DHANALAKSHMI SRINIVASAN
COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
(Nationally Re-accredited with 'A' Grade by NAAC)
Perambalur – 621 212. Tamil Nadu

B.Sc Biochemistry-Course Structure under CBCS pattern

(For the candidates admitted from the academic year 2018-2019 onwards)

Year/ Sem	Part	Course	Title	Course code	Inst. Periods/ Week	Credits	Exam Hours	Marks		Total
								Int	Ext	
I Year/ I Sem	I	Language Course -I	Cheyyul (ikkala ilakiyam) sirukathai illakkiyavaralaru	18U1LT1	6	3	3	25	75	100
			Hindi	18U1LH1						
			French	18U1LF1						
			Arabic	18U1LA1						
			Sanskrit	18U1LS1						
	II	English Language Course-I	English for communication-I	18U1EL1	6	3	3	25	75	100
	III	Core Course -I	Biomolecules	18UBC1C1	6	5	3	25	75	100
		Core Practical -II	Lab in Biomolecules	18UBC1C2P	4	3	3	40	60	100
		Allied Course- I	Inorganic, Organic and Physical Chemistry-I	18UBC1A1	3	3	3	25	75	100
		Allied Practical- II	Lab in Volumetric and organic qualitative analysis	18UBC1A2P	3	-	-	-	-	-
	IV	Environmental studies	Environmental studies	18U1EVS	2	2	3	25	75	100
	Total				**30**	**19**	**-**	**-**	**-**	**600**
I Year/ II Sem	I	Language Course-II	Cheyyul (idaikalailakiyam) Pudhinam	18U2LT2	6	3	3	25	75	100
			Hindi	18U2LH2						
			French	18U2LF2						
			Arabic	18U2LA2						
			Sanskrit	18U2LS2						
	II	English Language Course -II	English for communication-II	18U2EL2	6	3	3	25	75	100
	III	Core Course-III	Human Physiology	18UBC2C3	6	5	3	25	75	100
		Core Practical-IV	Lab in Human Physiology	18UBC2C4P	4	3	3	40	60	100
		Allied Practical- II	Lab in Volumetric and organic qualitative analysis	18UBC1A2P	3	3	3	40	60	100

		Allied Course-III	Inorganic, Organic and Physical Chemistry-II	18UBC2A3	3	3	3	25	75	100
	IV	Value education	Value education	18U2VED	2	2	3	25	75	100
			Total		**30**	**22**	**-**	**-**	**-**	**700**
IIYear/ III Sem	I	Language Course-III	Cheyyul (kappiyangal) urainadai aluuval murai madalgal illakiya varalaru	18U3LT3	6	3	3	25	75	100
			Hindi	18U3LH3						
			French	18U3LF3						
			Arabic	18U3LA3						
			Sanskrit	18U3LS3						
	II	English Language Course -III	English through literature-I	18U3EL3	6	3	3	25	75	100
	III	Core Course- V	Biochemical techniques	18UBC3C5	6	6	3	25	75	100
		Core Practical-VI	Lab in Biochemical techniques	18UBC3C6P	4	3	3	40	60	100
		Allied Course -IV	Microbiology-I	18UBC3A4	3	3	3	25	75	100
		Allied Practical-V	Lab in Microbiology	18UBC3A5P	3	-	-	-	-	-
	IV	Non Major Elective-I	Health and Nutrition	18UBC3N1A	2	2	3	25	75	100
			Nutrition for Women	18UBC3N1B						
			Nanomedicine	18UBC3N1C						
			Total		**30**	**20**	**-**	**-**	**-**	**600**
IIYear IVSem	I	Language Course - IV	Cheyyul (Sangailakiyam, Needhi ilakiyam)nadagam,ilakiya varalaru,pothukatturai	18U4LT4	6	3	3	25	75	100
			Hindi	18U4LH4						
			French	18U4LF4						
			Arabic	18U4LA4						
			Sanskrit	18U4LS4						
	II	English Language Course-IV	English for competitive Examination	18U4EL4	6	3	3	25	75	100
	III	Core Course- VII	Enzyme	18UBC4C7	6	6	3	25	75	100
		Core Practical-VIII	Lab in Enzymes Analysis	18UBC4C8P	4	3	3	40	60	100
		Allied Practical-V	Lab in Microbiology	18UBC3A5P	3	3	3	40	60	100
		Allied Course- VI	Microbiology -II	18UBC4A6	3	3	3	25	75	100
	IV	Non Major	Forensic Science	18UBC4N2A	2	2	3	25	75	100
			Biochemistry in Nutrition	18UBC4N2B						

		Elective-II	Health and Disease	18UBC4N2C						
	Total				**30**	**23**	**-**	**-**	**-**	**700**
III year V Sem	III	Core Course -IX	Bioenergetics and Metabolism	18UBC5C9	6	6	3	25	75	100
		Core Course -X	Genetics& Computational Biology	18UBC5C10	5	5	3	25	75	100
		Core Course -XI	Cell & Molecular Biology	18UBC5C11	5	5	3	25	75	100
		Core Practical- XII	Lab in Cell & Molecular Biology	18UBC5C12P	4	3	3	40	60	100
		Major Based Elective- I	Plant Biochemistry	18UBC5M1A	4	4	3	25	75	100
			Neurobiology	18UBC5M1B						
			Drug biology	18UBC5M1C						
	IV	Skill Based Elective -I	Tools of Biochemistry	18UBC5S1A	2	2	3	25	75	100
			Herbs and Drug action	18UBC5S1B						
			Ethnomedicine	18UBC5S1C						
		Skill Based Elective -II	Nanotechnology	18UBC5S2A	2	2	3	25	75	100
			Pharmacognosy	18UBC5S2B						
			Cardiovascular biology	18UBC5S2C						
		Soft Skill development	Soft Skill development	18U5SS	2	2	3	25	75	100
	Total				**30**	**29**	**-**	-	-	**800**
IIIYear VISem	III	Core Course-XIII	Clinical Biochemistry	18UBC6C13	6	6	3	25	75	100
		Core Course- XIV	Immunology	18UBC6C14	6	6	3	25	75	100
		Core Practical-XV	Lab in Clinical Biochemistry	18UBC6C15P	6	5	3	40	60	100
		Major Based Elective -II	Pharmaceutical Biochemistry	18UBC6M2A	6	4	3	25	75	100
			Cancer biology	18UBC6M2B						
			Biomedical instrumentation	18UBC6M2C						
		Major Based Elective -III	Advanced Endocrinology	18UBC6M3A	5	4	3	25	75	100
			Nutritional Biochemistry	18UBC6M3B						
			Fundamental of Genetics	18UBC6M3C						
	IV	Gender studies	Gender studies	18U6GS	1	1	3	25	75	100
	V	Extension Activity	Extension Activity		-	1	-	-	-	-
	Total				**30**	**27**				**600**

	GRAND TOTAL	**180**	**140**				**4000**

Tamil Language Course	04
English Language Course	04
Core Course	15
Allied Course	06
Major Based Elective	03
Skill Based Elective	02
Non Major Elective	02
EVS	01
Value Education	01
Soft Skill Development	01
Gender studies	01
Total	40

Total Course	40
Total Credits	140
Total Peroids	180

CORE COURSE- I

BIOMOLECULES

Semester : I | Max Marks: 60
Course Code : 18UBC1C1 | Credit: 5
Total Periods: 90 | Exam Hours: 3

Objectives

To understand the basis of chemical structure and function of various biomolecules found in living systems

Unit- I **(20 Periods)**

Biomolecules- chemical composition and bonding - chemical reactivity -ionization of water - weak acids and weak bases-PH, buffers - buffering in biological systems. Principles of bioenergetics- Laws of thermodynamics and their applications in biological system - entropy and enthalpy - standard free energy changes standard reduction potentials - thermodynamics of coupled reaction.

Unit -II **(20 Periods)**

Carbohydrates: Classification and structural elucidation of glucose and fructose. Inter conversion of sugars. Properties, structure and biological functions of mono, di, oligo and polysaccharides. Homoglycans and Heteroglycans. Blood group polysaccharides.

Unit -III **(20 Periods)**

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

Unit-IV **(20 Periods)**

Lipids: nomenclature, classification and Biological significance. Simple lipids: types of fatty acids,triglycerides, waxes, steroids, prostaglandins and their properties. Compound lipids: Phospholipids, sphingolipids and glycolipids. Lipoproteins. Analysis of oils: Reichert-Meisel value, Iodine number, saponification value, acid number and acetylvalue.

Unit -V **(17 Periods)**

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

REFERENCES

Text books:

1. Nelson.D.L, Cox. M. M. Lehninger's Principle of Biochemistry. 4th ed. Freeman, 2004
2. Murray. R.K, Granner.D.K, Mayes. P. A, Rodwell. V.W. Harper's Biochemistry. 27th ed. McGraw Hill, 2006.
3. Principles of Biochemistry – Lehninger.
4. Essentials of Biochemistry – M.C. Pant.
5. Essentials of Biochemistry – A.I. Jain.
6. Fundamentals of Biochemistry – O.P. Agarwal.
7. Essentials of Biochemistry – M.C. Pant.

Reference books:

1. Nelson.D.L, Cox. M. M. Lehninger's Principle of Biochemistry. 4th ed. Freeman, 2004
2. Murray. R.K, Granner.D.K, Mayes. P. A, Rodwell. V. W. Harper's Biochemistry. 27th ed. McGraw Hill, 2006.
3. Principles of Biochemistry -Lehninger
4. Textbook of Biochemistry-West & Todd.
5. Harper's Biochemistry 25th edn, McGraw Hill.
6. Fundamentals of Biochemistry – O.P. Agarwal.
7. Essentials of Biochemistry – M.C. Pant.
8. Essentials of Biochemistry – A.I. Jain.

Out come:

will be able to demonstrate an understanding of fundamental biochemical principles, such as the structure/function of biomolecules

CORE PRACTICAL II

LAB IN BIOMOLECULES

Semester : I | Max Marks: 60
Course Code : 18UBC1C2P | Credit: 3
Total Periods: 45 | Exam Hours: 3

Objectives

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

Qualitative analysis **(22** Periods**)**

1. Laboratory safety – Do's and Do not
2. Determination of Absorption Maximum
3. Weighing of reagents, Preparations of Normal and Molar solutions. Handling of Microscope.
4. Qualitative analysis of carbohydrates (glucose, fructose, maltose, galactose, sucrose, lactose), Identification of both monosaccharides and disaccharides in mixtures.
5. Qualitative analysis of amino acids (Tryptophan, Tyrosine, Arginine, Proline and Histidine).
6. Qualitative analysis of Lipids-Solubility, acrolein test for unsaturation, Libermann Burchard test for cholesterol Quantitative analysis.

Quantitative analysis **(23** Periods**)**

1. Estimation of reducing sugar by Benedict's quantitative method.
2. Estimation of amino acid by formal titration.
3. Estimation of acid number of Edible oil.
4. Determination of saponification number of edible oil.
5. Estimation of Iodine value of oil.

REFERENCES

Text books:

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

Reference books:

1. Manuals in Biochemistry – Dr. J. Jayaraman, New Age International Pub, Bangalore 2011.
2. Practical Biochemistry – Plummer, New Delhi: Tata Mcgraw Hill Publishing Company, 2000.
3. Biochemical methods – S.Sadasivam, V.A Manickam 2^{ed} New Age International `Publishers, 2006.

EVS

ENVIRONMENTAL STUDIES

Semester-I
Course Code; 18U1EVS
Total Periods :30

Max Marks:75
Credit: 5
Exam Hours:3

Objectives

To understand the natural resources and conservation, public health, environmental monitoring and remediation, industrial environmental management, or research or education of environmental science.

Unit 1: **(5** Periods**)**

Multidisciplinary nature of environmental studies

Definition, scope and importance need for public awareness.

Unit 2: Natural Resources: **(6** Periods**)**

Renewable and non-renewable resources: Natural resources and associated problems.
a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber Extraction, mining, dams and their effects on forest and tribal people.
b) Water resources: Use and over-utilization of surface and ground water, Floods, drought, conflicts over water, dams-benefits and problems.
c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water Logging, salinity, case studies.
e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
f) Land resources: Land as a resource, land degradation, man induced Landslides, soil erosion and desertification.
• Role of an individual in conservation of natural resources.
• Equitable use of resources for sustainable lifestyles.

Unit 3: Ecosystems **(6** Periods**)**

• Concept of an ecosystem. : Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem :-
a. Forest ecosystem. b. Grassland ecosystem. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit 4: Biodiversity and its conservation **(6** Periods**)**

• Introduction – Definition: genetic, species and ecosystem diversity.
• Bio geographical classification of India
• Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
• Biodiversity at global, National and local levels.
• India as a mega-diversity nation
• Hot-sports of biodiversity.
• Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
• Endangered and endemic species of India
• Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit 5: Environmental Pollution and Social Issues and the Environment **(7** Periods**)**

Definition, Cause, effects and control measures of:-
a. Air pollution. Water pollution c. Soil pollution. Marine pollutione. Noise pollution
. Thermal pollution. Nuclear hazards
• Solid waste Management: Causes, effects and control measures of urban and Industrial wastes.• Role of an individual in prevention of pollution.
• Pollution case studies. • Diaster management: floods, earthquake, cyclone and landslides.
• From Unsustainable to Sustainable development
• Urban problems related to energy
• Water conservation, rain water harvesting, watershed management
• Resettlement and rahabilitation of people; its problems and concerns. Case Studies
• Environmental ethics: Issues and possible solutions.
• Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
• Wasteland reclamation.
• Consumerism and waste products.
• Environment Protection Act.
• Air (Prevention and Control of Pollution) Act.
• Water (Prevention and control of Pollution) Act
• Wildlife Protection Act
• Forest Conservation Act
• Issues involved in enforcement of environmental legislation.
• Public awareness.

References
Text books

1. Agarwal KC, 2001. Environmental Biology, Nidi Publishers Ltd. Bikaner.
2. Bharucha Erach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad -380013, India.
3. Brunner RC, 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480pgs.
4. Clark RS, Marine Pollution, Clanderson Press, Oxofrd (TB).
5. Cunningham WP, Cooper TH, Gorhani E & Hepworth MT, 2001. Environmental Encyclopaedia, Jaico Publishing House, Mumbai, 1196pgs.
6. De AK, Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Center for Science and Environment (R)

8. Gleick HP, 1993. Water in Crisis, Pacific Institute for Studies in Development, Environment and Security. Stockholm Environmental Institute, Oxford University Press, 473pgs.

Reference books:

1. Agarwal KC, 2001. Environmental Biology, Nidi Publishers Ltd. Bikaner.
2. Bharucha Erach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad - 80013, India.
3. Brunner RC, 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480pgs.
4. Clark RS, Marine Pollution, Clanderson Press, Oxofrd (TB).
5.Down to Earth, Center for Science and Environment (R)
6. Gleick HP, 1993. Water in Crisis, Pacific Institute for Studies in Development, Environment and Security. Stockholm Environmental Institute, Oxford University Press, 473pgs

CORE COURSE- III

HUMAN PHYSIOLOGY

Semester : II | Max Marks: 75
Course Code :18UBC2C3 | Credit: 5
Total Periods: 90 | Exam Hours: 3

Objectives:

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

Unit- I **(18** Periods**)**

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

Unit- II **(22** Periods)

Cardiophysiology- functional anatomy of heart- genesis and spread of cardiac impulses-cardiac cycle- heart sound-cardiac output- cardiovascular regulatory mechanisms. Circulation: Structure of Heart and blood vessels, cardiac cycles, cardiac factors controlling blood pressure, electrocardiogram. Functions of heart. Respiration: Anatomy, and physiology of respiration, pulmonary surfactant, exchanger of gases between lung and blood and between blood and tissues. Role of lung in acid-base balance.

Unit-III **(20** Periods**)**

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

Unit- IV **(20** Periods**)**

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

Unit-V **(10** Periods**)**

Excretory system: Structure and functions of kidney. Urine-composition and formation.Renal regulation of acid-base balance.

REFERENCES

Text books

1. Human Physiology: Vol I & II C.C. Chatterjee, 2016.
2. Functions of the Human body – Guyton A.C, 2015.
3. Human Physiology-Systemic & applied-Sahalya, 2009

Reference Books:

1. Human Physiology: Vol I & II C.C. Chatterjee, 2016.
2. Functions of the Human body – Guyton A.C, 2015.
3. Human Physiology-Systemic & applied-Sahalya, 2009.
4. Human Nutrition and Dietetics – Swaminathan, Bangalore printing and Pulv. Co.Ltd, 1996.
5. Review of Medical Physiology – Ganong, Appleton and Lange, 2003

CORE PRACTICAL – IV

LAB IN HUMAN PHYSIOLOGY

Semester : II | Max Marks: 60
Course Code : 18UBC2C4P | Credit: 3
Total Periods: 45 | Exam Hours: 3

Objectives

To Understand the Physiological concepts of homeostasis and control mechanisms and to study the functions of body systems- with emphasis on clinical relevance.

Human physiology: (45 Periods)

1. Microscopy
2. RBC count & WBC count
3. Differential leucocyte count by Leishman' s staining
4. Estimation of Haemoglobin by Sahli's acid haematin method
5. Determination of Packed cell volume (PCV)
6. Determination of Erythrocyte sedimentation rate (ESR)
7. Determination of Coagulation time &bleeding time
8. Determination of blood group
9. Determination of Blood Pressure by Sphygmomanometry
10. Histology of Tissues – Columnar, cubical, ciliated, squamous, stratified squamous.
11. Microscopic structure of organs – lungs, artery, vein, stomach, ovary, testis, Uterus.
12. Determination of Respiratory rate and Pulse rate – before and after exercise
13. Determination of Rh factor.

REFERENCES

Text Books:

1. G.K.Pal& P. Pal. 2006. Textbook of Practical Physiology. 2nd Edn. Orient Blackswan
2. Applied Physiology – S. Wright.
3. Manuals in Biochemistry – Dr. J. Jayaraman.
4. Practical Biochemistry – Plummer.

Reference books:

1. G.K.Pal & P.Pal. 2006. Textbook of Practical Physiology. 2nd Edn. Orient Blackswan
2. Applied Physiology – S. Wright.
3. Manuals in Biochemistry – Dr. J. Jayaraman.
4. Dacie and Lewis Practical Haematology 12th Edition

CORE COURSE-V

BIOCHEMICAL TECHNIQUES

Semester : III | Max Marks: 75
Course Code : 18UBC3C5 | Credit: 6
Total Periods: 90 | Exam Hours: 3

Objectives:

1. To enable the students to have a deep knowledge on the techniques for measurement of biophysical factors in living organisms.

2. To enable the students to get an insight on the usage of various techniques and their applications in industry.

Unit I **(18 Periods)**

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

Unit II **(18 Periods)**

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

Unit III **(18 Periods)**

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

Unit IV **(18 Periods)**

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

Unit V **(18 Periods)**

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

Text Books

1. Freifelder D. M. Physical Biochemistry- Application to Biochemistry and Molecular Biology, 2nd ed., W.H. Freeman, 1982.
2. Wilson & Walker. Principles and Techniques in Practical Biochemistry. 5th ed.
3. Cambridge Univ.Press, 2000.
4. West & Todd. Biochemistry. 4th ed. Oxford and IBH
5. Horst Friebolin. Basic One and Two-dimensional spectroscopy. VCH Publ, 1991.
6. Murphy D. B. Fundamental of Light Microscopy & Electron Imaging. 1st ed. Wiley-Liss, 2001

Reference Books:

1. Freifelder D. M. Physical Biochemistry- Application to Biochemistry and Molecular Biology, 2nd ed., W.H. Freeman, 1982.
2. Wilson & Walker. Principles and Techniques in Practical Biochemistry. 5th ed. Cambridge Univ.Press, 2000.
3. West & Todd. Biochemistry. 4th ed. Oxford and IBH
4. Horst Friebolin. Basic One and Two-dimensional spectroscopy. VCH Publ, 1991.
5. Murphy D. B. Fundamental of Light Microscopy & Electron Imaging. 1st ed. Wiley-Liss, 2001

CORE PRACTICAL VI

LAB IN BIOCHEMICAL TECHNIQUES

Semester : III Max Marks: 60
Course Code : 18UBC3C6P Credit: 3
Total Periods: 45 Exam Hours: 3

Objectives: **(23 Periods)**

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

Practical

1. Preparation of buffers and measurement of pH.
2. Titrable acidity of amino acids
3. Measurement of BP
4. Calculate BMI
5. Handling of Colorimeter and Spectrophotometer
6. Estimation of RNA by orcinol method.
7. Estimation of DNA by Diphenylamine method. (**22 Periods)**

Demonstration

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

Text Books

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

Reference Books:

1. A Textbook of Practical Biochemistry by David Plummer. Tata McGrawHill Education, 1988.
2. Laboratory Mannual in Biochemistry by J. Jayaraman. New Age International Publishers. 2nd Edn. 1981.
3. Varley's Practical Clinical Biochemistry by Alan H Gowenlock, published by CBS Publishers and distributors, India Sixth Edition,

ALLIED COURSE- IV

MICROBIOLOGY-I

Semester : III Max Marks: 75
Course Code : 18UBC3A4 Credit: 3
Total Periods: 60 Exam Hours: 3

Objectives

The **aim** of **Microbiology** is to introduce basic principles and application relevance of clinical disease.

Outcome:

1. Students will be able to acquire, articulate, retain and apply specialized language and knowledge relevant to microbiology.

Unit -I (12 Periods)

Introduction and history of Microbiology-contribution of Louis Pasteur, Robert Koch, Alexander Fleming, Anton Van Leeuwenhoek, Joseph Lister, & Needham. Concepts of origin of life- abiogenesis and biogenesis, Spontaneous generation theory. Scope of Microbiology.

Unit-II (12 Periods)

Microscopy- Principles & uses of bright field, dark field, phase contrast, fluorescent, electron microscopy (TEM&SEM). Principles of staining of bacteria- simple staining, Negative staining, Gram's staining, Acid fast staining (Ziehl Neelsen staining), spore staining & staining of metachromatic granule

Unit-III (12 Periods)

Morphology and anatomy of bacterial cell- Cell size, shape, arrangement. Structure of Prokaryotic plasma membrane, cell wall, capsule, slime layer, S-layer, flagella, pili, nucleoid, inclusion bodies, endospore.

Unit-IV (12 Periods)

Culture media- Nutritional requirements of bacteria, classification of media. Methods of isolation of pure cultures - Serial dilution technique, streak plate method, pour plate method, spread plate method. Anaerobic culture methods. Preservation of cultures- refrigeration, deep-freezing, freeze drying (lyophilization).

Unit- V (12 Periods)

Sterilization (physical and chemical methods)-Sterilization by heat (Moist heat, dry heat and incineration), radiation (ionizing radiations and Ultraviolet rays), aldehydes and disinfectants. Factors influencing sterilization. Distinguishing characters of bacteria, fungi, algae and protozoa. General structure of Fungi, Algae and Protozoa, General characters of viruses, structure, classification, multiplication and cultivation. Structure and replication of bacteriophages.

REFERENCES

TEXT BOOK

1. Microbiology - Pelczar, Chan and Kraig (ISBN 0-07-462320-6)
2. Microbiology -Prescott, Harley and Klein (ISBN 0-07-111217-0)
3. Microbiology-Bernard D Davis
4. Foundations in Microbiology-Talaro and Talaro
5. Essentials of Microbiology (Sixth edition) - Purohit and Singh (ISBN 81-85)

REFERENCE BOOK

1. Microbiology - Pelczar, Chan and Kraig (ISBN 0-07-462320-6)
2. Microbiology -Prescott, Harley and Klein (ISBN 0-07-111217-0)
3. Microbiology-Bernard D Davis
4. Foundations in Microbiology-Talaro and Talaro
5. Essentials of Microbiology (Sixth edition) - Purohit and Singh (ISBN 81-85)

ALLIED PRACTICAL-V

LAB IN MICROBIOLOGY - I & II

Semester : III&IV Max Marks: 60
Course Code : 18UBC3A5P Credit: 3
Total Periods: 45 Exam Hours: 3

Objectives:

The objectives of the Microbiology are to introduce basic principles and application relevance of clinical disease for students. It covers all biology of bacteria, viruses and other pathogens related with infectious diseases in humans.

Part I (22 Periods)

1. Laboratory precautions- General rules and regulations.
2. Common instruments in Microbiology laboratory.
3. Cleaning and sterilization of glass wares.
4. Preparation of media.
5. Isolation of pure culture - Isolation of bacteria by pours plate, streak plate and spread plate methods.
6. Cultural characteristics of Microorganisms - Colony morphology on culture plate.

Part II (23 Periods)

7. Study of the various components of the microscope, its handling and maintenance.
8. Preparation of bacterial smear
9. Staining of bacteria:
    - Simple staining of bacteria,
    - Gram staining,
    - Negative staining,
    - Spore staining,
    - Volutin granule staining
10. Motility of bacteria by hanging drop method.

Text books

1. Dubey R C and Maheswari, D K (2002). Practical Microbiology. S. Chand & Co Ltd. (ISBN 81-219-2153-8)
2. Microbiology A Laboratory Manual - James G Cappucino Natalie Sherman(ISBN 81-297- 0265-7)
3. Experiments in Microbiology Plant Pathology and Biotechnology- K. R. Anej

Reference Books

4. Dubey R C and Maheswari, D K (2002). Practical Microbiology. S. Chand & Co Ltd. (ISBN 81-219-2153-8)
5. Microbiology A Laboratory Manual - James G Cappucino Natalie Sherman(ISBN 81-297- 0265-7)

NON – MAJOR ELECTIVE PAPER- I
HEALTH AND NUTRITION

Semester : III | Max Marks: 75
Course Code : 18UBC3N1A | Credit: 2
Total Periods: 30 | Exam Hours: 3

Objectives

The objectives of the Health and Nutrition are to introduce Body development and maintenance, Energy provision

Unit - I **(6 Periods)**

Health - definition, Factors affecting human health. Importance of health care of children, adults and elderly people. Balanced diet and calorific value.

Unit -II **(6 Periods)**

Vitamins-definition, classification, sources, properties, functions and deficiency symptoms. Recommended daily allowances.

Unit -III **(6 Periods)**

Sources and functions of dietary fats, role of fats and lipids in health. Calorific value.

Unit - IV **(6 Periods)**

Minerals- Role of minerals on human health, sources, biological functions, deficiency disorders with special reference to Calcium, Phosphorus, Potassium, Copper, Iron, Zinc and Selenium. Minerals in biological systems and their importance –Iron, Calcium, Phosphorus, Iodine, Copper, Zinc.

Unit - V **(6 Periods)**

Role of proteins and carbohydrates in health. Functions of protein and carbohydrate and their calorific value. Dietary sources and deficiency disorders – Kwashiorkor and Marasmus supplementation programmes in India and their implications.

Text & Reference Books

1. S.Davidson and J.R.Passmore (1986) Human Nutrition and Dietetics, (8th ed), Churchill Livingstone
2. J. S. Garrow, W. Philip T. James, A. Ralph (2000), Human Nutrition and Dietetics (10th ed Churchill Livingstone)
3. M.Swaminathan (1995) Principles of Nutrition and Dietetics, Bappco
4. Margaret Mc Williams (2012) . Food Fundamentals (10th ed) ,Prentice Hall
5. M.Swaminathan (1995) Principles of Nutrition and Dietetics. Bappc

Reference Books

1. S.Davidson and J.R.Passmore (1986) Human Nutrition and Dietetics, (8th ed), Churchill Livingstone
2. J. S. Garrow, W. Philip T. James, A. Ralph (2000), Human Nutrition and Dietetics (10th ed), Churchill Livingstone
3. M.Swaminathan (1995) Principles of Nutrition and Dietetics, Bappco

NON – MAJOR ELECTIVE PAPER- I

NUTRITION FOR WOMEN

Semester : III | Max Marks: 75
Course Code : 18UBC3N1B | Credit: 2
Total Periods: 30 | Exam Hours: 3

Objectives: To enable the students to

1. Understand the role of nutrition in different stages of life cycle.

2. Gain experience in Planning menu for different stages.

3. Develop skills in organizing and evaluating nutrition projects in the community.

Unit -I

Principles of Nutrition - Nutrients and their functions. Food groups, meal planning, Balanced diet, RDA, over nutrition, under nutrition, malnutrition.

Unit -II

Nutrition during Pregnancy- Physiological changes during pregnancy. Importance of Nutrition during pregnancy. Complications in pregnancy, food and nutritional requirements.

Unit -III

Nutrition during Lactation- Physiology and psychology of lactation, hormonal control, composition of colostrums and breast milk, nutritional requirements of a nursing mother.

Unit- IV

Nutritional care of Infants- Birth weight, growth and development, advantages of breast feeding, food and nutritional requirements for infants, weaning and supplementary foods for infants and immunization**.**

Unit- V

Nutrition for Adolescents- Growth and development, nutritional requirements, nutritional problems, food habits and factors influencing food intake.

REFERENCES

Text books:

1. Mahtab, S, Bamji, Kamala Krishnasamy, G.N.V. Brahmam, Text Book of Human Nutrition, Third Edition, Oxford and IBH Publishing Co. P. Ltd., New Delhi, 2012.
2. Srilakshmi, B., Dietetics, New Age International (P) Ltd., New Delhi, 2013.

3. Swaminathan, M., Advanced Textbook on Food and Nutrition, Vol. 1, Second Edition, Bangalore Printing and Publishing Co. Ltd., Bangalore, 2012.

Reference books:

1. Dietary Guidelines for Indians, ICMR, National Institute of Nutrition, Hyderabad, 2013.
2. Gopalan, C. Rama Sastri B.V. and Balasubramanian, Nutritive Value of Indian Foods, NIN, ICMR, Hyderabad, 2014.
3. Krause, M.V. and Hunscher, M.A., Food, Nutrition and Diet Therapy, 14th Edition, W.B. Saunders

NON MAJOR ELECTIVE-I

NANOMEDICINE

Semester : III | Max Marks: 75
Course Code : 18UBC3N1C | Credit: 2
Total Periods: 30 | Exam Hours: 3

Objectives

Nanotechnology, along with related concepts such as nanomaterials, nanostructures and nanoparticles, has become a priority area for scientific research and technological development.

Unit-I **(6 Periods)**

Introduction to nanomedicine; class overview, Types of nanomaterials, Tools and methodology I. Surface and size characterization (AFM, EM, Electrophoresis, BET, TGA)

Unit-II **(6 Periods)**

Tools and methodology II. Chemical property characterization (FTIR, electrochem, NMR, MS, LC), Cellular processes at nanoscale, Nanonephrology

Unit-III **(6 Periods)**

Nanoneurology and molecular imaging, Drug delivery (modes and example applications), Nanomedicine and cancer (diagnostic and imaging)

Unit- IV **(6 Periods)**

Toxicity of nanomaterials in medicine, Application of Nano system in Medicine, Nanomedicine in drug delivery and detoxification, Nanomedicine in immunotherapy

Unit-V **(6 Periods)**

Nanomedicine in diagnostics and bioimaging, Drug administration and transport by fluid motion Drug dispersion and diffusion in biological systems, Drug permeation through biological barriers Pharmacokinetics and biodistribution, Ligand-receptor engineering and targeted delivery, Case studies in nanomedicine

REFERENCES :

1. Thomas Webster .Technologies and application.

CORE COURSE VII
ENZYMES

Semester : IV | Max Marks: 75
Course Code : 18UBC4C7 | Credit: 6
Total Periods: 90 | Exam Hours: 3

Objectives

By the end of the course, the students should be able to demonstrate advanced knowledge and understanding in the following core areas.

UNIT- I **(20 Periods)**

History and terminology, nomenclature and classification of enzymes. Holoenzymes, metalloenzymes, metal activated enzymes, monomeric enzymes, oligomeric enzymes, ribozymes. Enzyme specificity, units of enzyme activity. Methods of isolation and purification- enzyme units- substrate specificity.

UNIT- II **(16 Periods)**

Enzyme kinetics- Factors affecting enzyme activity- Michaelis-Menten equation analyses of kinetic data- Lineweaver-burk plot- catalytic efficiency- Haldane relationship- Hill's plot- Bisubstrate reactions- sequential - ping-pong reactions rate equations and examples. Enzyme inhibition- Irreversible- reversible- competitive- non-competitive - uncompetitive inhibition- Graphical analysis.

UNIT- III **(18 Periods)**

Enzymatic catalysis- acid-base catalysis- covalent catalysis- metal ion catalysis electrostatic catalysis- catalysis through proximity and orientation effects catalysis by transition state binding. Co-enzymes- A, B-complex, C, D, E and K- structure and function- Isoenzymes LD-CK- Applied Enzymology-Immobilized enzymes- methods and applications in industry-medicine- enzyme electrodes - biosensors.

UNIT- IV **(18 Periods)**

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

UNIT- V **(18 Periods)**

Regulation of enzyme activity- allosteric control- reversible covalent modification- proteolytic activation- sequential- concerted and cumulative feed back control- importance of compartmentation- Allosteric enzymes- Jacob and Monod model of allosteric enzymes- Koshland model- subunit interaction and regulation of enzyme activity – ATCase

REFERENCES

Text Books

1. Nelson.D.L, Cox. M. M. Lehninger's Principle of Biochemistry. 4th ed. Freeman, 2004

2. Berg.J.M, Tymoczko.J.L, Stryer, L. Biochemistry. 6th ed. Freeman, 2006.

Suggested Reading:

1. Dixon & Webb. Enzymes. 3rd ed. Longmans, 1979.

2. Murray. R.K, Granner.D.K, Mayes. P. A, Rodwell. V. W. Harper's Biochemistry. 27th ed. McGraw Hill, 2006

Reference Books

1. Nelson.D.L, Cox. M. M. Lehninger's Principle of Biochemistry. 4th ed. Freeman, 2004

2. Berg.J.M, Tymoczko.J.L, Stryer, L. Biochemistry. 6th ed. Freeman, 2006.

Suggested Reading:

1. Dixon & Webb. Enzymes. 3rd ed. Longmans, 1979.

2. Murray. R.K, Granner.D.K, Mayes. P. A, Rodwell. V. W. Harper's Biochemistry. 27th ed. McGraw Hill, 2006

CORE PRACTICAL VIII

LAB IN ENZYMES ANALYSIS

Semester : II | Max Marks: 60
Course Code : 18UBC4C8P | Credit: 3
Total Periods: 45 | Exam Hours: 3

Objectives (22 Periods)

To assay the activity of enzymes from different sources.

Practical

1. Estimation of proteins by Lowry / Brad ford method
2. Estimation of phospholipids by phosphorous assay
3. Estimation of sodium and potassium by Flame photometry
4. Effect of pH, temperature and substrate concentration for amylase and urease and determination of Vmax & Km.
5. Estimation of AST
6. Estimation of ALT

REFERENCES

Text Books

1. Varley's Practical Clinical Biochemistry by Alan H Gowenlock, Published by CBS Publishers and distributors, India Sixth Edition (1998).
2. Tietz Fundamentals of Clinical chemistry- Burtis and Ashwood, Fifth Edition, WB Saunders Company. Oxford Science Publications USA, (2001).
3. Practical Biochemistry – Keith Wilson & John Walker, fifth Edition, Cambridge University Press, UK (2000).
4. Analytical Biochemistry & separation Techniques- Palanivelu Third edition (2004)
5. Biochemical calculations- Irwin H Segel, second edition, John Wiley & sons, USA (1976).

Reference Books

1. Tietz Fundamentals of Clinical chemistry- Burtis and Ashwood, Fifth Edition, WB Saunders Company. Oxford Science Publications USA, (2001).
2. Practical Biochemistry – Keith Wilson & John Walker, fifth Edition, Cambridge University Press, UK (2000).
3. Analytical Biochemistry & separation Techniques- Palanivelu Third edition (2004)
4. Biochemical calculations- Irwin H Segel, second edition, John Wiley & sons, USA (1976)

ALLIED COURSE-VI
MICROBIOLOGY -II

Semester : IV Max Marks: 75
Course Code : 18UBC4A6 Credit: 3
Total Periods: 45 Exam Hours: 3

Objectives

In this course the meaning of food microbiology and interaction between microorganism and foods and how food spoilage will be study.

Unit-I (9 Periods)

Food as a substrate for microbes – Microbes involved in food microbiology – Mould, Yeast, Bacteria – Factors affecting the growth of Microorganisms in food. Principles of food preservation – Asepsis – Removal of microorganisms, anaerobic conditions – high and low temperatures – drying – radiation – chemical preservatives – food additives.

Unit- II (9 Periods)

Collection and transport of clinical specimens for microbiological examination – Virulence factors of bacteria causing human infections – Normal flora of human body. Staphylococcus aureus, Streptococcus pyogenes, S.pneumoniae, Neisseria gonorrhoeae, N.meningitidis.

Unit -III (9 Periods)

Food-borne diseases – Food poisoning – infective and toxic bacterial food borne diseases and their diagnosis – Food sanitation and its control measures.

Unit -IV (9 Periods)

Food spoilage – General principles – underlying food spoilage and contamination – Cereals, vegetables, fruits, and poultry products, meat, fish, sea foods. Microorganisms in milk and milk products – Yoghurt, butter milk, butter and cheese – Quality control of Milk – MBRT, SPC, Phosphatase tests..

Unit -V (9 Periods)

Basic concepts of Virology - General characteristics of viruses, differences between bacteria and viruses. Classification of viruses Physical and chemical Structures of different Viruses on the basis of capsid symmetry - enveloped (Herpes virus), helical (TMV) and icosahedral (Polyoma viruses), Capsids, complex (Bacteriophage, and Virion size, enveloped (Herpes), helical (TMV) and icosahedral (Polyoma), Capsids

Reference Books

1. Adams MR Moss MO (2004). Food Microbiology, 2nd Edition, Panima Publishing House, New Delhi. Price Rs.395/-..
2. James M Jay (2003). Modern Food Microbiology. 4th Edition, CBS Publishers & Distributors, New Delhi. Price Rs.250/-. Bioinformatics basic skills and applications – Rastogi.
3. Frazier WC and Westhoff DC (1988). Food Microbiology, 4th Edition, Mc Graw Hill, New York

NON MAJOR ELECTIVE-II
FORENSIC SCIENCE

Semester : IV | Max Marks: 75
Course Code : 18UBC4N2A | Credit: 2
Total Periods: 30 | Exam Hours: 3

OBJECTIVES

- Provide a scheme of continuing professional development (CPD) for members, in partnership with other bodies.
- Encourage, and advise, on careers and professional development.

Unit I: Introduction to Forensic Science (9 Periods)

History and development of Forensic Science Definitions - Scope and need – Basic principles – Locard's principle - Tools and techniques - Branches of Forensic science - Organizational setup of Forensic science. Physical evidence in forensic science.

Unit II: Forensic Biology (9 Periods)

Ten digit finger print classification-latent Finger print, foot print, Tool markers and Tyre impression.

Unit III: (9 Periods)

The metric system and physical properties of evidence- Analysis of Physical evidence-glass, fibre, soil paint and hair.

Unit IV: Forensic Chemistry and Forensic Toxicology (9 Periods)

Blood analysis, Phenolphthalein Test, Benzedine Test, and Blood pattern Analysis, Grouping species identification.

Unit V: Document Examination (9 Periods)

Pharmacological and Toxicological effects and chemical examination of different type of poisons and drugs. Analysis of Biological fluids like semen, vaginal swabs, saliva, sweat, urine, Feces and vomit.

Text and References

1. Brewester, F. (1932). Contested documents and forgeries. [On methods of testing documents
2. In legal cases, with special reference to conditions in India. With plates. Calcutta: Book Co. Bureau of Police Research & Development (2000). Working Procedures Manual Ballistics. New Delhi: BPR&D.
3. Conway, J. (1959). Evidential documents. Springfield, Illinois: Thomas.

4. Curry, A. (1976). Poison detection in human organs (3rd ed.). Springfield, Illinois: Thomas.
5. Harrison, W. (1966). Suspect documents, their scientific examination. London: Sweet &
6. Maxwell.
7. Heard, B. (1997). Handbook of firearms and ballistics: Examining and interpreting forensic Evidence. Chichester, England: J. Wiley

NON MAJOR ELECTIVE-II
BIOCHEMISTRY IN NUTRITION

Semester : IV | Max Marks: 75
Course Code : 18UBC4N2C | Credit: 2
Total Periods: 30 | Exam Hours: 3

Objectives

This course will provide students with an understanding of:
-Principles of nutrition. -Human nutrient requirements involved in Biochemical reaction.

Unit - I

Nutritional profile of foods:- Cereals, pulses, vegetables, fruits, nuts, oil seeds, animal foods, milk and milk products, egg, fish, meat, drinks and spices. Role of dietary carbohydrates, proteins, fats, fiber and antioxidants.

Unit -II

Determination of calorific value of foods by Bomb calorimeter. Measurement of energy expenditure, respiratory quotients of food stuffs, specific dynamic action. BMR:- easurement of BMR and factors influencing BMR. RDA for patients:- Anemic, Diabetic, Blood pressure and obese.

Unit – III

Recommended dietary allowances for infants, children, adolescent, pregnant, lactating women, athletes and geriatrics.

Unit- IV

Drug - nutrient Interactions, food toxins, food allergy, adverse effects of alcohol, tobacco, tea, Acidic and alkaline foods. Nutraceticals:- Introduction and classification of nutraceticals.

Unit- V

Nutritional therapy for inborn errors of metebolism, role of diet and nutrition in the prevention and treatment of diseases:- Diabetes mellitus, peptic ulcer, jaundice, hypertension and cardiovascular diseases.

REFERENCES

Text Books

1. Human nutrition by B. Srilakshmi, New age International Pvt Ltd, 2009
2. Human nutrition and dietetics, S. Davidson and J.R. Passmore.
3. Human nutrition and dietetics, IS Garraw, WPT James, 10th edition.
4. Mechanism and theory in food chemistry, DWS Wong, CBS New Delhi, 1996.
5. Modern nutrition in health and diseases, Whol and Good hart.

Reference Books

1. Human nutrition by B. Srilakshmi, New age International Pvt Ltd, 2009
2. Human nutrition and dietetics, S. Davidson and J.R. Passmore.
3. Human nutrition and dietetics, IS Garraw, WPT James, 10th edition.
4. Mechanism and theory in food chemistry, DWS Wong, CBS New Delhi, 1996.

NON MAJOR ELECTIVE-II
HEALTH AND DISEASE

Semester : IV | Max Marks: 75
Course Code : 18UBC4N2C | Credit: 2
Total Periods: 30 | Exam Hours: 3

Objective:

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

Unit -I

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

Unit- II

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

Unit- III

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

Unit -IV

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

Unit -V

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

REFERENCES

Text Books:

1. Textbook of Medical Biochemistry, Chatterjea, MN and Rana Shinde. Jaypee Brothers, New Delhi, 7th edition, 2007.
2. The Biochemistry of Clinical Medicine, William S. Hoffman, Year Book Medical publishers, 1964.
3. Clinical Medicine (A Textbook of Clinical Methods and Laboratory Investigations), KV Krishna Das (Editor in Chief), 2013, Jaypee Brothers Meical publishers, New Delhi.
4. Clinical Chemistry Interpretation and techniques, 4th edition, A.Kaplan, R.
1. Jack, K.E. Opheim, B. Toivola, A.W. Lyon, Williams and Wilkins, USA, 1995.
5. Clinical Chemistry in Diagnosis and treatment, J.F. Zilva and P.R. Pannall.

Reference Books:

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

CORE COURSE-IX

BIOENERGETICS AND METABOLISM

Semester : V | Max Marks: 75
Course Code : 18UBC5C9 | Credit: 6
Total Periods: 90 | Exam Hours: 3

Objectives:

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

Unit -I **(20 Periods)**

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

Unit- II **(16 Periods)**

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

Unit- III **(18 Periods)**

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

Unit- IV **(18 Periods)**

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

Unit -V **(18 Periods)**

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

REFERENCES

Text Books:

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

Reference Books:

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

CORE COURSE -X

GENETICS AND COMPUTATIONAL BIOLOGY

Semester : V | Max Marks: 60
Course Code : 18UBC5C10 | Credit: 5
Total Periods: 75 | Exam Hours: 3

Objectives:

1. To identify and describe the process and purposes of the cell cycle, meiosis, and mitosis, as well as predict the outcomes of these processes
2. Computational Biology publishes works describing new methods or applications of analytical platforms for complex biological data.

Unit -1 **(10 Periods)**

Gene: gene concept, unit of function, replication, recombination and mutation Fine structure of gene: bar locus, complex loci, rII locus and complementation analysis Gene function: one gene/one enzyme hypothesis, pathways of gene action. Genome organization: Genome organization in prokaryotes and eukaryotes special features of eukaryotic gene structure and organization, genome organization in mitochondria and chloroplast,

Unit -2 **(18 Periods)**

DNA content and C-value paradox, methods to measure DNA content variation Various types of DNA sequences (simple sequences, repetitive sequences, nonsense sequences, tandem gene clusters, satellites) DNA Damage and repair: Spontaneous and Induced mutations – Physical and Chemical mutagenesis, Molecular mechanisms of mutagenesis – Transition, Transversion, Frame Shift, mis-sense and non-sense mutations, Photo-reactivation, Excision Repair, Mismatch Repair, Post-replication Repair, SOS Repair

Unit-3 **(11 Periods)**

Recombination in bacteria and viruses: Transformation: Competence factors, mechanism of transformation, mapping genes by transformation, Conjugation: Structure of F plasmid, Mechanism of transfer of F plasmid, Hfr, mechanism of integration of F plasmid into bacterial chromosome, circularization of chromosome, Conjugation mapping – different methods.

Unit -4 **(18 Periods)**

Systems biology: Self-organization, emergence, modularity and abstraction, Interaction networks overview- Gene Regulatory Network, Protein – Protein Interaction Network, Signaling Pathways, Metabolic pathways; network motifs, Systems Biology tools and standards: Matlab -Systems Biology toolbox; SBML; SBGL (Systems Biology Graphical Language); KEGG; Tools for systems Biology- Cell designer; Cytoscape.

Unit -5 **(18 Periods)**

Synthetic Biology: Engineering Biology; design and construction of novel biological systems; Abstraction hierarchy-Part, Device, Systems; BioBricks - a standard for (physical) DNA composition, Designing a biological system from Biobricks; iGEM; SBOL, Computational Synthetic biology: Codon optimization; AND gate and OR gate in biology; Operons; Switches and clocks; Repressilator; Applications- Environment, Energy, Pharmaceutical needs, Ethical issues of Synthetic Biology.

REFERENCES

Text books

1. Watson. J. D, Baker. T. A, Bell. S. P, Gann. A, Levine. M, Losick. R. Molecular Biology of Gene. 6th The Benjamin / Cummings Pub. Co. Inc, 2008
2. Lehninger's Principles of Biochemistry, sixth Edition, 2009 Publisher: W. H. Freeman; 6th edition | ISBN: 071677108X
3. Darnell, Lodish and Baltimore. Molecular Cell Biology, Scientific American Publishing Inc, 2000
4. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter.
5. Molecular biology of the Cell. 4th ed. Garland publishing Inc, 2002

Reference Books

1. Watson. J. D, Baker. T. A, Bell. S. P, Gann. A, Levine. M, Losick. R. Molecular Biology of Gene. 6th The Benjamin / Cummings Pub. Co. Inc, 2008
2. Lehninger's Principles of Biochemistry, sixth Edition, 2009 Publisher: W. H. Freeman; 6th edition | ISBN: 071677108X
3. Darnell, Lodish and Baltimore. Molecular Cell Biology, Scientific American Publishing Inc, 2000
4. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter. Molecular biology of the Cell. 4th ed. Garland publishing Inc, 2002
5. Benjamin Lewin. Gene VII. Oxford University Press, Nelson C

CORE COURSE- XI

CELL AND MOLECULAR BIOLOGY

Semester : V | Max Marks: 75
Course Code : 18UBC5C11 | Credit: 5
Total Periods: 75 | Exam Hours: 3

Objectives:

1. To study the structural and functional organization of cells

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

Unit -I **(18 Periods)**

Ultra-structure of prokaryotic and eukaryotic (plant & animal) cells Plasma membrane, cell wall their structural organization. Cellular organelles –: Mitochondria, chloroplast; Nucleus, Golgi apparatus. Other organelles and their organization, Transport of nutrients, ions and macromolecules across membranes.

Unit -II **(18 Periods)**

Cell cycle- Different phases of cell cycle, Controls and Check points, cyclins and cdks – types and their role. Molecular, events and model systems, Apoptosis, Cytoskeleton and Cell motility Cell communication: General principles of signaling – endocrine, exocrine& synaptic signaling, surface and intracellular receptors, G proteins and generation of secondary messenger, mode of action of cAMP and ca++ calmodulin, Target cell adaptation, cellular responses to environmental signals in plants and animals - mechanisms of signal transduction

Unit -III **(18 Periods)**

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

Unit-IV **(18 Periods)**

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

Unit- V **(18 Periods)**

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

REFERENCES

Text & Reference Books

1. Cell & Molecular Biology. E.D.D De Robertis & E.M.F De Robertis, Waverly publication.
2. Molecular Biology of the cell. Alberts, B; Bray, D, Lews, J., Raff, M., Roberts, K and Watson, J.D. 1991 3rd edn. Garland publishers, Oxford
3. Microbiology - M. J. Pelzar, E. S. N. Cfan and N.R. Kreig, McGraw Hill Publ.
4. Introductory Microbiology - J. Heritage, E.G.V. Erans, R.A. Killington, Cambridge Univ. Press.

Reference Books

1. General Microbiology - H.G. Schlegel Cambridge University Press.
2. Microbiology – concepts and Application. John Wiley and Sons, New York, 1988.
3. Microbiology- L. M. Prescott, J. P. Harley, D. A. Klein; McGraw Hills 5thedn. (2005)
4. General Microbiology – R. Y. Stanier, J. L. Ingraham, M. L. Wheelis, Page R Painter;MacMillan Press ltd; 5th edn (1986)
5. Microbiology, Tortora, Funke and Chase, Benzamin & Cummings
6. Manual of microbiology: Tools and Techniques 2nd

Outcome:

Students able to know cell structure, functions, composition, DNA function in cells.

CORE PRACTICAL –XII

LAB IN CELL & MOLECULAR BIOLOGY

Semester : V | Max Marks: 60
Course Code : 18UBC5C12P | Credit: 3
Total Periods: 45 | Exam Hours: 3

Objective: **(45 Periods)**

To introduce students to various practical aspects of Molecular biology Practical:

Practical:

1. Isolation of plasmid & Genomic DNA

2. Estimation of DNA by diphenylamine method

3. Estimation of RNA by orcinol method

4. Separation of DNA by Agarose Gel Electrophoresis

5. Separation of protein by SDS-PAGE

6. Purification of enzyme by ammonium sulphate precipitation Microbial

Techniques

7. Staining technique - Grams staining
8. Estimation of nitrogen ,iron, phosphorus, and calcium.

REFERENCES

Text books

1. Manuals in Biochemistry – Dr. J. Jayaraman, New Age International Pub, 2000.
2. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications Meerut, 2000
3. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub,2000.
4. Laboratory manual in Biochemistry T.N.Pattabiraman. All India publishers,1998.
5. Lab Manual in General Microbiology - N Kannan, Palaniappa Brothers, 2000.

Reference Books

1. Manuals in Biochemistry – Dr. J. Jayaraman, New Age International Pub, 2000.
2. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications Meerut, 2000
3. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub,2000.
4. Laboratory manual in Biochemistry T.N.Pattabiraman. All India publishers,1998.
5. Lab Manual in General Microbiology - N Kannan, Palaniappa Brothers, 2000.

MAJOR BASED ELECTIVE-I

PLANT BIOCHEMISTRY

Semester : VI | Max Marks: 75
Course Code : 18UBC5M1A | Credit: 6
Total Periods: 90 | Exam Hours: 3

OBJECTIVES

To know the Introduction to Plant cells and metabolic process

UNIT- I (18 periods)

Introduction to Plant cells Photosynthesis: Chloroplast- structure and function; Photosynthetic pigments and light harvesting complexes, Photo inhibition of photosynthesis, Photosynthetic carbon reduction (PCR) cycle, C4 syndrome and Crassulacean acid metabolism. Oxidative respiration, Alternate electron pathways and Respiration rate.

UNIT- II (18 periods)

Nitrogen metabolism: Physical and biological nitrogen fixation, Ammonification, Nitrification, Denitrification, Biochemistry and Genetics of nitrogen fixation and Ammonium assimilation. Plant Hormones: Biosynthesis, Physiological effects and mechanism of action of Auxins, Gibberellic acids, Cytokinins, Abscisic acid, Ethylene, Brassino steroids and Polyamines.

Unit III (17 periods)

Plant Stress physiology: Plant stress, Plant responses to abiotic and biotic stresses, Water deficit and drought resistance, Flooding, Temperature stress, Salt stress, Ion toxicity, Pollution stress and potential biotic stress (insects and diseases).

Unit IV (19 periods)

Introduction to tissue culture-Media composition and preparation. Culture types callus culture cell suspension culture, protoplast culture and etc., Somatic embryogenesis, organogenesis, Embryo culture and embryo rescue. Micropropagation. Protoplast isolation, Protoplast culture and fusion, selection of hybrid cells, cybrids, somaclonal variation. Germplasm storage and cryo- preservation..

Unit V (20 periods)

Application of transgenesis in crop improvement – Insect resistance, disease resistance, virus resistance herbicide resistance, and resistance to abiotic stress. Transgenesis for male sterility and terminator seed. Transgenic plant-Bt cotton, Bt brinjal, Plant genome-Rice Environmental Biotechnology – Biological fuel generation- ethanol and methane from

biomass. Sewage treatment. Bioremediation: oil spill cleanup, bioleaching, IPR, Biosafety and hazards of environmental engineering

Text & Reference Books

1. Mukherji, S and Gosh A. K. Plant Physiology. 2nd ed. New Central Book Agency, Kolkata, 2005.

1. 2.Slater A, NW Scott, MR Fowler. Plant bio technology, 2nd ed. Oxford University Press, 2008.
2. Hopkins, W. G and Huner, N. P. A. Introduction to Plant Physiology. 3rd ed. John Wiley & Sons Inc. New York, 2004.
3. Molecular Biotechnology: Principles and Applications of Recombinant DNA- B.R. Glick & J.J. Pasterak, ASM Press, Washington, D.C., 2010
4. Gene cloning and DNA analysis: an introduction / T.A. Brown.—6th ed. Brown, T.A. (Terence A.) Wiley-Blackwell. 2010.
5. Elements of Biotechnology- P.K.Gupta, Rastogi Publications, 2nd edition 3rd reprint, 2015-2016.
6. A text book of Biotechnology- R.C.Dubey, S.Chand Publications, 2014
7. Industrial Microbology- A.H.Patel,Macmillan , India Ltd, 2012

8. Animal Cell Culture and Technology, Michael Butler Garland Science/BIOS Scientific Publishers, Second Edition, London and New York. 2004

MAJOR BASED ELECTIVE-I

NEUROBIOLOGY

Semester : V | Max Marks: 60
Course Code : 18UBC5M1B | Credit: 3
Total Periods: 60 | Exam Hours: 3

Objectives:

The objectives of the students who wish to focus on or emphasize neuroscience in their course of study at CNS.

Unit – I **(12Periods)**

Neuromorphology and Neurocellular Anatomy : Central Nervous system – General features of Neurons, Cellular organization of neurons Dendrites and Axons, neurotubules, neurofilaments, synapse neuralgia, astrocytes, oligodendrocyte, ependymal cells, schwan cells.

Spinal Cord: Topographical anatomy,spinal nerves, spinal meninges, joint reflexes, gray and white matter of spinal cord.

Unit-II **(12Periods)**

Neurophysiology: Neuronal membrane, excitability, ion channels and transport of ions. Nerve And Synapse Structures: Structure function correlation at the synapse. Transmission across the synapse: membrane potential in the steady state action potential generation and propagation.

Unit -III **(12Periods)**

Chemical Composition Of Brain : Formation, structure and biochemistry of myelin, chemistry of major brain lipids, developmental changes, lipid composition, biosynthesis and catabolism of major lipids, characteristics of brain lipids, regional variations.

Neurotransmitter: Chemistry, synthesis, storage and release of nervous neurotransmitters, transmitter action, synaptic modulation and mechanism of neuroinal integration.

Unit-IV **(12 Periods)**

Synaptic Transmission : Structure of the synapse, correlation of structure and function at the synapse, transmission across the synapse, pre and post synaptic events, membrane potential in the steady state action, action potential and propagation of nerve impulse. cAMP in hormone action.

Blood Brain Csf Barriers :Characteristics of blood CSF barrier, composition of CSF, formation of CSF, active transport from CSF to brain CSF brain interface.

Unit-V **(12 Periods)**

Neuropeptides – Classes of neuropeptides, mode of action, role of neuropeptides in obesity

and pain neuropeptide receptors, coexistence of neuropeptides with other neurotransmitters in “Dorsomedial Hypothalamic Nucleus”.

Developmental Neurobiology: Organogenesis and neuronal multiplication, axonal and dendritic growth, glial multiplication and myelination, growth in size, regeneration and repair mechanisms, plasticity

REFERENCES

Text Books

1. Neuroscience: Exploring the Brain Fourth, North Americ Edition by Bear PhD, Mark F., Connors PhD, Barry W., Paradiso PhD, Mich (2015) Hardcover 4th Edition.
2. Principles of Neural Science, Fifth Edition (Principles of Neural Science (Kandel)) 5th Edition. Eric R. Kandel (Editor), James H. Schwartz (Editor), Thomas M. Jessell (Editor), Steven A. Siegelbaum (Editor), A. J. Hudspeth (Editor)

Reference

1 Neuroscience: Exploring the Brain Fourth, North Americ Edition by Bear PhD, Mark F., Connors PhD, Barry W., Paradiso PhD, Mich (2015) Hardcover 4th Edition.

2 Principles of Neural Science, Fifth Edition (Principles of Neural Science (Kandel)) 5th Edition. Eric R. Kandel (Editor), James H. Schwartz (Editor), Thomas M. Jessell (Editor), Steven A. Siegelbaum (Editor), A. J. Hudspeth (Editor)

3 Neuroscience 5th Edition Dale Purves (Author), George J. Augustine (Author), David Fitzpatrick (Author), William C. Hall (Author), Anthony-Samuel LaMantia (Author), Leonard E. White (Author

MAJOR BASED ELECTIVE-I

DRUG BIOLOGY

Semester : V | Max Marks: 60
Course Code : 18UBC5M1C | Credit: 3
Total Periods: 60 | Exam Hours: 3

OBJECTIVE:

- To learn about various drugs.
- To identify risk factors and protective factors associated with substance abuse (drugs and alcohol).

Unit I **(12Periods)**

Introduction: Definitions, ADME, concentration time profile, plotting the data, different fluid compartments and blood flow rate compartment models, biological half life, elimination rate constant. Biopharmaceutics and pharmacokinetics in drug research.

Unit- II **(12Periods)**

Drug disposition: Total body clearance, renal clearance, mechanism of clearance, clearance ratio, factors affecting renal clearance, hepatic clearance, volume of distribution and its significance.

Unit -III **(12Periods)**

Bioavailability and bioequivalence: Definitions, federal requirements, methods of determination of bioavailability using blood and urinary excretion data. Protocol design for bioavailability assessment. Methods for bioequivalence determination.

Unit -IV **(12Periods)**

Pharmacokinetic characterization of drugs: Pharmacokinetics of drugs following one/ two compartment open models with first order elimination kinetics as applied to rapid intravenous injection, Intravenous transfusion and oral administration. Determination of absorption rate constant using Wagner-Nelson, Loo Riegelman methods. Flip-flop models, method of residual. Urinary excretion data and its application in pharmacokinetic characterization of drugs.

Unit -V **(12Periods)**

Dosage regimen: Dosage regimen adjustment in patients with renal and hepatic iseases. Drug dosage in elderly, children and obese patients. Non Linear Pharmacokinetics: Various causes of non-linearity, Application and limitations of physiologic pharmacokinetic models.

REFERENCES

Text books

1 Applied Biopharmaceutics & Pharmacokinetics, by Shargel, L., S. Wu-Pong
2 Biopharmaceutics and Pharmacokinetics: An Introduction by Notari, R. E.
3 Introduction to Biopharmaceutics, by Gibaldi, M.
4 Biopharmaceutics and Relevant Pharmacokinetics, by Wagner, J. G.
5 Textbook of Biopharmaceutics and Clinical Pharmacokinetics by Niazi, S.K.
6 Handbook of Bioequivalence Testing, by Niazi, S. K.

References books

1 Modeling in Biopharmaceutics, Pharmacokinetics, and Pharmacodynamics: Homogeneous andHeterogeneous Approaches, by Macheras, P. and A. Iliadis
2 Comparative Pharmacokinetics: Principles, Techniques and Applications, by Riviere, J. E
3 Foundations of Pharmacokinetics, by Rescigno, A.
4 Clinical Pharmacokinetics and Pharmacodynamics: Concepts and Applications, byRowland, M. and

SKILL BASED ELECTIVE-I

TOOLS OF BIOCHEMISTRY

Semester : V | Max Marks: 75
Course Code : 18UBC5S1A | Credit: 2
Total Periods: 30 | Exam Hours: 3

OBJECTIVE:

Learn and integrate foundational material in Chemistry, Biology and Biochemistry that is relevant to Biochemistry and prepares students for careers and post-baccalaureate education.

Unit - I (**6 Periods)**

Acids and bases : Basis of acidity and basicity, pH and buffers. General principles of Biochemical investigation: In vivo and in vitro studies - organ and tissue slice techniques, tissue homogenization. Methods of cell disruption, basic principles of cell sorting and counting. Maintenance and preservation of cells.

Unit - II **(6 Periods)**

Chromatography: Principles, sample preparation, methods and applications of paper chromatography, thin layer chromatography, column chromatography - ion exchange chromatography, gel filtration chromatography, affinity chromatography. GLC, HPLC and HPTLC.

Unit - III **(6 Periods)**

Centrifugation : Basic principles of sedimentation, types of centrifuges – desk top, high speed and ultracentrifuges. Types of Rotors - swinging bucket, fixed angle, vertical tube and zonal rotor. Types of centrifugation: Preparative centrifugation - differential and density gradient centrifugation with applications, Analytical centrifugation – molecular weight determination.

Unit - IV **(6 Periods)**

Electrophoresis : Principles, techniques and applications of paper electrophoresis, gel electrophoresis - agarose, PAGE, SDSPAGE. Capillary electrophoresis, isoelectric focusing, Factors affecting electrophoresis. Colorimetry and spectroscopy :

Basic principles - the laws of absorption (Beer - Lambert's law). Principles, instrumentations and applications of colorimetry, spectrophotometry, spectrofluorimetry and flame photometry.

Unit -V **(6 Periods)**

Radioisotopic techniques : Radioisotopes commonly used in biochemical studies – P, S, H, I, etc. Radioactive decay - rate of 32 35 3 131 radioactive decay and units of radioactivity. Detection and measurement of radioactivity based on ionization, excitation properties. Autoradiography and its applications. Advantages, disadvantages and safety aspects of radioisotopic techniques.

TEXT BOOKS

1. Cell biology, T. Devasena, 2012, Oxford University press.
2. Principles and techniques of practical Biochemistry, Keith Wilson and John Walker, 1995. Cambridge University Press.
3. An Introduction to Spectroscopy for Biochemist, Brown. SB Academic Press.
4. Biophysical chemistry Principles and Techniques - Avinash Upadhyaye and Nirmalendhe Nath, Himalaya Publishers.
5. A Biologist Guide to Principles and Techniques of Biochemistry, Keith Wilson and Kenneth Goulding, Edward Arnold publishers.

REFERENCE BOOKS

1. Cell biology, T. Devasena, 2012, Oxford University press.
2. Principles and techniques of practical Biochemistry, Keith Wilson and John Walker, 1995. Cambridge University Press.
3. An Introduction to Spectroscopy for Biochemist, Brown. SB Academic Press.
4. Biophysical chemistry Principles and Techniques - Avinash Upadhyaye and Nirmalendhe Nath, Himalaya Publishers.
5. A Biologist Guide to Principles and Techniques of Biochemistry, Keith Wilson and Kenneth Goulding, Edward Arnold publishers.

SKILL BASED ELECTIVE – I

HERBS AND DRUG ACTION

Semester : Max Marks: 60

Course Code : 18UBC5S1B Credit: 2

Total Periods: 30 Exam Hours: 3

OBJECTIVE:

To raise awareness of issues in herbal and traditional medicines' safety and pharmacovigilance among relevant organisations, including those representing patient groups, healthcare providers, medicines information providers, media and others .

Unit - I (6 Periods)

Terminologies – Definitions – Classification of medicinal plants based on their effects with special reference to India.

Unit - II (6 Periods)

Allergens – types – sources – active principles – Chemical nature – Cell modifiers – Lectins – mutagens, teratogens – Allergic reactions with known examples.

Unit - III (6 Periods)

Drugs acting on brain and nervous system – Rheumatic arthritis – Psychoactive drugs – Depressants, Stimulants, hallucinogens – sources, effects, basic mechanism of action.

Unit -IV (6 Periods)

Cardiovascular diseases – blood pressure – cardiac drugs of plant origins – alkaloids, anticoagulants – basic mechanism of action. Pulmonary / respiratory disorders – asthma – bronchitis – common cold – allergy – Remedy from plants.

Unit -V (6 Periods)

Drugs for urinogenital disorders – roots of Withania somnifera – Memory stimulants – Centella asiatica – Drugs for dissolving kidney stones – Musa paradisica (pseudostem) – Antiinflammatory drugs – Cardiospermum – Anticancer drugs – Catharanthus roseus.

References

Kumar, N.C., An Introduction to Medical botany and Pharmacognosy. Emkay Publications, New Delhi. 1993

Rao, A.P. Herbs that heal. Diamond Pocket Books (P) Ltd., New Delhi, 1999

SKILL BASED ELECTIVE –I

ETHNOMEDICINE

Semester : I Max Marks: 60

Course Code : 18UBC5S1C Credit: 2

Total Periods: 30 Exam Hours: 3

Objectives

To document traditional medicinal plants knowledge used in treating skin diseases .

Unit- I (6 Periods)

Definition, history and its scope – Inter disciplinary approaches in ethnobotany - Collection of ethnic information.

Unit- II (6 Periods)

Medicinal plants in phytomedicine Importance of medicinal plants - role in human health care – health and balanced diet (Role of proteins, carbohydrates, lipids and vitamins). Emblica officinalis, Saraca Asoca, Withania Somnifera, Aegle marmelousm, Phyllanthous amarus, , Bacopa,Monnieri, Swertia Chiraita, Gymnema Sylvestre, Commiphora Wightii, Peeper longum, Cinnamomum Zeylanicum.

Unit -III (6 Periods)

Tribal medicine – methods of disease diagnosis and treatment – Plants in folk religion – Aegle marmelos, Ficus benghalensis, Curcuma domestica, Cyanodon dactylon and *Sesamum indicum. Allium sativum L. Mangifera indica L., Coriandrum sativum L, Asparagus racemosus Willd. Aloe barbadensis* Mill, *Tagetes arecta L. Coriandrum sativum L. Psidium guajava L. Punica granatum, Curcumadomestica* Val.

Unit -IV (6 Periods)

Traditional knowledge and utility of some medicinal plants in Tamilnadu – Solanum trilobatum, Cardiospermum halicacabum, Vitex negundo, Adathoda vasica, Azadirachta indica, Gloriosa,superba, Eclipta alba, Aristolochia indica, Phyllanthus fraternus and Boerhaavia diffusa.

Unit -V (6 Periods)

Plants in day today life – Ocimum sanctum, Centella asiatica, Solanum trilobatum, Cassiaauriculata, Aloe vera. Nutritive and medicinal value of some fruits (Guava, Sapota, Orange, Mango, Banana, Lemon, Pomegranate) and vegetables - Greens (Moringa, Solanum nigrum) Cabbage. Drugs for urinogenital disorders – roots of Withania somnifera – Memory stimulants – Centella asiatica – Drugs for dissolving kidney stones – Musa paradisica (pseudostem) – Antiinflammatory drugs – Cardiospermum – Anticancer drugs – Catharanthus roseus

Text Books:

1. Ethnobiology – R.K.Sinha & Shweta Sinha – 2001. Surabhe Publications – Jaipur.

2. Tribal medicine – D.C. Pal & S.K. Jain 1998, Naya Prakash, 206, Bidhan Sarani, Calcutta –700 006.

3. Contribution to Indian ethnobotany – S.K. Jain 1995, 3rd edition, Scientific publishers, P.B.No. 91, Jodhpur, India.

4. A Manual of Ethnobotany – S.K.Jain, 1995, 2nd edition.

5. Kumar, N.C. (1993). An Introduction to Medical botany and Pharmacognosy. Emkay Publications, New Delhi. 2. Rao, A.P. (1999). Herbs that heal. Diamond Pocket Books (P) Ltd., New Delhi.

Reference Books

1. Ethnobiology – R.K.Sinha & Shweta Sinha – 2001. Surabhe Publications – Jaipur.

2. Tribal medicine – D.C. Pal & S.K. Jain 1998, Naya Prakash, 206, Bidhan Sarani, Calcutta –700 006.

3. Contribution to Indian ethnobotany – S.K. Jain 1995, 3rd edition, Scientific publishers, P.B.No. 91, Jodhpur, India.

4. A Manual of Ethnobotany – S.K.Jain, 1995, 2nd edition.

SKILL BASED ELECTIVE –II

NANOTECHNOLOGY

Semester : V | Max Marks: 60

Course Code : 18UBC5S2A | Credit: 2

Total Periods: 30 | Exam Hours: 3

Objectives

The course aims at introducing students to the nanotechnology as a new emerging field spanning specifically on physics and generally on the other branches of science. The objective tasks are performed through discussing the concepts of nanotechnology

Unit- I **(6 Periods)**

Background to Nanoscience: Defination of Nano, Scientific revolution-Atomic Structure and atomic size, emergence and challengs of nanoscience and nanotechnology, carbon age-new form of carbon (CNT to Graphene), influence of nano over micro/macro, size effects and crystals, large surface to volume ration, surface effects on the properties.

Unit- II **(6 Periods)**

Types of nanostructure and properties of nanomaterials: One dimensional, Two dimensional and Three dimensional nanostructured materials, Quantum Dots shell structures, metal oxides, semiconductors, composites, mechanical-physical-chemical properties.

Unit -III **(6 Periods)**

Application of Nanomaterial: Ferroelectric materials, coating, molecular electronics and nanoelectronics, biological and environmental, membrane based application, polymer based application.

Unit- IV **(6 Periods)**

Environmental Pollution by Nanoparticles: Health impact, safety and toxicological effects transport of nanomaterials in soil/sediments. Study of physical and chemical properties of nanomaterials influencing their behavior in the environment and in biological systems.

Unit -V **(6 Periods)**

Application of Nanotechnology: Nanotechnology for waste reduction and improved energy efficiency, nanotechnology based water treatment strategies. Nanoporous polymers and their applications in water purification, Nanotoxicology.Use of nanoparticles for environmental remediation and water treatment. Case studies and Regulatory needs

References:

1. Chemistry of nanomaterials: Synthesis, properties and applications by CNR Rao et.al.

2. Nanoparticles: From theory to applications – G. Schmidt, Wiley Weinheim 2004.

3. Instrument E L Principe, P Gnauck and P Hoffrogge, Microscopy and Microanalysis (2005), 11: 830- 831, Cambridge University Press.

4. Processing & properties of structural naonmaterials - Leon L. Shaw,

Nanochemistry: A Chemical Approach to Nanomaterials, Royal Society of Chemistry, Cambridge UK 2005.

5 Environmental Chemistry for a Sustainable World, Volume 1: Nanotechnology and Health Risk Editors: Lichtfouse, Schwarzbauer, Robert

6. Advances in Nanotechnology and the Environment, Juyoung Kim, CRC Press, Taylor and Francis Group. NST-605 Appli

SKILL BASED ELECTIVE – II

PHARMACOGNOSY

Semester : V | Max Marks: 60

Course Code : 18UBC5S2B | Credit: 2

Total Periods: 30 | Exam Hours: 3

Objectives

To describe the development of a pharmacognosy course that uses a combination of didactic teaching, team-based projects, and practicum laboratory practice.

Unit – I **(6 Periods)**

History, Definition and scope of pharmacognosy; Systems of Indian Medicines -Siddha, Unani, Ayurveda, Homeopathy; Terminologies.

Unit – II **(6 Periods)**

Classification of Crude drugs – Taxonomical, Morphological, Pharmacological and chemical classifications; Chemistry of drugs and its evaluation.

Unit – III **(6 Periods)**

Preparation of crude and commercial drugs. Making infusion, decoction, lotion, washers, insect repellents, suppositories, tincture, making herbal syrups,

compresses, poultice, plasters, oinments, herbal oils and herbal salves. Surgical fibres, sutures and dressing.

Unit – IV **(6 Periods)**

Organoleptic study of the following medicinal plants: Fruit – Amla, Bulb –Garlic, Rhizome – Ginger, seed – castor, Bark – Cinchona, Leaves – Neem, Flower – Clove.

Unit – V **(6 Periods)**

Analytical Pharmacognosy – drug adultration and detection. Biological testing of herbal drug. Phytochemical investigations with reference to secondary metabolites of locally available medicinal plants.

References

1 Pharmacognosy, S.B.Gokhale, Dr.C.K. Kokate, A.P. Purohit, Publisher: Nirali Prakasham, Pune, 2002.

2 Herbs that Heal, Acharya Vipul Rao – Diamond Pocket Books, New Delhi, 2005 Practical Pharmacognosy. Dr.C.K. Kokate et al. 2003

3 An Introduction to Medicinal Botany and Pharmacognosy – N.C. Kumar, Emkay Publications, New Delhi, 2004.

SKILL BASED ELECTIVE – II

CARDIOVASCULAR BIOLOGY

Semester : V | Max Marks: 75
Course Code : 18UBC5S2C | Credit: 6
Total Periods: 75 | Exam Hours: 3

Objectives

- Recognize the key importance of medical problems in the context in the health priority of the country;
- Practice the specialty of cardiology in keeping with the principles of professional ethics

Unit- I (18 Periods)

Fundamentals of Cardiovascular Disease Global Burden of Cardiovascular Disease, Heart Disease in Varied Populations, Economics and Cardiovascular Disease, Clinical Decision-Making in Cardiology, Measurement and Improvement of Quality of Cardiovascular Care.

Unit- II (18 Periods)

Evaluation of the Patient The History and Physical Examination: An Evidence-Based Approach, Electrocardiography, Exercise Stress Testing, Echocardiography, Genetics of Myocardial Disease, Genetics of Myocardial Disease, The Chest Radiograph in Cardiovascular Disease, Nuclear Cardiology, Cardiovascular Magnetic Resonance, 4 Curriculum DM (Cardiology) Computed Tomography of the Heart, Cardiac Catheterization, Coronary Angiography and Intravascular Ultrasound Imaging.

Unit -III (18 Periods)

Heart Failure Mechanisms of Cardiac Contraction and Relaxation, Pathophysiology of Heart Failure, Clinical assessment, Acute Heart Failure, Systolic Heart Failure, Heart Failure w/Preserved Systolic Fx, Surgical management of Heart Failure, Assisted Circulation in the treatment of Heart Failure, Emerging therapies for Heart Failure, Care of Patients with End-Stage Heart Disease.

Unit -IV (18 Periods)

Arrhythmias, Sudden Death, and Syncope Genesis of Cardiac Arrhythmias: Electrophysiological Considerations, Diagnosis of Cardiac Arrhythmias, Therapy for Cardiac Arrhythmias, Cardiac Pacemakers and Cardioverter-Defibrillators, Specific Arrhythmias: Diagnosis and Treatment, Cardiac Arrest and Sudden Cardiac Death, Hypotension and Syncope

Unit-V (18 Periods)

Preventive Cardiology The Vascular Biology of Atherosclerosis, Risk Factors for Atherothrombotic Disease, Systemic Hypertension: Mechanisms and Diagnosis, Systemic Hypertension: Therapy, Lipoprotein Disorders and Cardiovascular Disease, The Metabolic

Syndrome, Diabetes Mellitus, and Atherosclerotic Vascular Disease, Nutrition and Cardiovascular Disease, Primary and Secondary Prevention of Coronary Heart Disease, Comprehensive Rehabilitation of Patients with Cardiovascular Disease, Complementary and Alternative Approaches to Management.

Reference

1. Braunwald’s Heart Disease Hurst’s The Heart Grossman's Cardiac Catheterization, Angiography, and Intervention
2. Stress Testing: Principles and Practice by Myrvin H. Ellestad Drugs for the Heart by Lionel H. Opie
3. The Cardiac Catheterization Handbook by Morton L. Kern Hemodynamic Rounds by Morton J. Ker Moss and Adams' Heart Disease in Infants, Children, and Adolescents
4. Pediatric Cardiology for Practitioners (4th Edition) by Myung K. Park Feigenbaum's Echocardiography
5. Shamroth’s An Introduction to Electrocardiography Valvular Heart Disease by Alpert & Dalen

CORE COURSE-XIII

CLINICAL BIOCHEMISTRY

Semester : VI | Max Marks: 75
Course Code : 18UBC6C13 | Credit: 6
Total Periods: 90 | Exam Hours: 3

Objectives

1. To know the clinical aspects of various metabolic disorder
2. To understand the significance of diagnostic biochemistry

Unit I **(20 periods)**

Automation in the clinical biochemistry: Precision, reliability, reproducibility and other factors in quality control. Normal values in health and diseases Basic concepts of Clinical Biochemistry: A brief review of units and abbreviations, used in expressing concentrations and standard solutions. Specimen collection and processing (Blood, urine, faeces). Anticoagulant preservatives for blood and urine. Transport of specimens. Blood coagulation - disturbances in blood clotting - haemophilia A and haemophilia B. Blood groups, haemoglobin in anaemias, sickle cell anemia, thallasemia, Porphyrias and porphyrinurias. Blood banking.

Unit II **(16 periods)**

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

Unit III **(19 periods)**

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

Unit IV **(18 periods)**

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

Unit V **(17 periods)**

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

REFERENCES

Reference Books

1. Clinical Chemistry in diagnosis and treatment, Philip, 6th ed ELBS. D. Mayne & Edward Arnold, 1994.
2. Textbook of Clinical Chemistry, 3rd ed, Burtis & Ashwood, TietZ WB Saunders, 1999.
3. Text book of Medical Biochemistry 2nd Edition, M.N. Chatterjee and Rana Shinde, Jaypee Brothers Medical publishers Private limited, New Delhi 1995.
4. Clinical Biochemistry – Metabolic & Clinical Aspects, William J.Marshall, Stephen K. Bansert, Churchill Livingstone, 1995.
5. Clinical Chemistry – Principles, procedures, correlations – Bishop, Lippincott.2000.
6. Fundamentals of Biochemistry - Ambika shanmugam, S.Chand, by Publishers 198

Reference Books

1. Clinical Chemistry in diagnosis and treatment, Philip, 6th ed ELBS. D. Mayne & Edward Arnold, 1994.
2. Textbook of Clinical Chemistry, 3rd ed, Burtis & Ashwood, TietZ WB Saunders, 1999.
3. Text book of Medical Biochemistry 2nd Edition, M.N. Chatterjee and Rana Shinde, Jaypee Brothers Medical publishers Private limited, New Delhi 1995.
4. Clinical Biochemistry – Metabolic & Clinical Aspects, William J.Marshall, Stephen K. Bansert, Churchill Livingstone, 1995.

CORE COURSE-XIV

IMMUNOLOGY

Semester : V | Max Marks: 60
Course Code : 18UBC6C14 | Credit: 3
Total Periods: 60 | Exam Hours: 3

Objectives:

To study about immune response and immunological techniques

Unit I (12Periods)

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

Unit II (12Periods)

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

Unit III (12Periods)

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

Unit IV (12Periods)

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

Unit V (12Periods)

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

REFERENCES

Text books

1. Immunology -8th edition, Ivan Roitt, - Publisher Wiley-Blackwell: 2012
2. .Immunology -Weir, Churchill Livingstone,. Publisher:; 8 edition (June 1997);
3. Donald M. Weir, Immunology, John Steward. Published by Harcourt Publishers Ltd; (1997).
4. Immunology -3rd ed Kuby,Freeman, 1997.

Reference Books:

1. . Immunology - Tizerd, Saunders College Publishing, 9th edition 2004.
2. Immunology- Dulsy Fatima and N. Arumugam, 2014.
3. Immunology- Male, with student Consult Online Access, 2012.
4. Immunology- C. Vaman Rao, 2007.

CORE PRACTICAL XV

LAB IN CLINICAL BIOCHEMISTRY

Semester : VI | Max Marks: 75
Course Code : 18UBC6C15P | Credit: 5
Total Periods: 45 | Exam Hours: 3

Objective:

To impart thorough knowledge about the biochemical basis of various Diseases and isorders.

Practical:

1. Collection of blood and urine, Types of preservative and anticoagulants
2. Blood grouping, hemoglobin content, PCV, TC/DC count and ESR
3. Qualitative tests of urine. Abnormal constituents- sugar, protein (albumin), ketone bodies, bile pigments and bile salts.
4. Quantitative estimation in blood and urine

a. Glucose
b. Cholesterol
c. Calcium
d. Urea.
e. Iron
f. Bilirubin
g. Uric acid
h. Creatinine

5. Quantitative estimations in urine

a. Glucose
b. Urea
c. Uric acid
d. Creatinine
E .albumine
F. Globulin
G. A/G ratio

Text & Reference Books

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

MAJOR BASED ELECTIVE II
PHARMACEUTICAL BIOCHEMISTRY

Semester : VI Max Marks: 75
Course Code : 18UBC6M2A Credit: 6
Total Periods: 90 Exam Hours: 3

Objectives

1. **To make a detailed study about action of drugs on living system**

Unit -I

Introduction: Sources of drugs, routes of drug administration, dosage forms, drug dosage. Bioavailability:- Bioavailability of drugs, determination and its importance, Bioequivalence. Combined effect of drugs:- Synergism, antagonism.

Unit- II

Pharmacokinetics: Absorption, distribution of drugs, factors influencing drug absorption and distribution. Drug elimination:- Renal excretion, feacal excretion, biliary excretion, pulmonary excretion and other routes of excretion.

Unit - III

Pharmacodynamics: Mechanism of phase I and Phase II metabolic reactions, factors affecting drug metabolism, significance of drug metabolism. Mechanism of drug action: Basis of drug action, drug - receptor interactions, Receptor mediated and non-receptor mediated drug action, Placebo effects, Factors modifying drug action.

Unit - IV

Adverse drug reactions: Classification:- Pharmacologic ADRs, Non-pharmacological ADRs, diseaserelated ADRs, multiple drug reactions, miscellaneous ADRs, Acute poisoning:- General principles and management. Drug dependence, drug tolerance and intolerance**.**

Unit- V

Drug discovery: Random screening, serendipity, molecular modification of a known drug, rational approaches in drug designing Drug development: Preclinical research, clinical research, FDA review and FDA post- market safety monitoring.

Text & Reference Books

1. Pharmaceutical Pharmacology by S C Metha and Ashutosh Kar, 2011, New age International Publishers.
2. Text book of Medical Pharmacology by Padmaja Udayakumar, 2nd Edition, CBS Publishers & Distributors, New Delhi, Bangalore.
3. Oxford Text book of Clinical Pharmacology and Drug Therapy, D.G Grahme Smith and K.Aronson.
4. Pharmacology and Pharmatherapeutics – R.S.Satoskar, S.D.Bhandhakarand.
5. Lippincotts Illustrated review Pharmacology, Mary.J.Mycek, Richards, Pa

MAJOR BASED ELECTIVE II
CANCER BIOLOGY

Semester : VI | Max Marks: 75
Course Code : 18UBC6M2B | Credit: 6
Total Periods: 90 | Exam Hours: 3

Objectives

To study about allow for greater precision, personalization and efficacy of care when diagnosing and treating patients with **cancer**

Unit -I

Overview: Introduction, historical perspective. Carcinogenesis; cancer initiation, promotion and progression. Cellular Differentiation, Malignant Behavior. Different forms of cancers, phenotypic characteristics of cancer cells, Clinical features & pathology of cancer, Diet and cancer.

Unit -II

Overview: Retroviral oncogenes, Cellular proto-oncogenes, Oncogene Activation, Growth Factors and Receptors, Signal Transduction, Transcription Factors.

Tumor suppressor genes, DNA Viruses and human cancer. Telomerase and cell immortalization , Cell: cell interactions; cell adhesion; invasion and metastasis, DNA methylation; epigenetic silencing of suppressor genes, Apoptosis in cancer biology

Unit -III

Clinical significances of invasion, hetrogeneity of metastatic phenotype, Metastatic cascade, Basement Membrane distruption, Three step theory of Invasion, Proteinases and tumour cell invasion.

Unit -IV

Free radicals, antioxidants and cancer, Aberrant metabolism during cancer development. Paraneoplastic syndromes; cancer endocrinology, Epidemiology of cancers, Gene rearrangements; detecting oncogene abnormalities in clinical specimens, prediction of aggressiveness of Cancer.

Unit -V

Different forms of therapy, Chemotherapy, radiation therapy. Translating therapies from the laboratory to the clinic, Strategies of anticancer drug therapy, Mechanisms of cytotoxic drug action, Strategies of anticancer immunotherapy.

REFERENCES

Text books

1. **An Introduction To Cellular And Molecular Biology of Cancer" by Peter J Selby Margaret A Knowles**
2. **"Introduction to the Cellular and Molecular Biology of Cancer" by L M Franks**
3. **"The Biology of Cancer" by Robert A Weinberg**
4. **"Principles of Cancer Biology" by Kleinsmith**

Reference Books

1. **“The Emperor of All Maladies: A Biography of Cancer (Old Edition)” by Siddhartha Mukherjee**
2. **An Introduction To Cellular And Molecular Biology of Cancer” by Peter J Selby Margaret A Knowles**
3. **“Introduction to the Cellular and Molecular Biology of Cancer” by L M Franks**
4. **“The Biology of Cancer” by Robert A Weinberg**

MAJOR BASED ELECTIVE II
BIOMEDICAL INSTRUMENTATION

Semester : VI Max Marks: 75
Course Code :18UBC6M2C Credit: 4
Total Periods: 60 Exam Hours: 3

Objectives:

Biomedical instrumentation provide the students about medical imaging, biomedical signal processing, rehabilitation and biomaterials

UNIT-I **(12** Periods **s)**

Bioelectric electrodes: ECG, EEG, EMG, microelectrodes. Biomedical recorders: ECG, EEG, EMG, cardiac pacemaker, defibrillators. Blood flow meters: Electromagnetic, ultrasonic, NMR, laser doppler

UNIT- II **(12** Periods**)**

Pulmonary function analyzers: Spirometry, respiratory gas analyzers, blood pH, blood pCO2, Blood pO2 analyzer. Microscopy in biology and medicine: Visualization of cells and sub cellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM,

UNIT-III **(12** Periods**)**

Ultrasonic imaging system: Echocardiogram, A, B, M scans and real-time B scanner. PET, MRI, fMRI, CAT Biomedical telemetry: Wireless telemetry, single and multi-channel telemetry, transmission of physiological signal over telephone lines.

UNIT-IV **(12** Periods**)**

Audiometers: Basic audiometer, Speech audiometers. Haemodialysis Machine: Dialyzers, artificial kidney Physiological transducers: Body temperature, Pulse sensors, Respiration sensors.

UNIT- **(12** Periods**)**

Basic idea about physiotherapy and electrotherapy instruments: Brief description of generation, circuit diagrams and testing. Demonstration of electrotherapy instruments, principles of their functioning, usage, and safety implications for human beings.

REFERENCES

Text books:

1. Handbook of Biomedical Instrumentation" by Khandpur
2. "Biomedical Instrumentation and Measurements" by R Ananda Natarajan
3. "Biomedical Instrumentation and Measurements" by Cromwell
4. "Introduction to Biomedical Instrumentation" by Mandeep Singh
5. "Biomedical Electronics and Instrumentation Made Easy" by G S Sawhney
6. Biomedical Instrumentation Systems" by Shakti Chatterjee.

Reference books:

1. Handbook of Biomedical Instrumentation" by Khandpur
2. "Biomedical Instrumentation and Measurements" by R AnandaNatarajan
3. "Biomedical Instrumentation and Measurements" by Cromwell
4. "Introduction to Biomedical Instrumentation" by Mandeep Singh

MAJOR BASED ELECTIVE III
ADVANCED ENDOCRINOLOGY

Semester : VI Max Marks: 75
Course Code : 18UBC6M3A Credit: 6
Total Periods: 75 Exam Hours: 3

Objectives
Clinical endocrinology plays a vital role in clinical Biochemistry and Metabolism

Unit I

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

Unit II

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

Unit III

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

Unit IV

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

Unit V

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

Text & Reference Books

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

MAJOR BASED ELECTIVE III
NUTRITIONAL BIOCHEMISTRY

Semester : VI | Max Marks: 75
Course Code : 18UBC6M3B | Credit: 6
Total Periods: 75 | Exam Hours: 3

Objectives

The course is an introcuction to nutritional biochemistry. The students will learn how nutrients effect biochemical processes and signal transduction pathways, and how this can lead to development og nutrinially related diseases.

Unit – I

Nutritional profile of principal foods: Cereals, pulses, vegetables, fruits, nuts, oil seeds, animal foods, milk and milk products, egg, fish, meat, drinks and spices. Role of dietary carbohydrates, proteins, fats, fiber and antioxidants. Energy content of foods: Determination of calorific value by Bomb calorimeter.

Unit – II

Dietary requirements: Balanced diet, Recommended dietary allowances for infants, children, adolescent, pregnant, lactating women, athletes and geriatrics. Measurement of energy expenditure, respiratory quotients of food stuffs, specific dynamic action.

BMR:- Measurement of BMR and factors influencing BMR.

Unit-III

Dietary protein: Biological value of proteins and nitrogen balance. Essential and non-essentials aminoacids. Protein energy malnutrition – aetiology, management of kwashiorkor and marasmus.

Unit – IV

Minerals: Nutritional significance of dietary macro minerals (Ca, P, Mg, S, K, Na, Cl) and trace minerals (Iron, Iodine, Zinc and copper). Disorders related to the deficiency of minerals. Nutraceticals: Introduction and classification of nutraceticals.

Unit- V

Nutrition and body defenses: Drug - nutrient interaction, nutritional therapy for inborn errors of metebolism, role of diet and nutrition in the prevention and treatment of diseases:- Diabetes mellitus, Jaundice, Peptic ulcer, Gout, blood pressure, cardiovascular diseases, nephritis.

REFERENCES

Text books

1. Human nutrition by B. Srilakshmi, New age International Pvt Ltd, 2009

2. Human nutrition and dietetics, S. Davidson and J.R. Passmore.

3. Human nutrition and dietetics, IS Garraw, WPT James, 10th edition

4. Modern nutrition in health and diseases, Whol and Good hart.

5. Mechanism and theory in food chemistry, DWS Wong, CBS New Delhi, 1996**.**

Reference books

1. Human nutrition by B. Srilakshmi, New age International Pvt Ltd, 2009

2. Human nutrition and dietetics, S. Davidson and J.R. Passmore.

3. Human nutrition and dietetics, IS Garraw, WPT James, 10th edition

4. Modern nutrition in health and diseases, Whol and Good hart

MAJOR BASED ELECTIVE-III

FUNDAMENTAL OF GENETICS

Semester : VI | Max Marks: 75
Course Code : 18UBC6M3C | Credit: 6
Total Periods: 75 | Exam Hours: 3

Objectives

i. Genome characteristic basic organization
ii. understand the structure of Prokaryotic and Eukaryotic chromosomes

Unit -I

a. History of Genetics:

Definition and scope of Genetics. Pre-mendelian genetic concepts- Pre-formation, Epigenesis, Pangenesis, Inheritance of acquired characters, Germplasm theory. Heredity and Environment; Genotype and Phenotype; Heredity and Variation. Clones, Purelines and Inbred lines. Norms of reaction and Phenocopies.

Unit -II

Biography of Mendel and his experiments with pea plant.

Law of segregation: Monohybrid cross, back cross and test cross. Dominance and Recessive ness, Co-dominance and Incomplete dominance. Genetic problems related-Law of Independent Assortment: Dihybrid cross in Pea plant and Drosophila, Back cross and test cross. Genetic problems related.

Unit- III

a. Multiple alleles:

Definition, Eye color in Drosophila, Blood groups and Rh factor in Human. Genetic problems related. Gene interactions-Deviations from Mendelism: Inter allelic- omplementry gene interaction (9:7) Ex. Lathyrus odoratus Supplementry gene interaction (9:3:4) Ex. Grain color in Maize. Epistasis: - Dominant –Ex. Fruit color in Cucurbita pepo. Epistasis:- Recessive –Ex. Coat color in Mice.

Unit- IV

Elements of biometry: Measures of Central tendency – Mean, Median and Mode. Measures of Dispersion – Range, Variance, Standard deviation and Standard error. Test of Hypothesis – Student's't' test, Chi square test. Probability- Basic concepts; Distribution- Normal, Binomial and Poisson.

Unit- V

Sex determination: Chromosomal theory of sex determination-XX-XY, XX-XO, ZZ-ZW; Genic balance theory of Bridges, Y chromosome in sex determination in Melandrium. Environment and sex determination. Hormonal control of sex determination (free martin).

Gynandromorphs / Intersexes, Super sexes in Drosophila. Sex differentiation and Dosage compensation (Drosophila and Man).

REFERENCES

Text books

1. Molecular Biology of the Gene, 4th edition by Watson J.D, N.H.Hopkins, J.W.Roberts, J.A.Steitz and A.M.Weiner (1987) Benjamin/Cummings.
2. The RNA World (2 edition) Gestel and R, T.Cech and J.Atkins (edition) 1999 Cold Spring Harbor, New York.
3. Cell Biology and Molecular Biology by EDP Robertis and EMF Robertis, Saunder College.Advanced Molecular Biology by Twyman R.M (1998) Viva Books Ltd.
4. Instant Notes in Molecular Biology by P.C.Turner etal (2002) Viva Books.
5. Instant Notes in Biochemistry 2 edition B.D.Hames and N.M.Hooper (2002) Viva Books.

Reference Books

1. Genomes by T.A. Brown (2002) Viva Books. Molecular cell Biology, 2nd edition by Darnell.J, H.Lodish and D.Baltimore (1990),Scientific American Books,
2. New York. GENES – IX by Benjamin Lewin
3. Recombinant DNA Technology by Watson
4. Molecular Genetics by D.N.Bharadwaj
5. Advanced Genetics by G.S.Miglani
6. Molecular Biology Techniques by Naik

Learning Outcomes

Biochemistry Major

Learning Outcomes

Learning outcomes for students who complete a B.Sc. degree in Biochemistry include the following:

Learning Outcome I

Senior Biochemistry Majors will be able to demonstrate an understanding of fundamental biochemical principles, such as the structure/function of biomolecules, metabolic pathways, and the regulation of biological/biochemical processes.

Learning Outcome II

Biochemistry Majors will gain proficiency in basic laboratory techniques in both chemistry and biology, and be able to apply the scientific method to the processes of experimentation and hypothesis testing.

Learning Outcome III

Students in the Biochemistry Major will be able to apply and effectively communicate scientific reasoning and data analysis in both written and oral forums.

Learning Outcome IV

Students in the Biochemistry Major will understand and practice the ethics surrounding scientific research.