DHANALAKSHMI SRINIVASAN
COLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
(Nationally Re-accredited with 'A' Grade by NAAC)
Perambalur - 621 212. Tamil Nadu
M.Sc Biochemistry-Course Structure under CBCS

(For the candidates admitted from the academic year 2020-2021 onwards)

Year Sem	Course	Title	Course-Code	Inst. Periods/ Week	Credits	Exam hours	Marks		Total
							Int	Ext	
I year I Sem	Core Course -I	Chemistry of Bimolecules	20PBC1C1	6	5	3	25	75	100
	Core Course - II	Analytical Techniques	20PBC1C2	5	4	3	25	75	100
	Core Course -III	Advanced Human Physiology	20PBC1C3	5	4	3	25	75	100
	Core Practical-IV	Lab in Chemistry of Bimolecules Analytical Techniques Human Physiology	20PBC1C4P	6	3	3	40	60	100
	Elective I	Advanced Microbiology	20PBC1E1A	5	4	3	25	75	100
		Advanced Human Genetics	20PBC1E1B						
	Application Oriented Course -1	Environmental Toxicology	20PBC1A1	3	3	3	25	75	100
	Total			**30**	**23**	**-**	165	435	**600**
I year/ II Sem	Core Course -V	Enzymology	20PBC2C5	6	5	3	25	75	100
	Core Course - VI	Metabolism & Regulation	20PBC2C6	5	4	3	25	75	100
	Core Course - VII	Cell &Molecular biology	20PBC2C7	5	4	3	25	75	100
	Core Practical -VIII	Lab in Enzymology Metabolism & Regulation Cell &Molecular biology	20PBC2C8P	6	3	3	40	60	100
	Elective -II	Biostatistics &Bioinformatics	20PBC2E2A	5	4	3	25	75	100
		Biomedical Instrumentation	20PBC2E2B						
	Application Oriented Course-II	Advanced Dietetics	20PBC2A2	3	3	3	25	75	100
	Total			**30**	**23**	-	165	435	**600**
IIYear/ IIISem	Core Course -IX	Advanced Immunology	20PBC3C9	6	6	3	25	75	100
	Core Course -X	Clinical Biochemistry	20PBC3C10	6	5	3	25	75	100
	Core Course - XI	Plant and animal Biotechnology	20PBC3C11	5	5	3	25	75	100

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	Core Practical- XII	Lab in Immunology Clinical biochemistry Plant & Animal Biotechnology	20PBC2C12P	8	4	3	40	60	100
	Elective -III	Endocrinology	20PBC3E3A	5	4	3	25	75	100
		Microbial &Industrial Biotechnology	20PBC3E3B						

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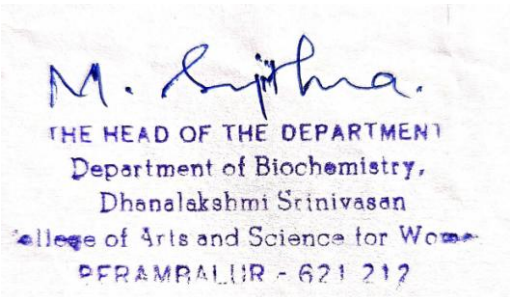
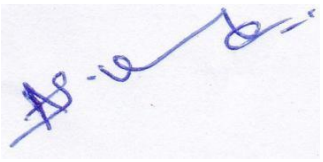


	Total			**30**	**24**	**-**	140	360	**500**
IIYear IVSem	Core Course - XIII	Genetic Engineering	20PBC4C13	6	5	3	25	75	100
		Project	20PBC4PW	24	15	3	50	150	200
	Total			**30**	**20**	**-**	**25**	**75**	**300**
	GRAND TOTAL			**120**	**90**		**495**	**1305**	**2000**

SUBJECT EXPERT
A.ANTONY JOSEPH VELAN GANNI



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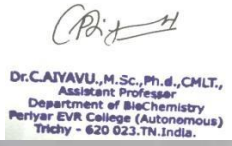
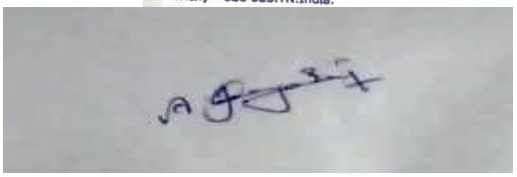


INDUSTRIALIST
MR.IRUDAYARA J



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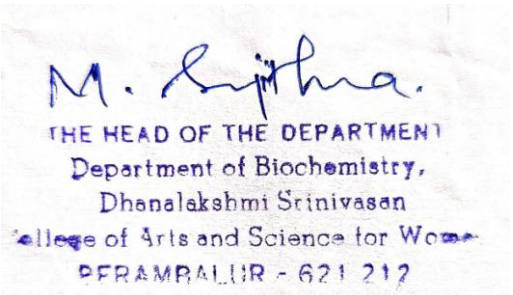

CORE COURSE-I
CHEMISTRY OF BIOMOLECULES

Semester : I **Max Marks: 75**
Course Code : 20PBC1C1 **Credit: 6**
Total Periods: 90 **Exam Hours: 3**

Objectives

To understand the chemical structure and function of various bio molecules found in living systems.

Unit-I Water and Carbohydrate (20 Periods)

Water - Unique properties, weak interactions in aqueous systems, ionization of water, buffers.Classification, chemical properties of carbohydrates, Chemistry and biological roles of homo and heteropolysaccharides. Structural elucidation of polysaccharides; Oligosaccharides – lectin interaction in biochemical processes. Structure and role of proteoglycans, glycoproteins and glycolipids (gangliosides and lipopolysaccharides).

Unit –II Lipids (20 Periods)

Classification of Lipids, Biological significance of lipids, Fatty acids andtheir physiochemical properties. Structure and properties of Prostaglandins. Storage lipids - triacyl glycerol and waxes. Structural lipids in membranes – glycerophospholipids, galactolipids and sulpholipids, sphingolipids and sterols, structure, distribution and role of membrane lipids.Lipids as signals, cofactors and pigments.

Unit- III Amino acids and Proteins (18 Periods)

Amino acids–classification, structure and physiochemical properties,chemical synthesis of peptides – solid phase peptide synthesis. Proteins – classification, purification, and criteria of homogeneity. Structural organization, sequence determination and characterization of proteins. Conformation of proteins – Ramachandran plots. Denaturation of proteins.Apoprotein and Prosthetic group- Porphyrins – Structure and properties of porphyrins –heme, Chlorophyll and Cytochromes.

Unit-IV Nucleic acids (15 Periods)

Nucleotides- structure and properties, physicochemical properties of nucleicacids, cleavage of nucleic acids by enzymatic methods, non – enzymatic transformation of nucleotides and nucleic

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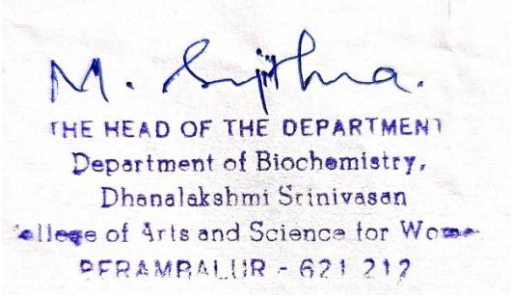

acids, methylation, Sequencing, chemical synthesis of DNA. Three dimensional structure of DNA. Different forms of DNA – circular DNA and Supercoiling. Types of RNA mRNA,tRNA, rRNA, Sn RNA,Si RNA,Hn RNA. Structure of t-RNA. Nucleotides as source of energy, component of coenzymes, second messengers. Porphyrins – Structure and properties of porphyrins – heme, Chlorophyll and Cytochromes.

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Unit-V Thermodynamics **(17 Periods)**

Principles of thermodynamics, free energy, enthalpy and entropy, Freeenergy changes in biological transformations in living systems. Redox potential, phosphate group transfer potential and ATP, High-energy compounds, oxidation and reduction reactions. Mitochondrial electron transport system – organization of components and importance.Substrate level phosphorylation, oxidative phosphorylation, Respiratory control, Mechanism and theories of oxidative phosphorylation. Respiratory chain inhibitors and uncouplers of oxidative phosphorylation.

REFERENCES

Text Books

1. Biochemistry Zubay 4th edition 1998 William C.Brown Publication.
2. Harper's Biochemistry 25th edition McGraw Hill.
3. Biochemistry Stryer 4th edition Freeman.
4. Principles of Biochemistry. Lehninger Nelson Cox Macmillan worth Publishers, 2000.

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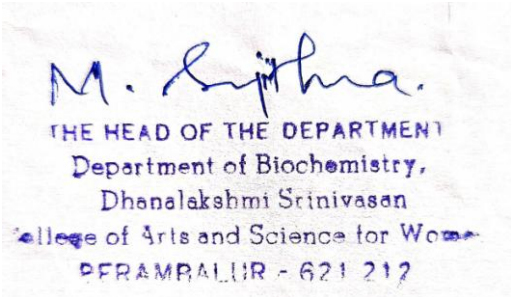

CORE COURSE-II
ANALYTICALTECHNIQUES

Semester : I **Max Marks: 75**
Course Code : 20PBC1C2 **Credit: 6**
Total Periods: 90 **Exam Hours: 3**

Objectives:

To understand the working principles, construction and applications of the instruments used in the studies related to various disciplines of biological sciences.

Unit- I **(18 Periods)**

Spectroscopy: Laws of absorption and absorption spectrum.CD, ORD, Principle, instrumentation and applications of UV-visible spectrophotometry, ESR, NMR, IR and spectrofluorimetry. Basic principles of turbidimetry and nephelometry. Principle, instrumentation and applications of luminometry. Atomic spectroscopy – principle and applications of atomic flame and flameless spectrophotometry. Use of lasers for spectroscopy. MALOF TOF.

Unit-II **(20 Periods)**

Chromatography-Principle, Instrumentation and applications- Paper, Thin layer, gas, Ion Exchange, gel filtration, Affinity chromatography- immune affinity, HPLC, RF- HPLC,HPTLC, FPLC, LC, Chromatofocusing, capillary electro chromatography .

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

Electrophoresis Principle, Instrumentation and applications- General principle, migration of charged particle in an electric field, factors affecting mobility, Electrophoresis of proteins native-PAGE,SDS-PAGE, 2D-PAGE, gradient gels, isoelectric focusing gels, detection, estimation & recovery of proteins in gels; electrophoresis of nucleic acids agarose gel electrophoresis, pulse field electrophoresis, capillary electrophoresis; microchip electrophoresis, Cellulose acetate electrophoresis,Di electrophoresis, Zymography.

Unit-IV **(18 Periods)**

Radioisotope techniques - Measurement of radioactivity – solid and liquid scintillation counting, scintillation cocktails and sample preparation, Autoradiography, Fluorography, Phosphor-imaging - applications, Cerenkov counting, applications of radioisotopes in biology, radiation hazards and safe disposal of radioactivity waste.

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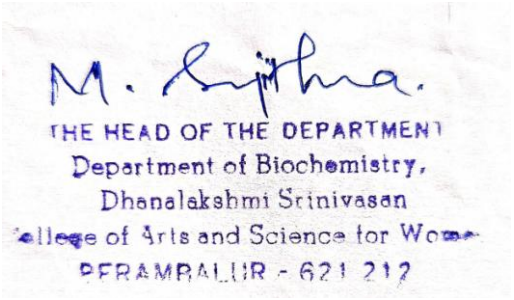

Unit-V **(14 Periods)**

Electrochemical techniques and Microscopy Principles, electrochemical cells - pH, Henderson – Hassel balch equation, buffer capacity, pH measurement, glass electrode. Ion- selective and gas sensing electrodes, oxygen electrode - principle and application.Biosensors. Microscopy - bright field, darkfield, fluorescence and phase contrast microscope. Scanning and transmission electron microscopy

REFERENCES

Text Books:

1. Principles and Techniques of Practical Biochemistry, Keith Wilson & John Walker, Cambridge University Press, India. 2005.
2. Biophysical Chemistry (Principles and Techniques) 4th Edition, Avinash Upadhyay, Kakoli Upadhyay and Nirmalendu Nath, Himalaya Publishing House, India, 2014.
3. Methods and Techniques, 2nd ed, C.R. Kothari, Research Methodology, New Age International Publishers. India, 2004.

Reference books

1. Textbook of Biochemistry, West, E.S. and Todd, W.R, MacMillan, Germany, 1985**.**

2. Research Methodology, Methods and Techniques 2nd Edition, C.R. Kothari, New Age International Publishers. New Delhi, 2004.

3. Fundamentals of Bio Analytical Techniques and Instrumentation, Ghosal Sabari and Srivastava A. K., PHI Learning Pvt. Ltd. India, 2009

4. Introduction to Spectroscopy. 3rd Edition. Pavia, Brooks/Cole Pub Co., New Delhi, India, 2000.

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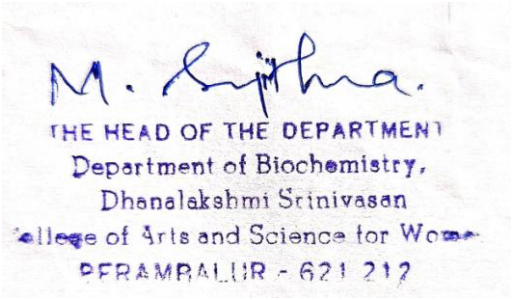

CORE COURSE –III

ADVANCED HUMAN PHYSIOLOGY

Semester : I **Max Marks: 75**
Course Code : 20PBC1C3 **Credit: 5**
Total Periods: 75 **Exam Hours: 3**

Objectives

Human physiology aims to introduce the students to the Physiological concepts of the body systems dealt with in the blood, nervous system, excitable tissues, the cardiovascular system, respiration, the gastrointestinal tract, renal physiology.

Unit-I **(15** Periods**)**

Blood: Composition and functions of blood. Separation of plasma and serum.Plasma proteins in health and disease.Red blood cells - formation and destruction.Important aspects of RBC metabolism.The RBC membrane – principle proteins (spectrin, ankyrin, glycophorins).Anaemias. Composition and functions of WBCs. Blood coagulation – mechanism and regulation. Fibrinolysis.Anticoagulants.

Unit-II **(20** Periods**)**

Cardiovascular System: Comparative anatomy of heart structure, myogenic heart, specialized tissue,.Structure and properties of cardiac muscle.Junctional tissues of heart - Origin and spread of cardiac impulses, heart block. Cardiac cycle: Definition, mechanical events during different phases of systole and diastole. Pressure volume changes inside heart chambers and aorta,. Heart Rate- Normal value, physiological variation.Regulation of heart rate. Cardiac output - Definition, normal values, physiological variation, factors affecting, cardiac index, cardiac reserve, regulation of cardiac output. Principles of measurement of cardiac output. Electrocardiogram- Principles of electrocardiography, Normal ECG. Characteristics of waves, Einthoven's triangle and law.Significance of ECG. Heart sounds- Causes, characteristics, significance, phonocardiogram, murmurs.

Unit-III **(15** Periods**)**

Comparison of respiration in different species, anatomical considerations,transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration. Neurons,

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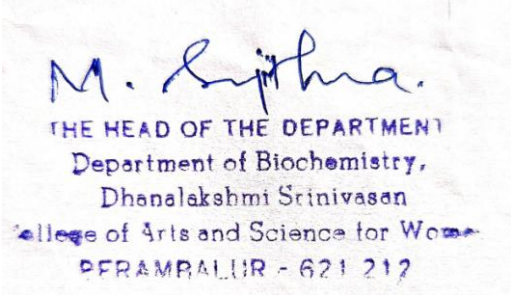

action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture. Muscle physiology.

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Unit- IV **(13** Periods)

Body Fluids: Lymph – composition and functions. CSF – composition and clinical significance. Formation of urine – structure of nephron, glomerularfiltration, tubular reabsorption of glucose, water and electrolytes. Countercurrent multiplication, tubular secretion. Composition, functions and regulation of saliva, gastric, pancreatic, intestinal and bile secretions. Digestion and absorption of carbohydrates, lipids, proteins and nucleic acids.

Unit -V **(12** Periods**)**

Neuromuscular System: Structure of neuron. Propagation of action potential: structure of voltage – gated ion channels. Neurotransmitters - examples, release and cycling of neurotransmitters. The neuromuscular junction – activation of gated ion channels. The acetylcholine receptor.Structure of skeletal muscle. Muscle proteins – myosin, actin, troponin and tropomyosin and other proteins. Sequence of events in contraction and relaxation of skeletal muscle.

REFERENCES

Text books:

1. Molecular Cell Biology 5th ed., Lodish, WH Freeman (for unit 1, 2, 5) 2003.
2. Harper's Biochemistry 26th ed- Murray, McGraw Hill (unit 2 Biomembranes, Principles of Biochemistry- Smith et al. Mammalian Biochemistry. McGraw Hill 7th ed. (for unit 3, unit 4) 1983.
3. Cell and Molecular Biology. De Robertis and De Robertis. Lea and Febiger 8thed 1987).
4. Molecular Biology of the Cell - Alberts , 4th ed. Garland Sci. 2002.

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1. Molecular Cell Biology 5th ed., Lodish, WH Freeman (for unit 1, 2, 5) 2003.
2. Harper's Biochemistry 26th ed- Murray, McGraw Hill (unit 2 Biomembranes,Principles of Biochemistry- Smith et al. Mammalian Biochemistry. McGraw Hill 7th ed. (for unit 3, unit 4) 1983.

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CORE PRACTICAL- I
LAB IN CHEMISTRY OF BIOMOLECULES, ANALYTICAL TECHNIQUES & HUMAN PHYSIOLOGY

Semester : I | Max Marks: 75
Course Code : 20PBC1C4P | Credit: 6
Total Periods: 90 | Exam Hours: 6

Objectives:

To understand the working principles, construction and applications of the instruments used in the studies related to various disciplines of biological sciences.

I. Biomolecules and Analytical Techniques **(30** Periods**)**

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. Desalting of proteins by dialysis
5. Separation of polar and non polar lipids by TLC
6. Rf value calculation of various amino acids using TLC and PC
7. Separation of serum proteins by paper electrophoresis

II Human physiology **(30** Periods**)**

1. Study of microscope and its uses.
2. Collection of blood and preparation of blood smear.
3. Study of haemocytometer.
4. Haemoglobinometry.
5. Determination of RBC count.
6. Determination of WBC count.
7. Determination of blood groups.
8. Leishman's staining and differential leukocyte count.
9. Calculation of blood indices.
10. Determination of bleeding time.
11. Determination of clotting time.
12. Determination of ESR.

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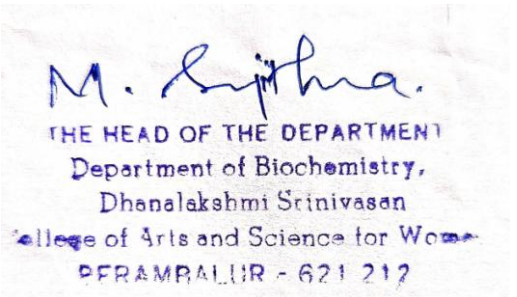

13. Determination of PCV.
14. Determination of specific gravity of blood.
15. Absolute eosinophil count

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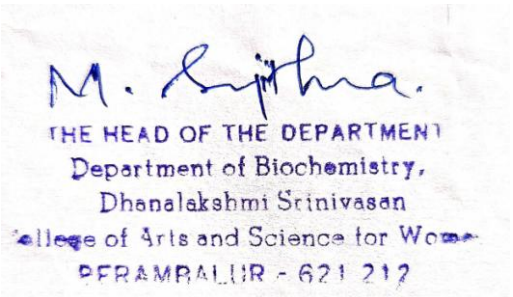

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Text books:

1. Laboratory manual for Analytical Biochemistry & separation Techniques, P.Palanivelu, MKU University, Madurai.2001.
2. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd[ed], 2005.
3. Biochemical methods – S.Sadasivam, New Age International Pub, 2000.
4. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications, Meerut, 2000

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1. Laboratory manual for Analytical Biochemistry & separation Techniques, P.Palanivelu, MKU University, Madurai.2001.
2. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd[ed], 2005.
3. Biochemical methods – S.Sadasivam, New Age International Pub, 2000.
4. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications, Meerut, 2000.
5. Enzyme Kinetics – A modern Approach. AG Marangani, John Wiley & Sons, 2003.
6. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub, 2000.

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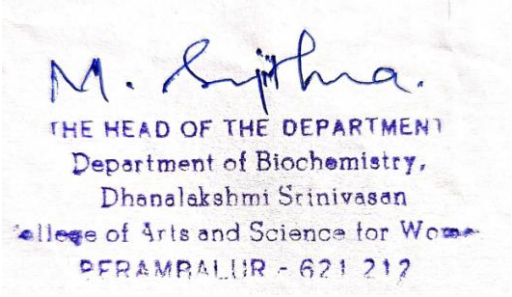

ELECTIVECOURSE-I

ADVANCED MICROBIOLOGY

Semester : I **Max Marks: 75**
Course Code : 20PBC1E1A **Credit: 4**
Total Periods: 60 **Exam Hours: 3**

Objectives

To understand the metabolic reaction occurs in the microbial cells, it helps the student to gain basic information about microbiology.

Unit -I **(15** Periods**)**

Morphology and Ultra structure: Ultra structure of bacteria, fungi, algae and protozoa. Classification of microbes, molecular taxonomy.Cell walls of ubacteria (peptidoglycan) and related molecules. Outer membrane of Gram-negative bacteria. Cell wall and cell membrane synthesis, flagella and motility, cell inclusions like endospores, gas vesicles. Purple and green bacteria, cyanobacteria, homoacetogenic bacteria, Acetic acid bacteria, Budding and appendaged bacteria, spirilla, spirochaetes, Endospore forming rods and cocci, Mycobacteria, Rickettsia and Mycoplasma.Archaebacteria.

Unit- II(15 Periods**)**

Microbial growth and metabolism: Microbial growth– definition. Mathematical expression of growth, growth curve, measurement of growth and growth yields, synchronous growth, continuous culture, factors affecting growth. Microbial metabolism– overview. Photosynthesis in microbes. Role of chlorophylls, carotenoids and phycobilins, Calvin cycle. Chemolithotrophy; Hydrogen– iron– nitrite oxidising bacteria; nitrate and sulfate reduction; methanogenesis and acetogenesis, fermentations– diversity, syntrophy-role of anoxic

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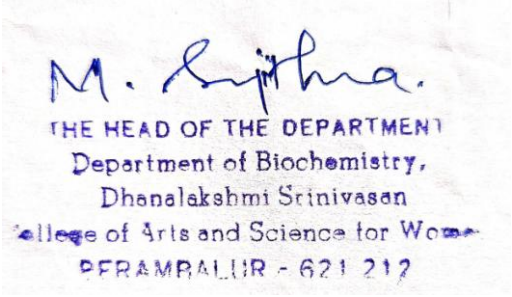

decompositions. Nitrogen metabolism, nitrogen fixation, hydrocarbon transformation.

Unit -III **(10** Periods**)**

Microbiological Techniques: Methods in microbiology. Current methods in microbial identification. Pure culture techniques.Theory and practice of sterilization. Principles of microbial nutrition, construction of culture media, Enrichment culture techniques for isolation of chemoautotrophs, chemoheterotrophs and photosynthetic microbes.

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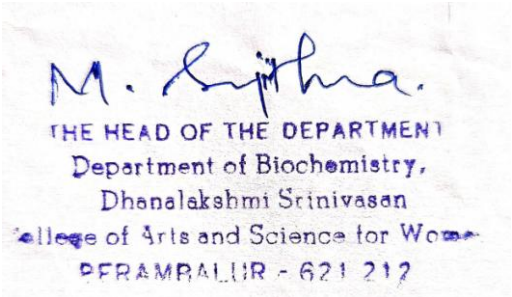

Unit- IV **(10** Periods**)**

Viruses: Bacterial, plant, animal and tumor viruses. Classification and structure of viruses.Lytic cycle and lysogeny.DNA viruses; positive and negative strand, Double stranded RNA viruses.Replication; example of Herpes, pox, adenoviruses, Retroviruses.Viroids and prions.

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

Medical Microbiology: Disease reservoirs; Epidemiological terminologies. Infectious disease transmissions. Respiratory infections caused by bacteria and viruses; Tuberculosis, sexually transmitted diseases including AIDS; Vector borne diseases, water borne diseases. Public health and water quality.Pathogenic fungi.Antimicrobial agents, Antibiotics.Penicillins and cephalosporins, Broad spectrum antibiotics. Antibiotics from Prokaryotes, Antifungal antibiotics– Mode of action, Resistance to antibiotics.Lantibiotics.

REFERENCES

Text Books:

1. Brock Biology of microorganisms- Madigan, 10th ed. Prentice Hall, 2002.
2. Microbiology 4th ed- Davis, Lippincott Williams and Wilkins, 1989.
3. Microbiology - Joklik, Zinsser's McGraw-Hill Professional, 1995.

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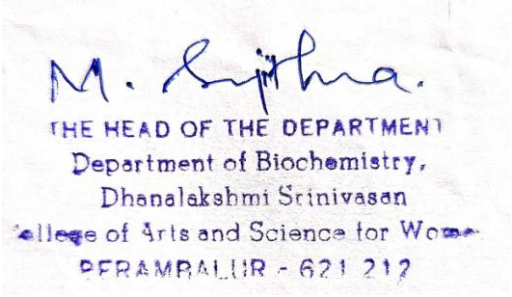

APPLICATION ORIENTED COURSE-I

ENVIRONMENTAL TOXICOLOGY

Semester : I **Max Marks: 75**
Course Code : 20PBC1A1 **Credit: 3**
Total periods: 45 **Exam Hours: 3**

Objectives:

Exposure of man and animal to potentially hazardous environmental factors of chemical, biological or physical nature.

Unit- I: Basic concepts of Eco-toxicology **(9** Periods**)**

Introduction to toxicology, Principles of toxicology, scope of toxicology**.**Types of toxic substances - degradable and non-degradable. Factors influencing toxicity, drug toxicity. Biochemical basis toxicity – mechanism of toxicity and receptor mediated events, acute and chronic toxicity. Sigmoid relationships, Corollary of toxicology. Influence of ecological factors on the effects of toxicity**.**

Unit- II: Toxicants in the Environment **(9** Periods**)**

Toxic substances in the environment, their sources and entry routes. Transport of toxicants by air and water: Transport through food chain - bioaccumulation and biomagnificationof toxic materials in food chain. Toxicology of major pesticides- biotransformation, biomonitoring, programs and parameters of biomonitoring, concept of bioindictor, bio indicator groups and examples. Environmental impacts of pesticides: Physiological and metabolic effects on flora and fauna**.**

Unit- III: Evaluation of toxicity **(8** Periods**)**

Methods used to assess toxicity classification of toxic materials. Concepts of Bioassay- types, characteristics.Importance and significance of bioassay, Microbial bioassay for toxicity testing, Bioassay test models and classification. Threshold limit value, LC50 LD50.Toxicity Testing, Concept of Dosimetry: lethal, sub-lethal & chronic tests. Dose response curves

Unit- IV: Organ toxicity **(8 Periods)**

Hepatotoxicity: Common examples of hepatotoxicants, injuries caused to liver Nepherotoxicity: Common examples of nepherotoxicants, injuries caused to kidney

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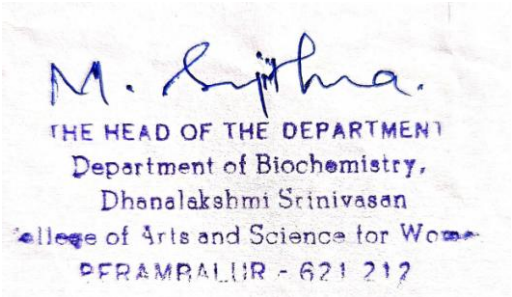

pulmonary toxicity: Common examples of pulmonary toxicants, injuries caused to lungs. Neurotoxicity**:** Common examples of neuro toxicants, injuries caused to nervous tissues.

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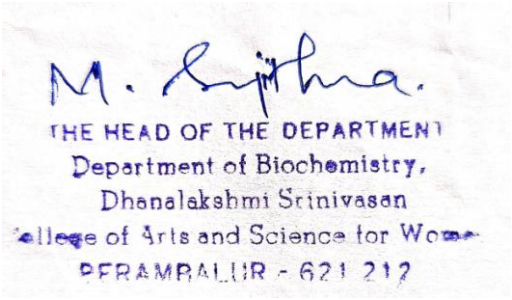

Unit–V: Experimental aspects of environmental analysis and toxicology (11 Periods) Overview of experimental component of the course.Toxicity testing and chemical analysis.Water quality testing; water quality indicators including dissolved oxygen, conductivity and alkalinity.Sections on dissolved oxygen; acid-base chemistry and alkalinity; ion concentrations in waters; water hardness

REFERENCES

Text Books

1. Principles of Environmental Toxicology: I. C. Shaw and J.Chadwick; Taylor&Francis ltd
2. Basic Environmental Health (2001): AnnaleeYassi, TordKjellstom, Theo de Kok, Tee Guidotti
3. Environmental Health: Monroe T. Morgan

Reference books

1. Principles of Environmental Toxicology: I. C. Shaw and J.Chadwick; Taylor&Francis ltd
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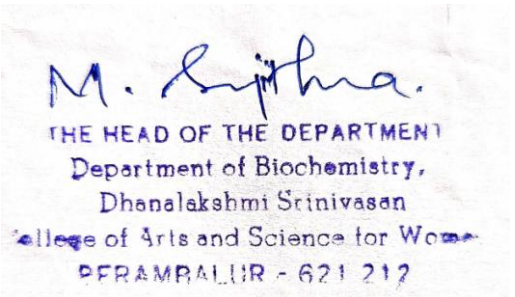

CORE COURSE-V
ENZYMOLOGY

Semester : II | Max Marks: 75
Course Code : 20PBC2C5 | Credit: 6
Total Periods: 90 | Exam Hours: 3

Objectives:

The objective of the course is to provide a deeper insight into the fundamentals of *enzyme* structure, kinetics, function and kinetics of soluble and immobilized enzymes.

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

Enzyme - Classification and general properties like effect of pH, substrate and temperature on enzyme catalysed reactions**.** Factors affecting rate of reactions - activation energy & transition state theory and catalysis. IUB Classification and Nomenclature, Intracellular Location of Enzymes, Enzyme Units, Active site - Determination of 3D structure of active site, Enzyme Turn over, Significance of Enzyme Turn over. Extraction, Purification and characterization of enzymes: Source and extraction procedures. Iso Enzymes, Antioxidant Enzymes.

Unit-II **(18** Periods**)**

Kinetics of enzyme-catalyzed reactions- Methods used in the investigation of thekinetics of enzyme-catalyzed reactions, initial velocity studies, rapid reaction techniques and relaxation

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Dhanalakshmi Srinivasan
College of Arts and Science for Women
PERAMBALUR - 621 212

technique. Enzyme kinetics of single substrate reactions – Michaelis Menten and Briggs and Haldane theory (rapid equilibrium and steady state theory). Kinetic data evaluation-linear transformation of Michaelis-Menten equation. Pre-steady state kinetics. Integrated velocity equation. Haldane equation. King-Altman procedure for deriving the rate equation. Effect of pH & temperature on enzymatic reactions, Arrhenius plot, determination of activation energy.

Unit-III **(18** Periods**)**

Enzyme Regulation: Mechanism, forward stimulation, Feedback inhibition- Allosteric Enzymes, Sigmoidal Kinetics and their Significance, Hill's Equation, Scatchard Plot and their application. Reversible and irreversible inhibition- types, Kinetics, Determination of Inhibitor constant and LB Plot.

Unit-IV **(14** Periods**)**

Multi Enzyme complex-Structure and Mechanism of action and Regulation of Pyruvate Dehydrogenase complex. Enzyme Immobilisation- Source and techniques of immobilization.Effect of immobilization on enzyme activity. Application of immobilized enzymes. Enzymes as Biosensors - Calorimetric, Amperometric, Optical and Immuno biosensors.

Unit-V **(22** Periods**)**

Industrial application of carbohydrases, proteolytic enzyme, lignocellulose degrading enzyme, pectin and pectic enzyme. Applications of enzymes in food and allied industries : leather, textile, detergent, paper industries. Clinical Enzymology: Enzymes as thrombolytic agents, anti-inflammatory agents, debriding agents, digestive aids, Enzyme therapy. Therapeutic enzymes. Enzyme and isoenzymes in diagnosis – Phosphatases, transaminases, LDH, CK, amylase, cholinesterase. Enzyme electrodes, enzyme biosensors and their applications, ELISA, EMIT Application of Enzymes - Enzymes as analytical reagents, Enzymes in Textile, Food and Detergent Industry. Enzymes used in diagnosis and various diseases. Therapeutic application of enzymes. Biotechnological applications of Enzymes. Enzyme Engineering: Artificial enzymes. Future prospects of Enzyme engineering.

REFERENCES

Text books:

1. Enzymes. Dixon, E.C Webb, CJR Thorne and K.F. Tipton, Longmans, London
2. Fundamentals of Enzymology, Nicholas C.Price, Lewis Stevans. 2 ed., (1998), Oxford

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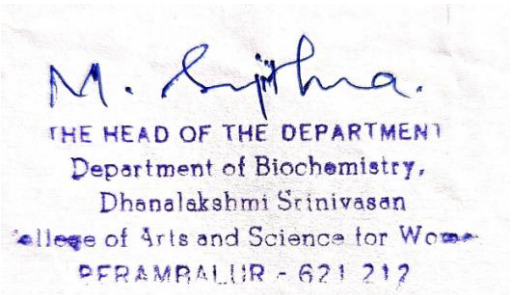

University Press,
3. Understanding Enzymes, Trevor Palmer, 1991. Third Edition Ellis Horwood Limited.
4. Protein Biotechnology. Gary Walsh and Denis Headon, 1994.John Wiley and Sons,
5. Protein Biochemistry and Biotechnology, Gary Walsh ,2002. John Wiley and Sons

Reference books:

1. Enzymes. Dixon, E.C Webb, CJR Thorne and K.F. Tipton, Longmans, London
2. Fundamentals of Enzymology, Nicholas C.Price, Lewis Stevans. 2 ed., (1998), Oxford University Press,
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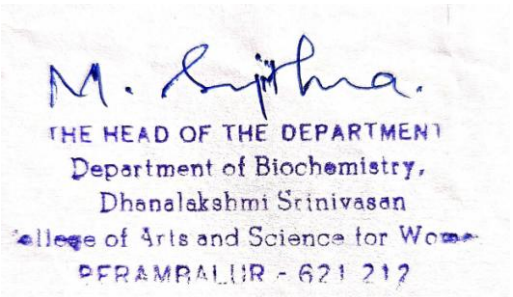

CORE COURSE-VI
METABOLISM AND REGULATION

Semester : II | Max Marks: 75
Course Code : 20PBC2C6 | Credit: 6
Total Periods: 90 | Exam Hours: 3

Objectives:

To understanding of the reactions involved in the breaking down and building up of biomolecules, and also discuss how metabolic pathways are regulated by effectors molecules and by hormones in living systems.

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

Bioenergetics: Free energy and entropy. Phosphoryl group transfers and ATP. Enzymes involved in redox reactions. The electron transport chain– organization and role in electron capture. Electron transfer reactions in mitochondria. Oxidative phosphorylation- F1/F0 ATPase- structure and mechanism of action. The chemiosmotic theory.Inhibitors of respiratory chain and Oxidative phosphorylation uncouplers, ionophores.Regulation of oxidative phosphorylation.Mitochondrial transport systems- ATP/ADP exchange, malate /glycerophosphate shuttle.

Unit -II **(18** Periods**)**

Carbohydrate metabolism: Glycolysis and gluconeogenesis– pathway, key enzymes and co-ordinate regulation. Pyruvate dehydrogenase complex and the regulation of this enzyme through reversible covalent modification. The citricacid cycle and regulation.The pentose phosphate pathway.Metabolismof glycogen and regulation.

Unit- III **(18** Periods**)**

Lipid metabolism: Lipogenesis-Control of acetyl CoA carboxylase-Role of hormones-Effect of diet on fatty acid biosynthesis. Regulation of biosynthesis of triacylglycerol, phospholipids and cholesterol. Metabolism of triacylglycerol during stress.α, β,γ, Oxidation of fatty acids– Role of carnitine cycle in the regulation of β -oxidation. Ketogenesis and its control.Lipoprotein metabolism exogenous and endogenous pathways.

Unit -IV **(18** Periods**)**

Metabolism of amino acids, purines and pyrimidines: Overview of biosynthesis of nonessential amino acids. Catabolism of amino acid–transamination, deamination, ammonia

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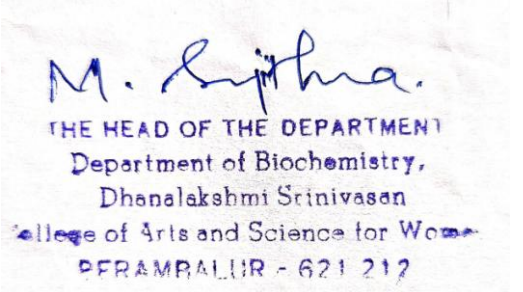

formation, the urea cycle and regulation of ureogenesis. Importance of glutamate dehydrogenase. Overview of Catabolism of carbon skeletons of amino acids. Metabolism of purines- denovo and salvage pathways for purine biosynthesis-Purine

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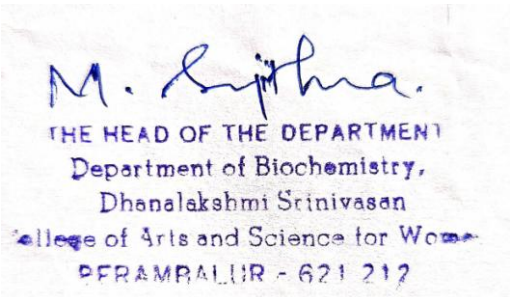

catabolicpathway.Metabolism of pyrimidines -biosynthesis and catabolism. Regulation of biosynthesis of nucleotides.

Unit-V **(18** Periods**)**

Metabolic integration and hormonal regulation: Key junctions in metabolism– glucose-6-phosphate, pyruvate and acetyl CoA. Metabolic profiles of brain, muscle, liver, kidney and adipose tissue. Metabolic interrelationships in various nutritional and hormonal states– obesity,aerobic, anaerobic endurance, exercise, pregnancy, lactation, IDDM, NIDDM and starvation**.**

REFERENCES

Text Books

1. Biochemistry- Stryer, Freeman. 5th ed, 2002.
2. Harper's Biochemistry- Murray, 29th ed. Mc. GrawHill, 2011.
3. Principles of Biochemistry. 7th ed, Nelson Cox. Lehninger's McMillan Worth, 2013.
4. Biochemistry- Donald Voet, J.G. Voet, John Wiley, J O H N WI VP & PublisherKaye Pace
5. Biochemistry- 2nd ed- Kuchel and Ralston. Schaum's Outlines McGraw Hill,1998.
6. Biochemistry NMS.4th ed- Davidson and Sittman. Lippincott.Willams and Wilkins, 1999.
7. Biochemistry 4th ed- Campbell and Farrell, Brooks/Cole Pub Co. 2002.
8. Metabolic Regulation-Keith N. Frayne, 2009.

Reference Books

1. Biochemistry- Stryer, Freeman. 5th ed, 2002.
2. Harper's Biochemistry- Murray, 29th ed. Mc. GrawHill, 2011.
3. Principles of Biochemistry. 7th ed, Nelson Cox. Lehninger's McMillan Worth, 2013.
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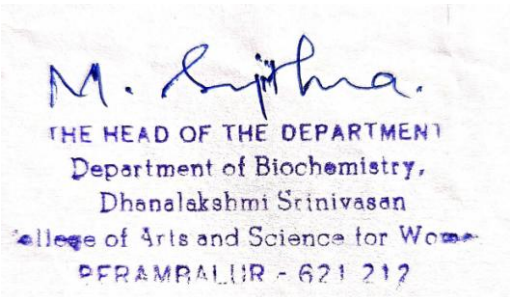

CORE COURSE-VII
CELL AND MOLECULAR BIOLOGY

Semester : II | Max Marks: 75
Course Code : 20PBC2C7 | Credit: 5
Total Periods: 75 | Exam Hours: 3

Objectives

To understand the general principles of gene organization and expression in both prokaryotic and eukaryotic organisms.

Unit-I **(15** Periods**)**

Structure and function of cells–prokaryotes and eukaryotes, Introduction to cytogenetics, Heterochromatin, euchromatin, and the nucleosome, Chromosome replication, segregation, and the centrosome, Numerical Abnormalities, Structural Chromosome Abnormalities mechanisms of structural Abnormalities , Sex chromosomes, X chromosome inactivation Homework, Sex chromosome abnormalities, Banding Techniques. Eukaryotic and Prokaryotic chromosomes: Structure of prokaryotic Chromosomes Structure of eukaryotic chromosomal centromere, nuclear organizer,telomeres, Histones, Non-histone proteins, and their properties, structure of nucleosome, role of histones in chromatin folding, concept of gene.

Unit- II **(15** Periods**)**

Replication: Review of replication in bacteria, plasmid and viruses, Models of DNA replication.DNA replication in prokaryotes and eukaryotes. Eukaryotic DNA polymerases and their roles, origin of replication, Autonomously Replicating Segments (ARS) in yeast, elongation, lagging strand synthesis, and termination. Recombination: DNA recombination: Homologous, site specific and transposition, Homologous recombination: Holliday Model, Messelsson - Radding Model, Rec BCD pathway. Site specific recombination: Lambda phage integration, and excision rearrangement, of immunoglobulin genes. Transposition: Prokaryotic transposition, conservative and replicative ransposition. Eukaryotic transposable elements, yeast and Drosophila transposons.

Unit- III **(15** Periods**)**

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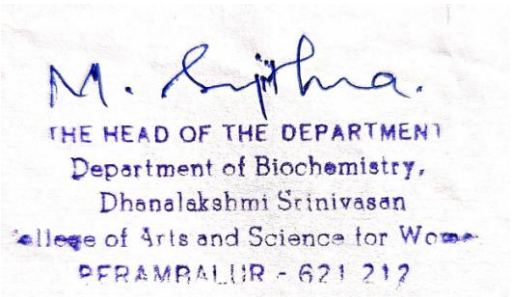

Transcription: Review of prokaryotic transcription, transcription in eukaryotes: Eukaryotic RNA polymerases and their subunit structure, Class I, II and III promoters, upstream elements, enhancers and silencers, General transcription factors, Class I, II, III genes and their functions, elongation factors, TBP structure and its role in transcription, mediators. Structure of transcription activators, zinc fingers, homeo domains, helix loop helix, bZIP, Beta barrels, Post transcriptional modification.

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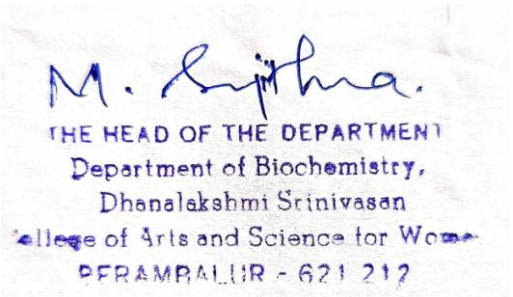

Unit - IV **(15** Periods**)**

Translation: genetic code and its features. Wobble hypothesis. Translation machinery, initiation, elongation and termination of translation in prokaryotes and eukaryotes. Translational proof reading, translational inhibitors, post-translational modifications, chaperones and protein targeting- translocation, heat shock proteins, glycosylation; SNAPs and SNAREs. Bacterial signal sequences. Mitochondrial, chloroplast and nuclearprotein transport. Endocytosis - viral entry. Ubiquitin TAG protein destruction.

Unit - V **(15** Periods**)**

Chromosomal changes and consequences: Changes in the chromosome number and chromosome structure and its related genetic disorders. Mutation: definition, chemical basis and types. Types of mutagens. Mutant types - lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertionalmutagenesis.DNA repair mechanism: thymine dimer, light activation, excision, recombinational, SOS and mismatch repair. Cancer Biology: genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth

REFERENCES

Text books

1. The Cell- A Molecular Approach Geoffrey Cooper, Robert E Harsman, 3rd ed ASM Press 2004.
2. Molecular Cell Biology, Lodish et.al. 5th ed., WH Freeman & Company 2003.
3. Cell and Molecular Biology De Robertis and De Robertis.. 8th ed Wolters Kluwer India Pvt Ltd 2001.
4. Molecular Biology of the Cell Alberts et al 4th ed. Garland Science Inc. 2002.
5. David Freifelder, 2008. Molecular Biology.(Ed: 2). Narosa Publications, New Delhi.
6. Cell and Molecular Biology, Gerald Karp, 4th ed John Wiley & Sons, Inc, New York 2004.
7. Text book of Principles of Molecular Biology- Cram, 2015

Reference books

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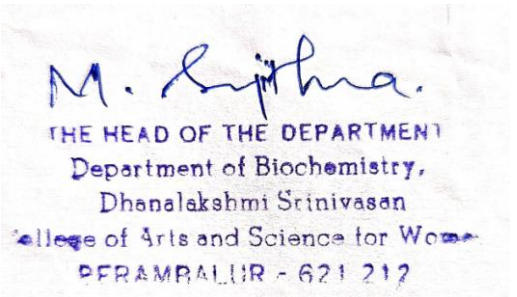

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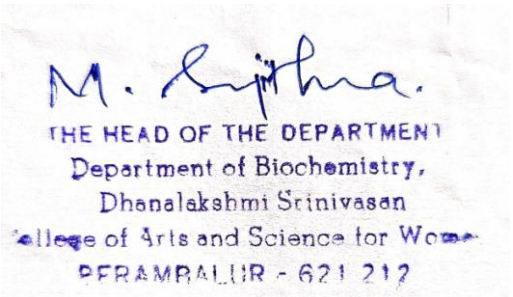

3. Cell and Molecular Biology De Robertis and De Robertis.. 8th ed Wolters Kluwer India Pvt Ltd 2001.
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6. Cell and Molecular Biology, Gerald Karp, 4th ed John Wiley & Sons, Inc, New York 2004.

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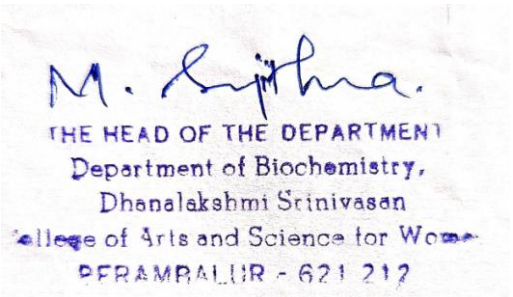

CORE PRACTICAL- VIII

LAB IN ENZYMOLOGY, METABOLISM & REGULATION, CELL & MOLECULAR BIOLOGY

Semester : II
Course Code : 20PBC2C8P
Total Periods: 90

Max Marks: 60
Credit: 6
Exam Hours: 6

Objectives:

To introduce students to various practical aspects of molecular techniques and Enzymology

Techniques and Enzyme analysis **(90** Periods**)**

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. Effect of pH, temperature and substrate concentration for amylase and urease and determination of Vmax& Km
8. Effect of inhibitor on activity of any one enzyme
9. Effect of activator on activity of any one enzyme
10. Electrophoretic separation of isoenzyme
11. Assay of AST or ALP from animal tissue and calculation of specific activity

REFERENCES

Text books:

1. Laboratory manual for Analytical Biochemistry & separation Techniques, P.Palanivelu, MKU University, Madurai.2001.
2. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd[ed], 2005.

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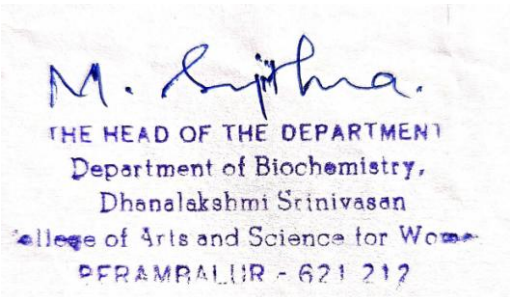

3. Biochemical methods – S.Sadasivam, New Age International Pub, 2000.
4. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications, Meerut, 2000
5. Manuals in Biochemistry – Dr. J. Jayaraman, New Age International Pub, 2000.
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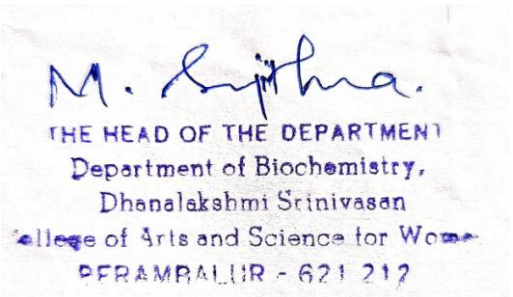

Meerut, 2000

7 Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub, 2000.

8. Laboratory manual in Biochemistry T.N.Pattabiraman. All India publishers, 1998

Reference Books:

1. Laboratory manual for Analytical Biochemistry & separation Techniques, P.Palanivelu, MKU University, Madurai.2001.

2. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd[ed], 2005.

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4. Instrumental Methods of Chemical Analysis Bk.Sharma, Goel publications, Meerut, 2000.

5. Enzyme Kinetics – A modern Approach. AG Marangani, John Wiley & Sons, 2003.

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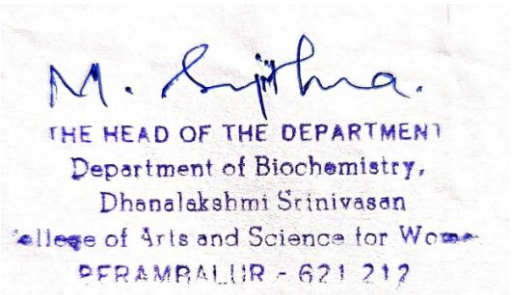

ELECTIVE II
BIOSTATISTICS & BIOINFORMATICS

Semester : II | Max Marks: 75
Course Code : 20PBC2E2A | Credit: 4
Total Periods: 60 | Exam Hours: 3

Objectives

Understand the fundamental of Bio informatics and biostatistical concepts, statistical software package, SPSS and Able to analyze data from a typical clinical research project.

Unit-I **(12** Periods**)**

Measures of central tendency; arithmetic mean, median, mode. Probability - Definition, concepts, theorems (proof of the theorems not necessary) and calculations of probability - Simple problems. Theoretical distributions - Binomial, Poisson and normal distribution - Simple problems (proof of the theorems not necessary). Sampling distribution and test of significance – Concepts of sampling, Testing of hypothesis, errors in hypothesis testing, standard error and sampling distribution, sampling of variables (large samples and small samples.).

Unit-II **(12** Periods**)**

Statistical survey – Organizing, planning and executing the survey. Source of data - Primary and secondary data, collection, observation, interview, enquiry forms, questionnaire schedule and check list. Classification and tabulation of data.Diagrammatic and graphic presentation of data. Measures of central tendency - arithmetic mean, median, mode, quartiles, deciles and percentiles. Measures of variation - range, quartile deviation, mean deviation, standard deviation, Coefficient of variation. Correlation analysis - Scatter diagram, Karl's Pearson's coefficient of correlation and Spearman's rank method. Regression analysis.

Unit- III

Sequence alignment basics, match, mismatch, similarity, scoring an alignment, gap penalty, protein vs. DNA alignments, Dot-matrix alignment, Pair wise alignment global and local alignment algorithms, Multiple sequence alignment-progressive alignment and Iterative alignment algorithms, consensus sequence, patterns and profiles, Database searching:

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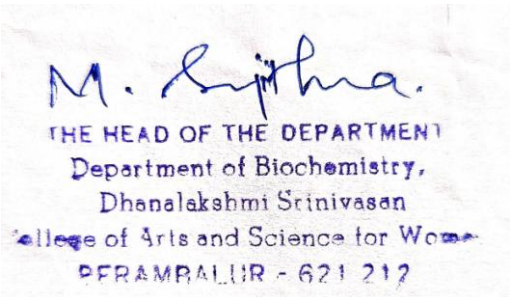

Pairwise alignment based rigorous algorithm (Smith and Waterman) and Heuristic algorithms (FASTA and Blast). Multiple sequence alignment based database searching PSI- Blast, PAM and Blosum matrices

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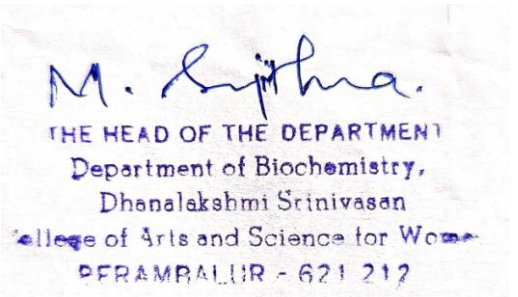

Unit-IV **(12** Periods**)**

Bioinformatics for genome sequencing, EST Clustering and analyses, Finding genes in prokaryotic and eukaryotic genomes, Regulatory sequence analysis, Bioinformatics for Genome maps and markers, Bioinformatics for understanding Genome variation, Protein structure prediction and classification, Bioinformatics in support of Proteomic research

Unit-V **(12** Periods**)**

Probability - Definition, concepts, theorems (proof of the theorems not necessary) and calculations of probability - Simple problems. Theoretical distributions - Binomial, Poisson and normal distribution - Simple problems (proof of the theorems not necessary). Sampling distribution and test of significance – Concepts of sampling, Testing of hypothesis, errors in hypothesis testing, standard error and sampling distribution, sampling of variables (large samples and small samples.).

REFERENCES

Text books:

1. Dassanayake S.Ranil, Y.I.N. Silva Gunawardene., 2011. Genomic and Proteomic Techniques, Narosa Publishing House Pvt. Ltd, New Delhi.
2. Thiagarajan B, Rajalakshmi.P.A. , 2009. Computational Biology, MJP publishers, Chennai.
3. BosuOrpita, SimminderKaurThukral., 2007. Bioinformatics Databases, Tools and Algorithms, Oxford University press, New Delhi.
4. Rastogi.S.C, Mendiratta.N, Rastogi.P., 2004. Bioinformatics methods and applications., Prentice-Hall of India private limited, New Delhi.
5. Lohar s. Prakash., 2009. Bioinformatics, MJP Publishers, Chennai. Stephen misener and Stephen A. Krawetz., 2000. Bioinformatics methods and protocols, Humana press Inc, New Jersey.

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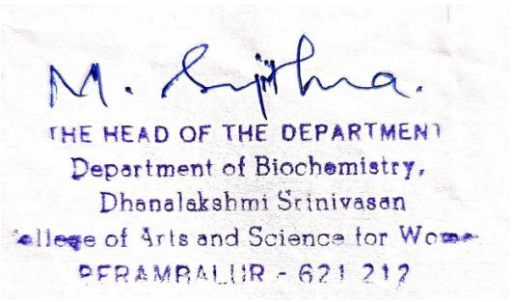

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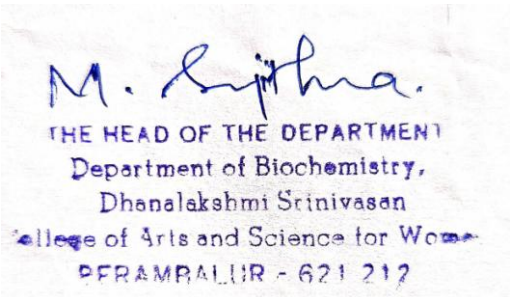

5. Lohar s. Prakash., 2009. Bioinformatics, MJP Publishers, Chennai. Stephen misener and Stephen A. Krawetz., 2000. Bioinformatics methods and protocols, Humana press Inc, New Jersey.
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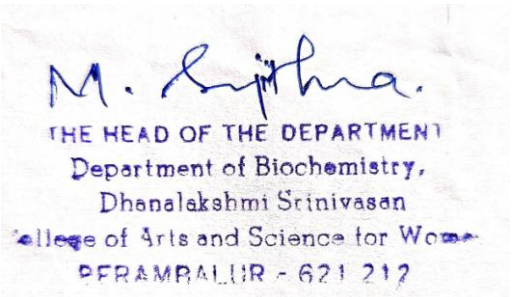

ELECTIVE II
BIOMEDICAL INSTRUMENTATION

Semester : II | Max Marks: 75
Course Code :20PBC2E2B | 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**)**

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, freeze-etch and freeze fracture methods for EM, image processing methods in microscopy phase-Contrast microscopy; fluorescence, ultraviolet microscope

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. Detection of radiation: Detection and measurement of different types of radioisotopes normally used in biology; ionization chamber, G.M. counter, proportional counter, liquid scintillation counter,

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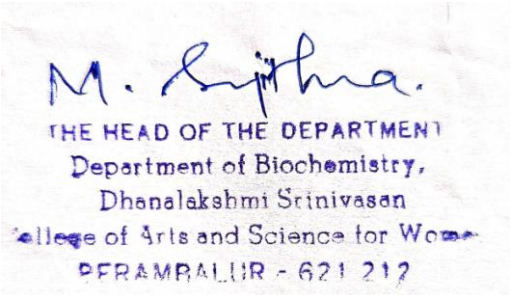

molecular imaging of radioactive material, safety guideline

Unit-IV **(12** Periods**)**

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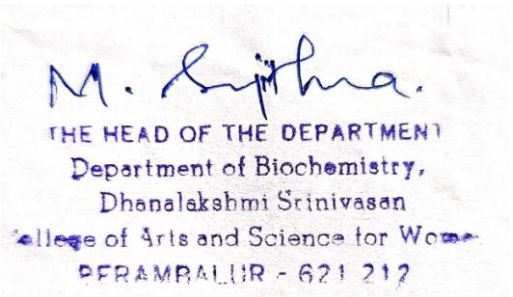

Audiometers: Basic audiometer, Speech audiometers. Haemodialysis Machine: Dialyzers, artificial kidney Physiological transducers: Body temperature, Pulse sensors, Respiration sensors.

Unit- V **(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

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THE HEAD OF THE DEPARTMENT
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APPLICATION ORIENTED COURSE –II
ADVANCED DIETETICS

Semester : II | Max Marks: 75
Course Code : 20PBC2A2 | Credit: 3
Total periods: 45 | Exam Hours: 3

Objectives

To provide students with an in depth understanding of the more complex and current nutrition and clinical issues and further develop skills in evidence based practice in preparation for dietetic practice and encountered problems and clinical conditions.

Unit- I **(9** Periods**)**

Concept of Diet therapy: growth and source of dietetics, purpose and principles of therapeutic Diets, modification of normal diet, classification of therapeutic diets. Role of Dietician: definition of nutritional care, interpersonal relationship with patient, planning and implementer dietary care, Team approach to nutritional care.

Unit -II **(9** Periods**)**

Routine hospital diets: Preoperative and postoperative diets, study and review of hospital diet. Basic concepts and methods of - (a) Oral feeding (b) Tube feeding (c) Parental nutrition (d) Intravenous feeding. Diet in surgical conditions, burns and cancer. Obesity and leanness-causes, complication and health effects, dietary treatment and other recommendation.

Unit -III **(9** Periods**)**

Diet in fever and infections- Types- metabolism in fever, general dietary consideration diet in influenza, typhoid fever, recurrent malaria and Tuberculosis .Diet in gastritits, peptic ulcer-symptoms, clinical findings, treatment, dietary modification, adequate nutrition, amount of food, and intervals of feeding, Chemically and mechanically irrigating foods, four stage diet (Liquid, soft, convalescent, liberalized diet).

Unit -IV **(9** Periods**)**

Diet in disturbances of small intestine and colon. Diarrhoea- (child and adult)- classification, Modification of diet, fibre, residue. Fluids& nutritional adequacy, Constipation- flatulence -

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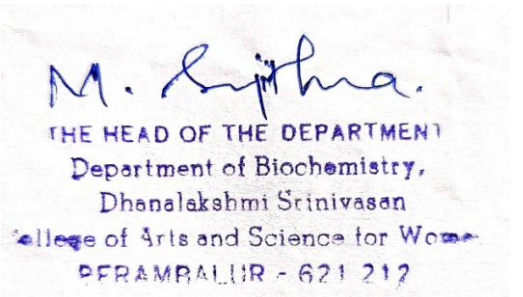

dietary considerations, Ulcerative colitis (adults)- symptoms, dietary treatment. Spruce, coeliacdisease- disaccharide intolerance, dietary treatment. Diet in diseases of the liver, gall bladder and pancreas. Etiology, symptoms and dietary treatment in - Jaundice, hepatitis, cirrhosis and hepatic coma. b) Role of alcohol in liver diseases. c) Dietary treatment in

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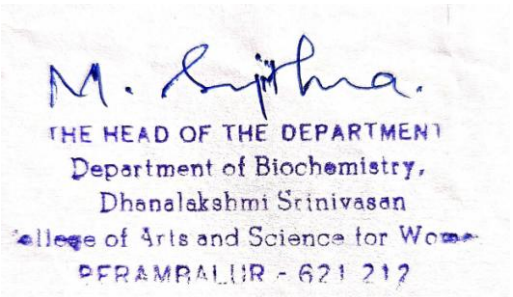

cholecystitis, cholelithiasis and pancreatitis. Gout- Nature and occurrence of uric acid, causes, symptoms and diet. Diet in allergy and skin disturbances: Definition, classification, manifestations, common food allergies and test and dieteric treatment.

Unit -V **(9** Periods**)**

Diet in Diabetes mellitus: a) Incidence and predisposing factors. b) Symptoms-types and tests for detection. c) Metabolism in diabetes d) Dietary treatment & meal management Hypo glycemicagent, insulin and its types. Diet in Renal diseases: Basic renal function, symptoms and dietary treatment in acute and chronic glomerulonephritis, Nephrosis, renal failure, dialysis. Urinary calculi-causes & treatment, acid and alkali producing and neutral foods and dietary treatment. Diet in Cardiovascular diseases: Role of nutrition in cardiac efficiency, incidence of Atherosclerosis, Hypertension- causes and dietary treatment, Sodium restricted diet, level of sodium restriction, sources of sodium, danger of severe sodium restrictionents to various practical aspects of Molecular biology.

REFERENCES

Text books:

1. "Dietetics" by Srilakshmiedn 2014
2. "Nutrition and Dietetics" by Shubhangini A Joshi. Jul 2017
3. "Clinical Dietetics and Nutrition" by Antia F Pul 2002
4. "Principles of Therapeutic Nutrition And Dietetics" by Sharma A2005
5. "Dietetics in Practice: A Handbook" by MalhotraS2012

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1. Dietetics" by Srilakshmiedn 2014
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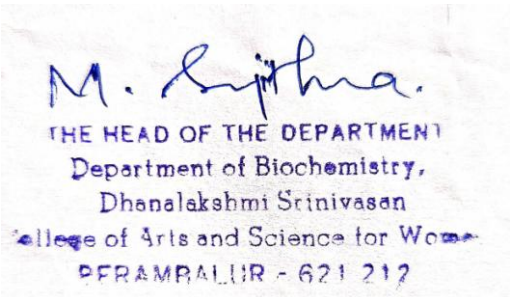

CORE COURSE-IX
ADVANCED IMMUNOLOGY

Semester : III | Max Marks: 75
Course Code : 20PBC3C9 | Credit: 6
Total Perids : 90 | Exam Hours: 3

Objectives:

To understand about immune response and immunological techniques

Unit- I **(18 Periods)**

History of Immunology .Elements of Immunology. Types of immunity- innate and acquired. Humoral and cell mediated immunity. Central and peripheral lymphoid organs- Thymus, bone marrow, spleen, lymph nodes and other peripheral lymphoid tissues- GALT. Cells of the immune system- lymphocytes, mononuclear phagocytes- dendritic cells, granulocytes, NK cells and mast cells, cytokines.

Antigens vs immunogens – types – determinants – Haptens – Factors influencing immunogenicity. Immunoglobulins structure, classification and functions. Isotypes, allotypes and idiotypes.

Unit - II **(18 Periods)**

Complement activation and its biological consequences. Complement fixation test and assessment of immune complexes in tissues. Immune suppression and immune tolerance. Theories of Antibody formation. - Factors influencing antibody production – Genetic basis of antibody diversity. T-cell, B-cell receptors, Antigen recognition- processing and presentation to T-cells. Interaction of T and B cells. Immunological memory. Effector mechanisms-macrophage activation. Cell mediated cytotoxicity, immunotolerance, immunosuppression.

Unit -III **(18 Periods)**

MHC genes and products. Polymorphism of MHC genes, role of MHC antigens in immune response, MHC antigens in transplantation. Transplantation types. Immune responses to infectious diseases- Viral, bacterial and protozoal. Tumor antigens-immune response to tumor antigens-immunotherapy. AIDS and other immunodeficiency disorders. Autoimmunity - Autoimmune diseases – pathogenesis - treatment. Hypersensitivity - types & Mechanism.

Unit- IV **(18 Periods)**

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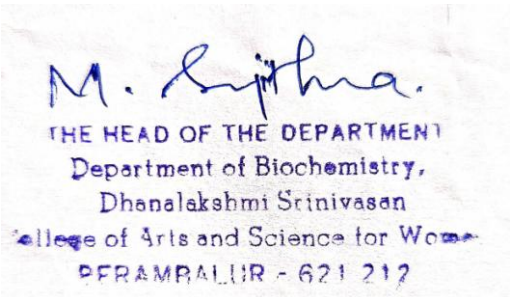

Immunization practices- active and passive immunization. Vaccines- killed, attenuated-toxoids. Recombinant vector vaccines- DNA vaccines, synthetic peptide vaccines- anti idiotype vaccines. Hybridomas - production of polyclonal and monoclonal antibodies. Principles, techniques and application. Genetically engineered antibodies.

Fractionation of leucocytes by density gradient centrifugation. Identification of lymphocytes and their subsets in blood. Leukocyte migration inhibition technique. Delayed type hypersensitivity technique.

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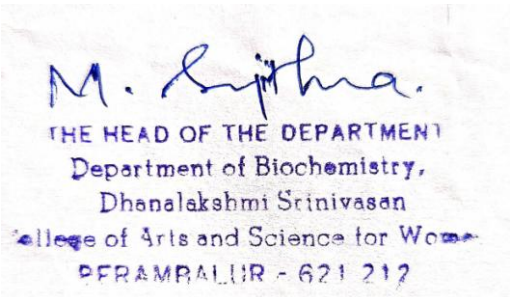

Unit- V **(18 Periods)**

Agglutination and precipitation: Techniques - Immuno-electrophoresis, RIA, immunoblotting assay, Avidin- biotin mediated immuno assay. Immunohistochemistry- immunofluorescence, immunoferritin technique.

Cytokines assay: ELISA and ELISPOT, Abzymes. Experimental animal models: inbred strains, SCID mice, nude mice, knockout mice cell culture system: Primary lymphoid culture cloned lymphoid cell lines.

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1. Essential Immunology, 10th ed - Roitt's, Blackwell Sci, 2001.
2. Immunology, 4th ed- Kuby, Richard A, Goldsby et al. WH Freeman & Co. 2003.
3. Cellular and Molecular Immunology- Abbas, W.B. Saunders Company, 2000.
4. Immunobiology- 5th ed Janeway, C. (Ed), Paul Travers. Garland Publ. 2001.
5. Immunology- Eli Benjamini AU, A short course. 4th ed. Wiley-Liss, 2000.
6. NMS Series in Immunology- 3rd ed, Lippincott Williams & Wilkins.
7. Fundamentals of immunology- Bier, Springer Verlag, 1986.
8. Cellular and Molecular Immunology: 7th Edition, Abul K, 2011.

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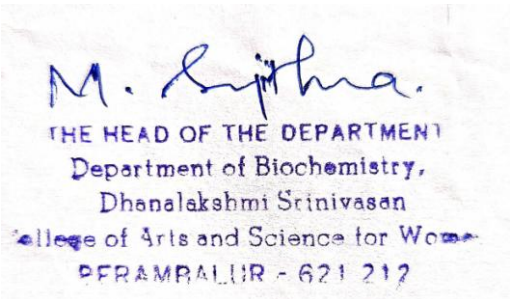

CORE COURSE-X
CLINICAL BIOCHEMISTRY

Semester : I | Max Marks: 75
Course Code : 20PBC3C10 | Credit: 5
Total Perids: 90 | Exam Hours: 3

Objectives

1) To impart through knowledge about the biochemical basis of various diseases and disorder
2) Generally concerned with analysis of bodily fluids for diagnostic and therapeutic purposes.

Unit- I **(18 Periods)**

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).

Disorder of carbohydrate and lipid metabolism Disorders of carbohydrate metabolism– glycogen storage diseases, galactosemia, fructose intolerance and fructosuria. Blood sugar homeostasis: Role of tissues and hormones in the maintenance of blood sugar. Hypoglycemia, hyperglycemia, glycosuria. Diabetes mellitus – classification, metabolic abnormalities, diagnosis and management. Disorders of lipid metabolism– lipoproteinaemias. Lipid storage diseases – Gaucher's, Tay Sach's Niemann Pick disease. Fatty liver. Atherosclerosis.

Unit -II **(18 Periods)**

Disorders of amino acid and nucleic acid metabolism Disorders of amino acid metabolism– amino aciduria, Phenylketonuria, Hartnup disease, alkaptonuria, albinism, cystinuria, cystinosis, homocystinuria and maple syrup urine disease. Disorders of purine, pyrimidine metabolism: Hyperuricemia and gout. Hypouricemia. Orotic aciduria. Serology: C reactive protein test, Rheumatoid arthritis (RA) test.

Unit- III **(18 Periods)**

Liver function test and gastric function test Jaundice- Causes, consequences, biochemical findings, treatment in jaundice, hepatitis and cirrhosis. Liver function test. Tests related to excretory (bile pigments) synthetic (plasma proteins, prothrombin time) detoxifying (hippuric acid, NH3, aminopyrine) and metabolic (galactose) functions. Gall stones. Gastric function

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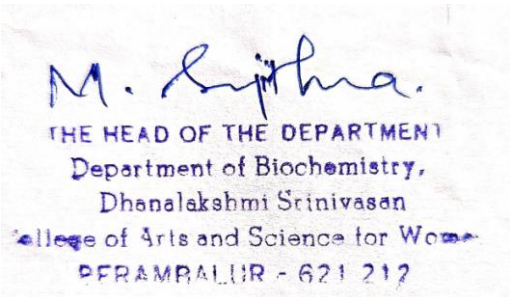

tests- Stimulation tests – insulin and pentagastrin. Peptic ulcer, gastritis and Zollinger Ellison syndrome**.**

Unit- IV **(20 Periods)**

Renal function test and metabolic disorders: Kidney function- Biochemical findings in glomerulonephritis, renal failure and nephritic syndrome. Nephrolithiasis. Kidney function

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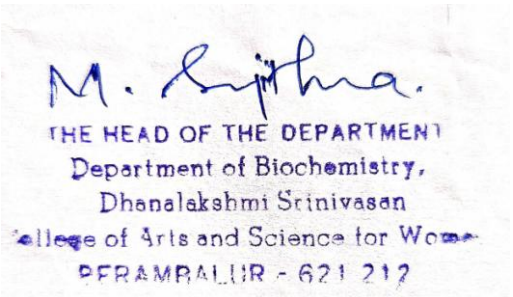

tests - Glomerular function tests – inulin, urea and creatinine clearance tests, renal plasma flow, plasma microglobulin. Tubular function tests – water load, concentration and acid excretion tests. Abnormal constituents of urine. Clinical enzymology - Serum enzymes and isoenzymes in health and disease – Transaminases (AST, ALT) acid. Alkaline phosphatases, amylase, LDH and CK.

Unit- V **(16 Periods)**

Oncology: Cancer cell – morphology and growth characteristics. Biochemical changes in tumor cells. Differences between benign and malignant tumors. Tumor markers – AFP, CEA and HcG Agents causing cancer – radiation, viruses, chemicals. Multistep carcinogenesis – initiation, promotion, progression. oncogenes and proto- oncogenes – mechanisms of protooncogene activation. Tumor suppressor genes – p53.

REFERENCES

Text Books

1. Clinical Chemistry in diagnosis and treatment, Philip. D. Mayne & Edward Arnold, 6th ed ELBS.1994.
2. Textbook of Clinical Chemistry, 3rd ed- Tietz, WB Saunders, Burtis & Ashwood, 1999.
3. Principles of Internal Medicine. Harrison's Vol 1 & 2, 16th edition Mc Graw Hill.2005.
4. Biochemistry and disease.Cohn and Roth, Williams and Wilkins, 1996.
5. The Metabolic & Molecular Basis of inherited Diseases, Vol 1 - 4 8th ed Serives, Vallersty, Tata McGraw Hill Companies, 2001.
6. Clinical Biochemistry – Metabolic & Clinical Aspects, William J.Marshall, Stephen K.Bansert, Churchill Livingstone, 1995.
7. Clinical Chemistry – Principles, procedures, correlations – Bishop, Lippincott.2000.
8. Textbook of Biochemistry with Clinical Correlation Thomas M Devlin 2nd ed Wiley & Sons. 2006

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1. Clinical Chemistry in diagnosis and treatment, Philip. D. Mayne & Edward Arnold, 6th ed ELBS.1994.
2. Textbook of Clinical Chemistry, 3rd ed- Tietz, WB Saunders, Burtis & Ashwood, 1999.
3. Principles of Internal Medicine. Harrison's Vol 1 & 2, 16th edition Mc Graw Hill.2005.
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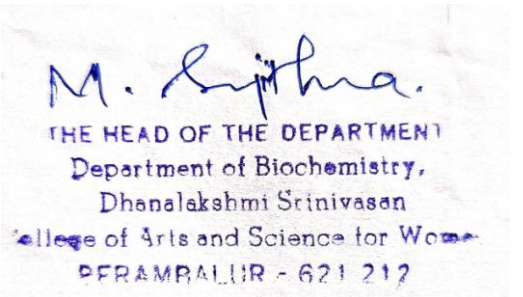

6. Clinical Biochemistry – Metabolic & Clinical Aspects, William J.Marshall, Stephen K.Bansert, Churchill Livingstone, 1995.
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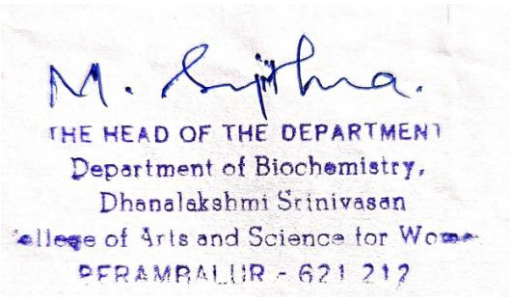

CORE COURSE-XI
PLANT AND ANIMAL BIOTECHNOLOGY

Semester : III | Max Marks: 75
Course Code : 20PBC3C11 | Credit: 5
Total Perids: 90 | Exam Hours: 3

OBJECTIVES

The **aims** of **plant** cell and tissue culture in agricultural and food applications are improvement of crops and increased food production.

Unit-I **(18 Periods)**

Introduction of plant tissue culture, composition of media, Micropropagation, organogenesis, somatic embryogenesis, haploid and triploid production, protoplast isolation and fusion, hybirid and cybrid, synthetic seed production, secondary metabolic production.

Unit-II **(18 Periods)**

Plant Transformation Direct transformation by electro oration and particle gun bombardment. -Agrobacterium, Ti plasmid vector. Theory and techniques for the development of new genetic traits, conferring resistance to biotic and abiotic. Plant engineering towards development of enriched food products, plant growth regulators.

Unit-III **(18 Periods)**

Animal health disease diagnosis, hybridoma technique, monoclonal antibodies, application of probes for disease diagnosis of existing and emerging animal diseases. Prophylaxis - Vaccines, Oral vaccines DNA Vaccines in animal disease. Cell culture: primary and established culture; organ culture; tissue culture

Unit-IV **(18 Periods)**

Disaggregation of tissue and primary culture; cell separation, Slide and coverslip cultures, flask culture, test tube culture techniques, cell synchronization, cryo preservation. Scaling up of animal cell culture, cell line and cloning micromanipulation and cloning, somatic cell cloning. Karyotyping; measuring parameters for growth, measurement of cell death, apoptosis and its determination, cytotoxicity assays.

Unit –V **(18 Periods)**

Nuclear magnetic resonance methods of monitoring cell metabolismculturing animal cells in

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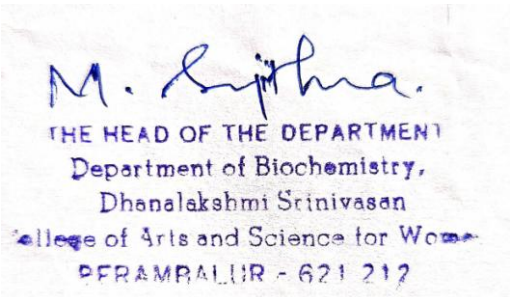

fluidised bed reactors- GPI- Anchored fusion proteins- harvesting GPI- anchored proteins from CHO cells- Hematopoietic cells for cellular and gene therapy. Transgenic animals: Production and application; transgenic animals in livestock improvement, transgenic animals as model for human diseases.

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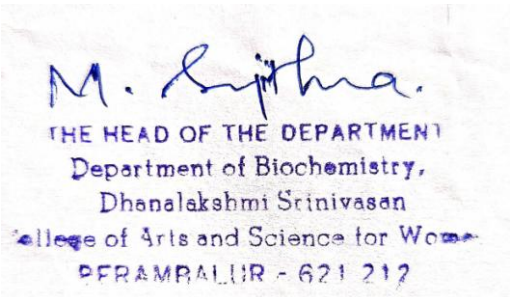

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1. Razdan.M.K., 2011. Plant tissue culture. Oxford and IBH publishing Company Pvt. Ltd, New delhi.
2. Chawla.H.S., 2010. Introduction to plant biotechnology. Oxford and IBH publishing company pvt. Ltd, New delhi.
3. Ian Freshney, 2010. Culture of animal cells. 6th edition. Wiley-Blackwell publishers. Slater, 2008. Plant Biotechnology
4. J.D.Watson, M.Gillman, J.Witknowski and M.Zoller, 2006. Recombinant DNA. 3rd edition., W.H.Freeman.
5. K. Dass. 2005, Text book of Biotechnology, Second Edition, Wiley Dreamtech, India (P) Ltd.
6. H.Kreuzer & A.Massey. 2001. Recombinant DNA and Biotechnology: A guide for teachers Second Edition. ASM press, Washington. · M.Sudhir. 2000. Applied

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1. Razdan.M.K., 2011. Plant tissue culture. Oxford and IBH publishing Company Pvt. Ltd, New delhi.
2. Chawla.H.S., 2010. Introduction to plant biotechnology. Oxford and IBH publishing company pvt. Ltd, New delhi.
3. Ian Freshney, 2010. Culture of animal cells. 6th edition. Wiley-Blackwell publishers. Slater, 2008. Plant Biotechnology
4. J.D.Watson, M.Gillman, J.Witknowski and M.Zoller, 2006. Recombinant DNA. 3rd edition., W.H.Freeman.
5. K. Dass. 2005, Text book of Biotechnology, Second Edition, Wiley Dreamtech, India (P) Ltd.
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www.animalbiotechnology.org/default.asp?news_id=1266...

www.biotechnology4u.com/

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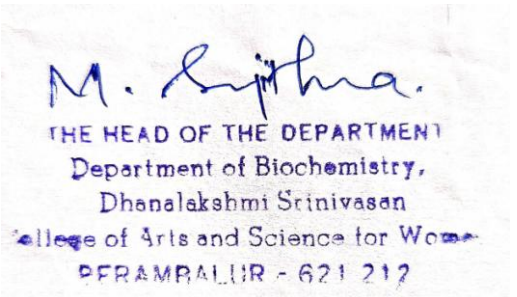

CORE PRACTICAL -XII

LAB IN IMMUNOLOGY, CLINICAL BIOCHEMISTRY & PLANT AND ANIMAL BIOTECHNOLOGY

Semester : III | Max Marks: 75
Course Code : 20PBC3C12P | Credit: 4
Total Perids: 90 | Exam Hours: 3

OBJECTIVES

To Study the various diagnostic and therapeutic methodologies available for diseases and disorder

CLINICAL BIOCHEMISTRY & IMMUNOLOGY

I. HAEMATOLOGICAL STUDIES **(35 Periods)**

1. Blood Grouping and Rh typing.
2. Estimation of haemoglobin content.
3. Total RBC count.
4. Total WBC count.
5. Determination of clotting time
6. Total platelet count.
7. Determination of Prothrombin time
8. Determination of ESR.

II. BIOCHEMICAL ANALYSIS OF URINE & BLOOD COLLECTION, PRESERVATION (BLOOD AND URINE) **(35 Periods)**

1. Estimation of blood glucose
2. Estimation of serum total proteins and A: G ratio
3. Estimation of serum cholesterol
4. Estimation of blood and urine urea
5. Estimation of serum and urine calcium
6. Estimation of serum and urine uric acid
7. Estimation of serum bilirubin.
8. Estimation of serum creatinine
9. Estimation of serum AST / ALT

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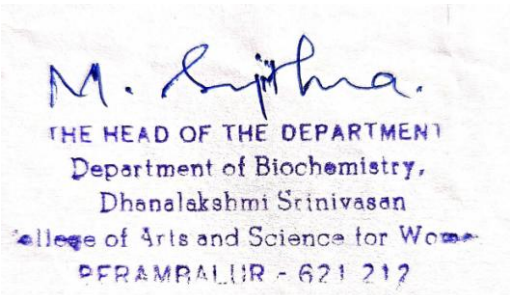

10. Estimation of serum acid phosphatase / alkaline phosphatise
11. Widal test – rapid slide test for typhoid
12. Immunoelectrophoresis

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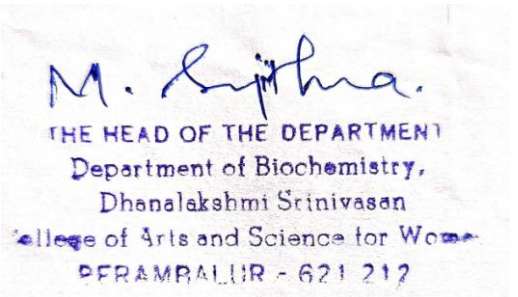

III. UROLOGY **(10 Periods)**

Urine - Qualitative tests of urine. Abnormal constituents - Reducing sugar-Benedict test, protein: -Heat and acetic acid test, and sulfosalicylic acid method, Ketone bodies-Rothera's test, Bile pigment (Fouchet method), bile salt (Hay's test), Urobilinogen-Ehrlich aldehyde test and Bence Jones protein test.

PLANT AND ANIMAL BIOTECHNOLOGY **(10 Periods)**

1) Isolation of plasmid & Genomic DNA
2) Separation of DNA Agarose gel Electrophoresis.

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1. Practical Clinical Biochemistry- Varley's by Alan H Gowenlock, published by CBS Publishers and distributors, India Sixth Edition ,1988.
2. Laboratory manual in Biochemistry, T.N.Pattabiraman. All India publishers, 1998.
3. Practical Biochemistry for Students, Varunkumar Malhotra, Jaypee Bros, 1986.
4. Laboratory Manual in Bio Chemistry, Jayaraman, New Age International Pub, 2000.
5. Medical Lab Technology Vol I& II, Kanai L Mukerjee New Delhi: Tata Mcgraw Hill Publishing Company, 1996.
6. Practical Biochemistry – Plummer, New Delhi: Tata Mcgraw Hill Publishing Company, 2000.
7. Introductory practical Biochemistry – S.K. Sawhney, Randhir Singh, 2nd ed, 2005.

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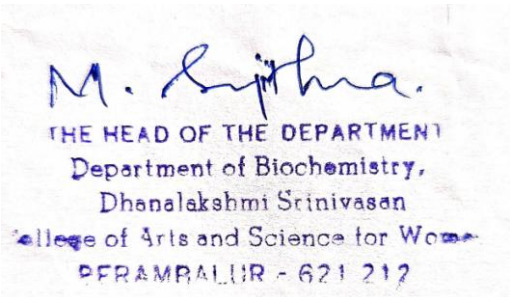

Elective-III

ENDOCRINOLOGY

Semester : III | Max Marks: 75
Course Code : 20PBC3E3A | Credit: 4
Total Periods: 90 | Exam Hours: 3

OBJECTIVES

To explain the roles of the **endocrine** system in maintaining homeostasis, integrating growth and development,

Unit -I **(18 Periods)**

Hypothalamic and pituitary hormones: Hormones – classification, biosynthesis, circulation in blood, modification and degradation. Hormone receptors-structure and regulation. Mechanism of hormone action. Hypothalamic and pituitary hormones. Hypothalamic releasing factors.Anterior pituitary hormones: biological actions, regulation and disorders of Growth hormones, ACTH, gonadotrophins and prolactin. Leptin. Posterior pituitary hormones – biological actions and regulation of vasopressin. Diabetes insipidus and SIADH secretion. Oxytocin. Hypopituitarism.

Unit -II **(18 Periods)**

Thyroid and parathyroid hormones: Thyroid hormones – synthesis,secretion, regulation, transport, metabolic fate and biological actions.Antithyroid agents. Thyroid functions tests. Hyper and hypothyroidism. Hormonal regulation of calcium and phosphate metabolism. Secretion and biological actions of PTH, calcitonin and calcitriol. Hypercalcemia and hypocalcemia Rickets and osteomalacia.

Unit- III **(18 Periods)**

Adrenal hormones: Adrenal cortical hormones.Synthesis, regulation,transport, metabolism and biological effects. Adrenal function tests. Cushing's syndrome, aldosteronism, congenial adrenal hyperplasia, adrenal cortical insufficiency. Adrenal medullary hormones – synthesis, secretion, metabolism, regulation and biological effects of catecholamines.Phaeochromocytoma.

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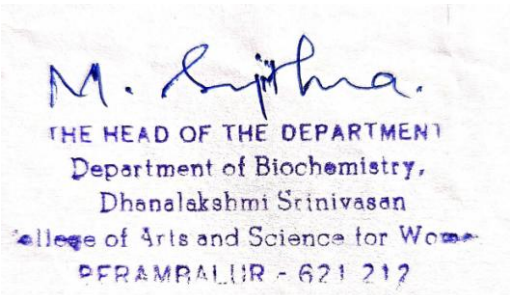

Unit-IV **(20 Periods)**

Gonadal, G.I. and pancreatic hormones: Gonadal hormones: Biosynthesis, regulation, transport, metabolism and biological actions of androgens. Hypogonadism and gynecomastia.

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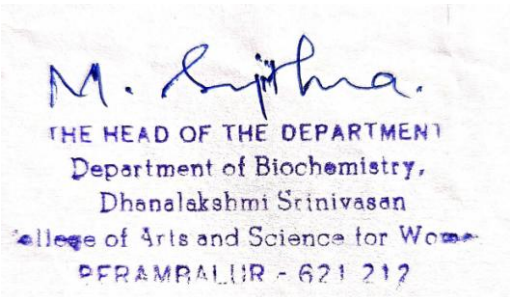

Biosynthesis, regulation, transport, metabolism and biological effects of oestrogen and progesterone. The menstrual cycle. Pregnancy – diagnostic tests and biochemical changes. Foetal monitoring. Amenorrhea. Pancreatic hormones – synthesis, regulation, biological effects and mechanism of action of glucagons, somatostatin and insulin. Insulin receptor. Brief account of gastrointestinal hormones.

Unit -V **(16 Periods)**

Signal transduction: Fundamental concepts and definitions of signals, ligands and receptors, endocrine, paracrine and autocrine signaling. Receptors and signaling pathways – cell surface receptors, ion channels, G protein coupled receptors, receptor kinases (tyr, ser/thr).Signal transduction through cytoplasmic and nuclear receptors. The Ras-raf MAP kinase cascade, second messengers – cyclic nucleotides, lipids and calcium ions. Crosstalk in signaling pathways.

REFERENCES

Text Books

1. Williams Textbook of Endocrinology – Wilson and Foster 13th ed. 2015.
2. Mechanisms of hormone action – Autind and Short, 1980.
3. Harper's Biochemistry – Murray et al. 26th ed. McGraw Hill, 2003.
4. Principles of Biochemistry – Mammalian Biochemistry, Smith et al. McGraw Hill, 1983.
5. Williams et al, Textbook of Endocrinology, 2015.

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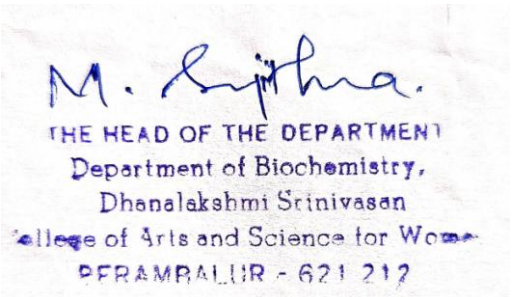

Elective-III

MICROBIAL AND INDUSTRIAL BIOTECHNOLOGY

Semester : III | Max Marks: 75

Course Code : 20PBC3E3B | Credit: 4

Total Periods: 90 | Exam Hours: 3

Objectives

To equip the students to apply knowledge of molecular mechanisms of cellular processes in living systems including microbes, plants, and higher order organisms to applied aspects

Unit - I

Microscopy: Simple, Light, Dark, Phase Contrast, Fluorescence, SEM and TEM. Sterilization and disinfection, Bacterial Growth curve, Continous growth, Diauxic growth. Staining principles and techniques:- Gram +ve and Gram –ve staning. Structure and biosynthesis of cell wall components, Phosphotransferases, Porins and Iron uptake.

Unit-II

Microbial metabolism: Entner Doudoroff pathway, Bacterial photosynthesis, pectin and aldo hexuronate pathway, cellulose degradation, fermentative diversity- clostridium and propionic acid fermentationstickland reaction and bioenergitics of methanotrophy, methanogenesis, Biochemistry of sulphur reaction**.**

Unit- III

Introduction to fermentation technology: Isolation and screening of industrially important microbes, Inoculum preparation, strain improvement for better yield. Fermentation-Submerged and solid state fermentation, Fermentor design, Downstream processing.

Unit- IV

Industrial applications of microbes: Industrial production of alcohol, alcoholic beverages – Wine and Beer. Microbes in mineral recovery - Bioleaching and Biosorption, Production of Biomass, Production of Single cell protein and Mushrooms.

Unit -V

Microbial production of bioactive compounds: Production of bacterial and fungal polysaccharide, Industrial Production of Penicillin and streptomycin. Vitamins - B12 **and** riboflavin.

REFERENCES

Text Books

1. Microbiology, Pelczar. Jr.M.J.Chan, McGraw- Hill Inc. NY.
2. Fundamental Principles of bacteriology, Salle.A.J 7 th edition, 1992. Mc.Graw.
3. Textbook of Microbiology, Ananthanarayanan.R. and Jayaram Panicker.C.K.Orient Longaman, 1994.
4. Textbook of medival parasitology, Parija.S.c, Orient Longmans, 1996

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5. Medical Parasitology, Chatterjeee, TATA McGraw Hill, 1986.

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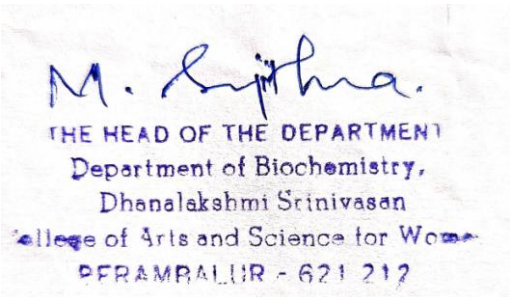

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5. Medical Parasitology, Chatterjeee, TATA McGraw Hill, 1986.
6. Mehrotra RS & KR Aneja (2006), An Introduction to Mycology. Reprinted and Published by New Age International (P) Limited, Publishers, New Delhi.
7. Jagadish Chander(1996). A Text book of Medical Mycology, Interprint, NewDelhi.
8. Brock Biology of Microorganisms 12thEdition - Michael T.Madigan, John M.Martinko, Paul V. Dunlap, David P.Clark.

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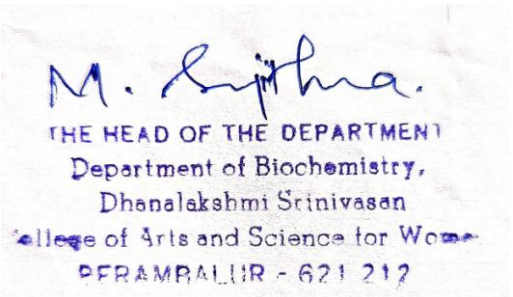

CORE COURSE-XIII

GENETIC ENGINEERING

Semester : IV | Max Marks: 75
Course Code : 20PBC4C13 | Credit: 5
Total Perids: 90 | Exam Hours: 3

OBJECTIVES

Aims and Objectives ... originating from animals or humans with those produced by genetic engineering

Unit -I **(16 periods)**

Gene cloning Genetic engineering tools Nucleic acid manipulating enzymes. Promoters, Selectable markers and reporters used in rDNA technology. Restriction digestion, Ligation, Transformation, Selection of Recombinants. Construction of gene libraries.

Unit -II **(18 Periods)**

E.Coli vectors - pBR322 and its derivatives; Cloning vectors for gramnegative bacteria - ColE1, p15A, R1, IncPa, pSC101; Lambda bacteriophage vectors, filamentous phages, Cosmids, Phasmids, Phagemids. Cloning in gram-positive bacteria (Bacillus subtilis).

Unit -III **(18 Periods)**

Cloning in yeast Saccharomyces cerevisae Life cycle and types of vectors; Eukaryotic vectors SV40 (molecular genetics and expression); Specialized cloning vector for cDNA; Synthesis of specific RNA in vitro; Vectors for cloning promoters and terminators; vectors with adjustable copy number**.**

Unit- IV **(18 Periods)**

Nucleic acid hybridization techniques; Molecular probes (Types of probes and its construction); probe labeling Nick translation, End labeling and Random primer labeling. Polymerase chain reaction and its variants; DNA fingerprinting; DNA sequencing first generation sequencing methods (Maxam and Gilbert sequencing, Sanger's Dideoxy sequencing, Pyrosequencing, PCR based sequencing and hybridization sequencing).Second generation sequencing methods.

Unit -V **(18 Periods)**

Site directed mutagenesis; DNA microarray; chromosome walking and jumping.Molecular techniques in prenatal diagnosis gene therapy, Pharmaceutical products (Vaccine, Humulin, etc), Crop improvement pesticide resistance, herbicide resistance, transgenic animals and GM

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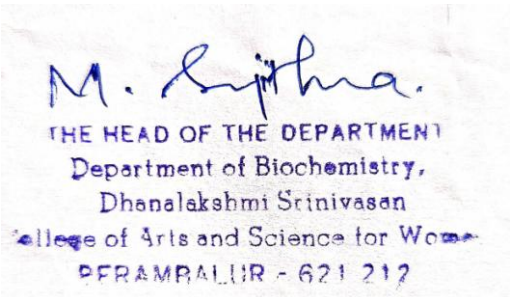

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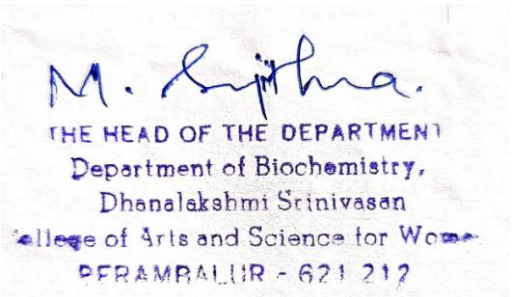

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2. Sandy B.Primrose and Richard Twyman, 2006. Principles of Gene Manipulation and genomics, 7th edition, Wiley-Blackwell.
3. Lewin, 2009. Genes X, 10th edition, Jones & Barlett Publishers 4. Raymond Rodriguez and David T.Denhart 2003.Vectors A survey of molecular cloning vectors and their uses
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