques.

Text Book

1. L. Mukherjee., Medical laboratory technology, Vol. I, II, & III. Tata McGraw- Hill Publishing Company Limited.

References

1. V.H. Talib, Medical Laboratory Technology
2. Clinical Laboratory Practice in CMC Procedure, CMC, Vellore.
3. Carl A. Burtis, Edward R. Ashwood, David E. Bruns. Tietz, Text book of clinical chemistry and molecular diagnostics

Non-Major Elective: Health Builders

2 Hrs
2 Credits

Aim:

- To develop skills on biomolecules, source and functions.

Unit - I:

Carbohydrates – Introduction, source, classification, biological importance of carbohydrate and disease condition.

Unit - II:

Proteins – Introduction, source, classification, biological importance of proteins and disease condition.

Unit - III:

Fats – Introduction, source, classification, biological importance of fats and disease condition.

Unit - IV:

Vitamins – Introduction, source, classification, biological importance of vitamins and disease condition.

Unit - V:

Minerals – Introduction, source, classification, biological importance of minerals.

Note: Structure not necessary

Text Book

- A.C. Deb, Fundamentals of Biochemistry, New Central Book Agency Pvt., Ltd., Calcutta.
- J.L.Jain., Sunjay Jain and Nitin Jain, Fundamentals of Biochemistry, S. Chand.

References

- Robert.K.Murry, Daryl K. Grammer, Harpers biochemistry, McGrawHill, Lange medical books. 25th edition.
- M. Swaminathan, Hand book of food and nutrition, Ganesh and Co., -Chennai-17
- Lenhinger's Principle of Biochemistry [2002], Nelson & Cox.
- Sathya Narayanan, Text book of Biochemistry

Semester - VI Medical Biochemistry

6 Hrs
6 Credits

Paper – IX

Aim

- To give input on clinical diseases, symptoms and treatments

Unit -I:

Blood sugar level, renal threshold, regulation of blood glucose- hormonal action, hypo, hyperglycemia, diabetes mellitus, GTT, glycosuria, ketoacidosis, glycogen storage disease, fructosuria & galactosemia.

Unit -II:

Disease related to amino acid - Clinical manifestation of phenylketonuria, cystinuria, albinism, Fanconi syndrome, Tyrosinemia and alkaptonuria. Lipoproteins - various types, hyperlipoproteinemia, hypo lipoproteinemia, atherosclerosis, myocardial infarctions & obesity.

Unit -III:

Liver function test - recent aspects (enzyme markers), Metabolism of bilirubin - jaundice, classification, causes and differential diagnosis. Liver disorders - Acute and Chronic Hepatitis, Cirrhosis, Fatty Liver, Gall Stones.

Unit -IV:

Renal function test: clearance test – urea, creatinine, inulin, PAH test , concentration and dilution test. Renal disorders- glomerulonephritis, Diabetes Insipidus, Nephrotic syndrome, renal failure.causes, symptoms and clinical features of UTI.

Unit - V:

Gastric function test- collection of gastric content, examination of gastric residue, FTM stimulation test, tubeless gastric analysis. Disorders - Peptic ulcer, gastric carcinoma, Zollinger-Ellison syndrome.

Pancreatic function test- Composition of pancreatic juice. Disorders - acute and chronic pancreatitis and steatorrhea.

Text Book

1. N.Chatterjee,Textbook of Medical Biochemistry.4th edition, RanaShinde – Jaypee publication.
2. Devlin, Wiley.Clinical Biochemistry with clinical Correlation

References

6. P.D. Mayne, Clinical chemistry in Diagnosis and Treatment, ELBS / Arnold, New Delhi.
7. W.J. Marshall and S.K. Bangert, Clinical Chemistry [1995]
8. K.V. Krishnadas, Textbooks of Medicine [1996], Jaypee Brothers.
9. Harrison, T.R. Fauci, Branunwalad and Isselbaeher,Principles of Internal Medicine [1998] McGraw Hills.[Vol-I & II]
10. Harold Varley,Practical Clinical Biochemistry, CBS, New Delhi.
11. Joan F. ZilvaA, PR Pannall,Clinical Chemistry in Diagnosis and Treatment, Liyods – Luke [Medical Books] Ltd., Lon.
12. Carl A. Burtis, Edward.R. Ashwood, David E Bruns, Tietz Text book of clinical chemistry and molecular diagnostics

Cell & Molecular Biology**5 Hrs****Paper – X****5 Credits****Aim:**

- To give basic aspects of molecular theories

Unit – I:

Introduction: Structure and types of cell (prokaryotic and eukaryotic), brief account of cell division (mitosis & meiosis), The cell cycle-phases, regulation by cyclins and cyclin dependent kinases. Organisation of genes, chromosome structure, types and functions.

Unit – II:

DNA as genetic material and central dogma satellite DNA.Replication - types, evidence for semi conservative replication. Replication in prokaryotes.Inhibitors of replication. Enzymes - DNA polymerases I, II, III, topoisomerases, DNA ligases and other enzymes.

Unit – III:

Transcription: RNA polymerases, role of sigma factor, steps - initiation, elongation and termination [Rho-dependant and independent]. Inhibitors of transcription. Post transcriptional modifications and reverse transcription.

Unit – IV:

Translation – Genetic code – codon dictionary and salient features of genetic code. Composition of prokaryotic and eukaryotic ribosomes, structure of RNA, role of signal peptide. Activation of amino acids, initiation, elongation and termination of protein synthesis in prokaryotes. Post translational modifications. Inhibitors of protein synthesis.

Unit- V:

Gene mutation: types – point mutation (transition & transversion), frame shift mutation- insertion and deletion, suppressor mutation – nonsense and missense suppression. DNA damage – physical & chemical mutagens DNA repair mechanism – Base excision and UV repair. Gene regulation – operon concept (Lac operon), Oncogenes.

Text Book

1. Twyman - Molecular Biology
2. S.C.Rastogi , Molecular Biology, CBS publishing 2nd edition.

References

1. Benjamin Lewin, Genes VIII 2004. Oxford Univ. press.
2. G.Karp. John Wiley and Sons N.Y. Cell and Molecular biology – 3rd edition [2002].
3. David Freifelder, Molecular cell biology, 2nd edition, Narosa publishing House.
4. Lehninger's Principle of Biochemistry [2002], Nelson & Cox.
5. Robert K. Murray, Daryl K. Grammer, Harper's Biochemistry McGraw Hill, Lange medical books.
6. Adam et al., Biochemistry of nucleic acids
7. P.S. Verma and V.K. Agarwal, Cell Biology and Genetics, S.Chand publication.
8. Manju Yadav , Genetics – 1st edition 2003, Discovery Publishing House.

Elective: I. Endocrinology

**4Hrs
4 Credits**

Aim

- To give basic aspects of hormones, chemical classification and functions

Unit - I:

Introduction: definition of Hormones, chemical nature of hormones, classification of hormones. Signal transduction - hormonal receptors and general mechanism of action of group I and group II hormones.

Unit - II:

Hypothalamus and pituitary hormones- introduction, hypothalamic releasing factor, chemistry, secretion, functions and regulation of pituitary hormones: Anterior hormones – GH, pituitary tropic hormones (LH, FSH, ACTH & pituitary gonadotropins) and Posterior hormones – Vasopressin and oxytocin.

Unit – III:

Thyroid and Parathyroid Hormones – Introduction, chemistry, synthesis, secretion, functions and regulations of thyroid and parathyroid hormones.

Unit –IV:

Adrenal gland hormones- Introduction, chemistry, secretion, functions and regulations of adrenal cortex hormones (glucocorticoids and mineralocorticoids) and adrenal medullary hormones (epinephrine and Nor-epinephrine).

Unit –V:

Pancreatic and Gonadal Hormones - Introduction, chemistry, secretion, functions and regulations of pancreatic hormones (insulin and glucagon) and gonadal hormones (testosterone, estrogen and progesterone).Outline of hormonal defects.

Text Book

1. N.Chatterjee, Textbook of Medical Biochemistry - 4th edition, RanaShinde – Jaypee publication.
2. Guyton, Text book of medical physiology.

References

1. K.V. Krishnadas, Textbooks of Medicine, [1996], Jaypee Brothers.
- 2.Emil.L. Smith, Principles of Biochemistry
3. Williams, Endocrinology
4. Mac E. Hadley, Endocrinology, Publishers – Prentice Hall International Inc, 4th edition.
5. Rober K. Murray, Daryo K. Grammer, Harper’s Biochemistry, McGraw- Hill, Lange Medical books. 25thedition.

Elective: II. Biotechnology

**5 Hrs
5 Credits**

Aim

- To give knowledge on applied field of life sciences like DNA technology, PTC and ATC, Fermentation technology.

Unit – I:

Recombinant DNA technology: Introduction, Isolation of gene, Cloning vectors: plasmid, cosmid, phage, YAC, binary vector, shuttle vector and expression vectors, rDNA formation (DNA cloning). Ligation, Use of linkers and adapters.

Unit – II:

Methods of gene transformation.Recombinant selection and screening methods- Insertional inactivation, Hybridisation and Immunological methods.Techniques of cloning – Southern, Northern and Western blotting techniques.Gene amplification PCR.

Unit – III:

Plant tissue culture – Media composition, nutrients, growth regulators, initiation and differentiation. Callus and suspension culture, Micro propagation, Somatic embryogenesis and somoclonal variation.

Animal tissue culture – substrate, culture media and culture procedures, Primary culture and cell lines, tissue culture- slide, flask and test tube culture.

Unit – IV:

Transgenic plant and transgenic animal, Herbicide resistant, stress resistant, pesticide resistant and insect resistant, transgenic fish and transgenic sheep. Hybridoma technology – monoclonal antibodies. DNA chips and Micro arrays.

Unit – V:

Stem cells – stem cell engineering and uses. Fermentation technology (beer, wine and cheese) and nanobiotechnology.

Text Book

3. R.C.Dubey, A textbook of Biotechnology, S.Chand & Co.
4. A.K. Srivastava, R.K. Singh and M.P. Yadav, Animal Biotechnology – 2005, Oxford and IBH.

Reference

7. D. Balasubramaniam et al., Concept in biotechnology, Universities press (India) Ltd.
8. Razdan, Plant tissue culture, Oxford IBH Publisher.
9. Freshney, Animal cell culture, IRL Press.
10. Channarayappa, Molecular Biotechnology 2006, Univ. Press.
11. H.D. Kumar, Molecular Biology & Biotechnology (1997), Vivas publishing house Pvt. Ltd.
12. Bernard, R. Glick Jack.J. Pasternak, Molecular biotechnology – Principle and application of recombinant DNA, 3rd edition 2003, Library of Congress cataloging in publication data.
13. Prakash.S. Lohar. Biotechnology, MJP publisher, Chennai – 5.

Elective: III. Pharmacology and Bioinformatics

5 Hrs

5 Credits

Aim

- To give focus on drug chemistry and online resources in life sciences

Unit – I:

Drugs: definition, sources and classification of drugs. Routes of drugs administration, dosage forms. drug receptors, mechanism of action of drugs, combined effect of drugs. Factors modifying drug action.

Unit – II:

Drug metabolism – general pathways of drug metabolism (different types of reaction in phase I and II with examples), metabolism and excretion of drugs. Drug interactions, factors affecting drug metabolism and significance of drug metabolism in medicinal chemistry.

Unit– III:

Adverse drug reactions, drug tolerance and intolerance, pharmacogenetics, drug allergy, drug abuse, assay of drug potency – bio assay and immune assay.

Unit- IV

General awareness of computer hardware; CPU and other peripheral devices (Input/Output and auxiliary storage devices), internet, http, browser and MS-office.

Unit - V

Comparative genomics, evolution of genomes, genomic identification, Biomedical genome research, human genomic variation, genome resources – NCBI map viewer, ORF finder, locus link. Analysis tools for sequence data banks. Pair wise alignment, smith waterman, multiple alignment – CLUSTAL, PRAS. Sequence databanks – protein, nucleotides, BLAST and FASTA.

Text Book

1. Attwood T.K. and Parry-Smith D.J. (2003). Introduction to bioinformatics, Singapore, Pearson education.
2. The internet (1999) Christian Crumlish. BPB publications.

References

1. K.Mani&N.Vijayaraj - Bioinformatics for the beginners
2. Spang R. and Vingron M. (1998). Statistics of large scale sequence searching. Bioinformatics. 14: 279-284.
3. Mullan L.J. (2002). Multiple sequence alignment- The gateway to further analysis. Brief.Bioinform. 3: 303- 305.
4. J.(1999). Introduction to protein structure, 2nd ed. New York:Garland publishing.
5. Huynen M.A., Snel B., Mering C. and Bork P.(2003). Function prediction and protein networks. Curr.Opin. Cell Biol. 15: 191-198.
6. Twyman R.M.(2004). Principles of proteomics, York: Garland Science/Bios Scientific

Non-Major Elective: Healthcare and Disease Management

2 Hrs

2 Credits

Aim

- To give awareness about first aid, basic health issues, handling emergencies.

Unit – I:

Safe guards to health: Physical fitness and normal weight, normal diet, merits and demerits of taking foods and beverages, sleep quota.

Unit – II:

First Aid for Accidents, wounds, burns, bites, hiccup, shock, poisoning, vomiting, drowning and fainting.

Unit-III:

Handling Emergencies: Heart attack, blood pressure, diabetic condition, unconsciousness, asthma, sprain and foreign body injury.

Unit – IV:

General Diseases: Causes, symptoms and prevention of headache, fever, common cold, cough, constipation, diarrhea, itching, dizziness and Obesity.

Unit – V:

Specific Diseases: Cataract, dandruff, dental caries, cancer, AIDS, jaundice, ulcer, appendicitis and hemorrhage, kidney disorders and heart diseases.

Text Book

1. K.V. Krishna Das, Text book of medicine, 5th edition.

2. Harold Shryock and Hubert O. Swartout, M.D., Dr.P.H , You and Your health –(Vol-I, II & III)

References

1. Harold Shryock.M.D, Modern medical guide
2. Harold Shryock and Hubert O. Swartout, M.D., Dr.P.H,You and Your health (Vol-I, II & III)
3. Harrison's principles of internal medicine – Vol-I & II
4. K.V. Krishna Das, Text book of medicine, 5th edition

Main Practical – III

Semester – V & VI

**10 Hours
5 Credits**

I. Colorimetric Estimation

Clinical parameters of the following

- a. Estimation of Creatinine by Jaffe's Method.
- b. Estimation of Urea by DiacetylMonoxime Method.
- c. Estimation of DNA by DNPH method.
- d. Estimation of RNA by Orcinol method.
- e. Estimation of glucose by Anthrone or O-Toluidine methods
- f. Estimation of Cholesterol by Zak's method.
- g. Estimation of proteins by Biuret method

II. Urinary Analysis

Qualitative analysis of urine for normal and pathological conditions.

III. Experiments on Enzymes by Colorimetry

Effect of pH, temperature and substrate concentration for amylase and urease.

Assay of activity of Serum Transaminases (SGOT & SGPT).

Enzyme Immobilization, Isolation of LDH from animal source.

IV. Haematology

Blood grouping, BP, RBC and WBC Count, Hb, PCV, ESR, Differential Count.

References

1. Practical Clinical Biochemistry, Harold Varley, CBS, New Delhi.
2. Kanai L. Mukherjee, Medical Laboratory Technology, Tata McGraw Hill. publication and Co. Ltd., Vol-I, II & III.
3. RanjanaChawla- Clinical Chemistry
4. Jayaraman - Laboratory manual in Biochemistry
5. S.Sadasivan and Manickam - Biochemical Methods.
6. David T.Plummer- Introduction to Practical Biochemistry

Regulation for Theory Courses

4. Evaluation Scheme for Continuous Assessment

Written tests (2) 15 marks

Attendance 05 marks

Other Components 05 marks

Other components may comprise assignments, seminars, open book test and on-line assignment. At least two components must be considered for a paper.

5. Question Paper Pattern (Theory) for CA

The question paper shall have three sections with the maximum of 75 marks with the following break-up:

Section - A

Section A shall contain 7 short answer questions without choice drawn from two units

Each question shall carry 3 marks. (7 x 3 = 21 marks)

Section - B

Section B shall contain 3 either or questions drawn from two units.

Each question shall carry 8 marks. (3 x 8 = 24 marks)

Section – C

Section C shall contain 3 questions from two units.

Two questions out of the three are to be answered each carrying 15 marks.

(2 x 15 = 30 marks)

6. Question Paper Pattern (Theory) for Semester Examinations

The question paper shall have three sections with the maximum of 75 marks with the following break-up:

Section - A

Section A shall contain 10 short answer questions without choice drawn from all the units on the basis of minimum two from unit.

Each question shall carry 2 Marks. (10 x 2 = 20 marks)

Section - B

Section B shall contain 5 either or questions drawn from all the five units.

Each question shall carry 5 marks. (5 x 5 = 25 marks)

Section – C

Section C shall contain 5 questions drawn one each from the five units.

Three questions out of the five are to be answered each carrying 10 marks.

(3 x 10 = 30 marks)

7. Question paper pattern for Core Practicals

Total: 100 Marks

Time: 6 Hours

The practical papers consist of the internal assessment (40 marks) and semester examination (60 marks)

Internal Assessment (40)

Class Work - 20 marks

Model exam - 20 marks

Semester Examination (60)

Core Practical - I

Total: 100 Marks

Time: 6 Hours

Semester Examination (60)

Volumetric Analysis : 25 marks
Qualitative Analysis : 25 marks
Record : 10 marks

Core Practical - II

Total: 100 Marks
Time: 6 Hours

Semester Examination (60)

Colorimetric Analysis : 20 marks
Microbiology / Preparation : 20 marks
Spotters : 10 marks
Record : 10 marks

Core Practical - III

Total: 100 Marks
Time: 6 Hours

Semester Examination (60)

Colorimetric Analysis or Enzyme Assay : 20 marks
Urinary Analysis : 20 marks
Heamatology : 10 marks
Record : 10 marks