SRI KALISWARI COLLEGE, SIVAKASI

(An Autonomous Institution Affiliated to Madurai Kamaraj University, Madurai and Re- accredited with 'A' Grade (CGPA 3.30) by NAAC)

Programme Scheme, Scheme of Examinations and Syllabi

(with effect from June 2015)

Department of Biotechnology

(UG, PG and M.Phil Programmes)

Programme Outcome (PO) for Postgraduate Programmes

Knowledge

PO 1: Acquisition of advanced knowledge for higher studies and research.

PO 2: Synthesis of knowledge and critical thinking

Skills

PO 1: Life Skills and Skills for contribution to nation building.

PO 2: Acquisition of specialized skills for entrepreneurship/employability.

Attitude

PO 1: Acquisition of professional ethics and human values.

PO 2: National Integration and Social Commitment to Society.

.

Programme Specific Outcome (PSO) for Postgraduate Programmes

Knowledge: Core course of biotechnology like Biochemistry, Molecular biology, rDNA technology helps to improve the basic knowledge.

Skill Development: Project and practical training in various fields of biotechnology.

Higher level ability: Technical skills like SDS PAGE, PCR, Cloning, Transformation, Micro propagation develop higher level ability .

Progression to higher studies: In-depth knowledge on Animal biotechnology, Molecular biology, Biochemistry, rDNA technology, Microbial biotechnology equips the students to go for higher studies.

Entrepreneurship and Employment: Ability to design experiment during research project, Opportunities in learning bee keeping, Mushroom cultivation helps in becoming entrepreneur

SRI KALISWARI COLLEGE (AUTONOMOUS) -SIVAKASI.
DEPARTMENT OF BIOTECHNOLOGY
Choice Based Credit System-Curriculum Pattern
PG Programme- M.Sc., Biotechnology-2015 - 2017

Course code	Course Name	Hours	Credits
Semester I			
15PBT C11	**Core I:** Biochemistry	6	5
15PBT C12	**Core II:** Cell & Molecular Biology	6	5
15PBT C13	**Core III:** Microbial Genetics	6	5
15PBT C1P	**Core IV:** Lab in Biochemistry	6	4
	Subject Elective Course-I:		
15PBT O11	1.Bioinformatics	6	4
15PBT O12	2.Biophyscics and structural biology		
	Total	**30**	**23**
Semester II			
15PBT C21	**Core V:** Microbiology	6	5
15PBT C22	**Core VI:** Bioprocess Technology	6	5
15PBT C23	**Core VII:** Recombinant DNA technology	6	5
15PBT C2P	**Core VIII:** Lab in Microbial Genetics	6	4
15PBT C2Q	**Core IX :** Lab in Recombinant DNA Technology	6	4
	Total	**30**	**23**

Semester III			
15PBT C31	**Core X:** Animal Biotechnology	6	5
15PBT C32	**Core XI:** Immunology & Immunotechnology	6	5
15PBT C3P	**Core XII:** Lab in Immunology and Animal Tissue Culture	6	4
	Subject Elective Course-II :		
15PBT O31	1**.** Enzymes &Enzyme Technology.	6	4
15PBT O32	2. Molecular oncology		
	Non Major elective Course-I :		
15PBT N31	1.Concepts in Biotechnology	6	4
15PBT N32	2.Cancer Biology		
	Total	**30**	**22**
Semester IV			
15PBT C41	**Core XIII:** Plant Biotechnology	6	5
15PBT C4P	**Core XIV:** Lab in Plant Tissue Culture.	6	4
15PBT J41	**Core XV:** Project	12	9
	Subject Elective Course-III :		
15PBT O41	**1.** Genomics &Proteomics.	6	4
15PBT O42	2. Environmental Biotechnology.		
	Total	**30**	**22**

Semester	I	II	III	IV	TOTAL
Credits	23	23	22	22	90

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
Choice Based Credit System
PG Programme-M.Sc., Biotechnology-2015-2017
I Semester

CORE- I: BIOCHEMISTRY-15PBTC11 **Duration: 75 Hours**
Credits : 5

Objectives:

- To develop a sufficient background for those students who wish to study more advanced biochemistry.
- To motivate the students familiar with basic biochemistry techniques
- To improve the ability of thinking in biochemistry fields.

Course Outcome:

- Developed sufficient background for those students who wish to study more advanced biochemistry.
- Aware on thermodynamics and biological energy
- Indepth knowledge in the classification, structure, function and metabolic pathways of carbohydrate, lipids and fatty acids
- Understand the molecular structure and function of amino acids and proteins
- Analyze the structure and function of DNA and biosynthesis of nucleotides
- Basic knowledge on bioactive compounds and secondary metabolites
- Familiar with various basic biochemistry techniques
- Ability of thinking in biochemistry fields.

Unit : I (15 Hours)

Thermodynamics and its principles in biology, Dissociation and association constants, Concept of free energy and standard free energy, energy rich bonds, Biological energy tranducers, Concepts of pH, buffers and its biological importance.

Unit :II (15 Hours)

Classification, structure, functions and reactions of Carbohydrates, Metabolism of carbohydrates-Starch, Glycogen, Glycolysis, Gluconeogenesis, Glycogensis, HMP pathway TCA cycle and glyoxylate cycle. ETC and Photophosphorylation, ATP synthesis.

Unit :III (15 Hours)

Classification, structure, functions and reactions of Lipids, Biosynthesis of saturated fattyacids, Triglycerides, phospholipids and sterols,Catabolism of fattyacids: oxidation,catabolism of triglycerides and phospholipids, Structure and functions of Glycolipids and Lipoproteins.

Classification, structure, functions and reactions of nucleic acids, Biosynthesis of Purines and pyrimidines.

Unit :IV (15 Hours)

Proteins:Classification and structure of aminoacids, (Classification of Proteins based on nutritional, chemical and polarity), peptides and polypeptides, classification of Proteins based on structure and function. Metabolism of aminoacids.

Unit :V (15Hours)

Synthesis and application of Heterocyclic Compounds and secondary metabolites: Prostaglandins, Leukotrienes, Thromboxanes, Alkaloids and Flavonoids. Role of biological membranes and transport system.

Text books:

1. J.L.Jain, Sunjay Jain, Nitin Jain, Sixth edition(2007), Fundamentals of Biochemistry S.Chand and company Ltd.
2. Eric E.Conn and Paul K.Stumpf, George Breening, Roy H.Doi (2005), Outlines of Biochemistry, John Wiley &Sons.

References:

1. Lehninger.A.L, Nelson.D.L, Cox M.M, 4TH Edition (2004), Principles of Biochemistry, W.H.Freeman and company, Newyork.
2. Voet .D, Voet J.G, and Pratt C.W (1999), Fundamentals of Biochemistry John wiley and sons,Newyork.
3. R.K. Murray, D.K.Granner,P.A. Mayes & V.W.Rodwell, 25TH Edition, Harper's Biochemistry, Mc Graw Hill Publications.
4. Lubert Stryer (2007), Biochemistry Stanford university, W.H.Freeman company,New york .

   Concepts in Biochemistry by Rodney Boyer,(1999) Brooks Cole publishing company.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI.
Choice Based Credit System
PG programme – M.Sc., Biotechnology – 2015-2017
Semester-I

CORE – II: CELL AND MOLECULAR BIOLOGY - 15PBTC12 Duration: 90 Hours
Credits: 5

Objectives:

- To know the basic structure and functions of a cell and cell organells
- To understand the structure and function of DNA and RNA

Course Outcome:

- Understand the basic structure and function of cell and cell organelles in prokaryotes and eukaryotes
- Understand the history of genetic transformation principle of DNA
- Analyse the Watson and Crick helical structure of DNA and to understand the different forms of DNA, mRNA, rRNA and tRNA
- Explore the mechanisms of DNA replication, transcription and protein translation in both prokaryotes and eukaryotes
- Role of physical, chemical and biological agents that causes mutation and DNA damage
- Analyse the mechanisms of DNA repair

Unit: I (18 hours)

Prokaryotic and eukaryotic cells. Plasma membrane: Fluid mosaic model. Transport across cell membrane: passive and active transport. Nucleus: ultra structure and composition. Chromosome: types, structure, heterochromatin and euchromatin. Nucleolus: ultrastructure and functions. Cell division: mitosis and meiosis.

Unit: II (18 hours)

Ultra structure, types and special functions of Endoplasmic reticulum, Golgi complex,GERL,Mitochondria, Lysosomes and Chloroplast.

Unit: III (18 hours)

DNA - Watson and Crick model of double helix, different structural forms of DNA – A, B & Z forms, Experimental evidence that DNA as genetic material: Griffith, Hershy-Chase & Meselson & Stahl and Avery experiments. DNA replication: types, enzymology and mechanism of semi-conservative mode of replication. RNA: structure of rRNA, tRNA, and mRNA.

Unit: IV (18 hours)

Transcription of prokaryotic and eukaryotic genes, post transcriptional modifications of mRNA. Splicing : 5' capping of poly-A tail. Protein synthesis: the genetic code, components required for translation, codon recognition by tRNA. Steps in protein synthesis: initiation, elongation, termination and polysomes formation. Post translational modifications.

Unit: V (18 hours)

Mutations – spontaneous and induced mutation, Mutagenesis by nitrous acid, hydroxylamine and intercalators. DNA damage by UV, alkylating agents and Cross linkers.

DNA repair mechanisms – photoreactivation, excision repair, recombination repair and SOS repair.

Text Books:

1. De Robertis, E.D.P. and De Robertis, E.M.F., (2001), Cell and Molecular Biology, Lippincott Williams and Wilkins, USA.
2. Gupta, P.K., (1999), Cell and Molecular Biology, Rastogi Publications, Meerut.
3. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and Walter. P, (2003), Essential Cell Biology, Garland Science, New York.

References:

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and Walter, P, (2010), Biology of the cell, Garland Science, New York.
2. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and Walter. P, (2003), Essential Cell Biology, Garland Science, New York.
3. Cooper, G.M., (2009), The Cell – A Molecular Biological Approaches, ASM Press, Washington.
4. Lewin, B., (2010), Genes XII Oxford University Press, Oxford.
5. Pavlella. P., (1998), Introduction to Molecular Biology, McGraw-Hill Companies Inc., New York.
6. Roy, S.C and De, K.K, (2010), Cell Biology, New Central Book Agency, Calcutta
7. Walker, J.M., and Gingold, E.B, (2002), Molecular Biology and Biotechnology, Panima University Press, Oxford Publishing Co., New Delhi.

SRI KALISWARI COLLEGE,(AUTONOMOUS) SIVAKASI.
Choice based Credit System
PG Programme-M.Sc., Biotechnology-2015-2017
Semester-I

CORE-III: MICROBIAL GENETICS-15PBTC13 **Duration: 90 Hours**
Credits: 5

Objectives:

- To enable the students to understand about the basics of Molecular biology & Molecular genetics.
- To impart knowledge to the students about the process of replication, transcription and translation.
- It explains the concept of gene regulation and gene transfer methods.

Course Outcome:

- Understand the mechanism of regulation of gene expression
- Basic concept of gene transfer methods- conjugation, transformation and transduction.
- In depth knowledge about the jumping genes and the process of transposition mechanism
- Understand the genetics of viral phage, replication and integration in the host genome
- Awarness on genetic organization of the chromosomes and its abnormalities
- Basic concepts in genetics of drosophila, as a model organism
- Understand what is gene linkage, crossing over and chromosomal mapping

Unit: I (18 Hours)

Basic concepts of microbial genetics; bacterial genomes, organization and basic functions: *E.coli* and *Streptomyces*.

Unit: II (18 Hours)

Regulation of gene expression in Prokaryotes: The Operon concept- i) lac ii) trp iii) ara operons. Transformation – competent cells, regulation, general process; Transduction – general and specialized; Conjugation – process, F plasmid, R plasmid, control of copy number.Plasmid incompatablity.

Unit: III (18 Hours)

Phage genetics- Lytic and Lysogenic cycles. Genetics of T4 and Lamba Phage.Lamba DNA replication and Phage production. Decision between Lysis and Lysogeny. Other modes and properties of Lysogens.

Unit: IV (18 Hours)

Transposable genetic elements-IS elements, Composite transposons. Tn3, Tn5, Tn9, Tn10 and Mu phage. Mechanism of Transposition, Transposable elements in Eukaryotes: Maize-Ac and Ds, SPM and DSPM elements, Drosophila –P elements. Retrotransposons.

Unit: V (18 Hours)

Genetics of Eukaryotes: Gene linkage and Chromosome mapping, Crossing over-Three point cross, Tetrad analysis, Organization of Chromosomes, Specialized chromosomes, Chromosome abnormalities, Quantitative Inheritance, Population Genetics, Development of Genetics using Drosophila as a model system. Somatic cell genetics.

Text books:

1. S.R. Maloy, J. E. Cronan Jr., and D. Freifelder, (2006),Microbial Genetics Jones and Bartlett Publishers, Sudbury, Massachusetts.
2. T. A. Brown (2007), Genomes 3 Garland Science Publishing.

References:

1. James D Watson, Tania A. Baker,Stephen P. Bell,Alexander Gann, Michael Levine and Richard Losick, Benjamin Cummings.(2004),Molecular Biology of the Gene Fifth Edition.
2. G. M. Malacinski, (2002)Essentials of Molecular Biology Fourth Edition Jones & Bartlett Publishers.
3. Peter J. Russel. (2006),Genetics – A Molecular Approach 2nd Edition
4. T.Cullis,Burton,S.Guhman,Antony Griffiths,David Suzuk.,(2003)Genetics:A Beginner's guide One world publication limited.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
Choice Based Credit System
PG Programme-M.Sc., Biotechnology – 2015 - 2017
I Semester

CORE –IV: LAB IN BIOCHEMISTRY-15PBTC1P **Duration:90Hours**
Credits :4

Objectives:

- To enable the student acquire the knowledge about technical skills in biochemistry.
- To provide information on biochemistry concepts such as –chromatography, enzyme assay, electrophoretic techniques, etc.
- To provide hand on training on experiments in lab.

Course Outcome:

- Basic information on concepts of biochemistry including pH, buffer preparation and calculations
- Hands on training to every students in the laboratory.
- Knowledge on chromatographic techniques, enzyme assay, electrophoretic techniques.
- Facts on screening and identification of industrially important enzymes
- Extraction and purification of enzymes isolated from different sources
- Understand the kinetics of enzyme production
- Basic concepts of protein precipitation, purification and detection by SDS-PAGE.

1.Theory and applications of Colorimeter, spectrophotometer, pH meter and buffers.
2. Methods of Protein estimation (Lowry's, Bradford's method)

3.Thin layer chromatography, paper chromatography and Column chromatography.
4.Separation techniques: Thin layer chromatography, Paper chromatography and Column chromatography.
5.Screening and identification of industrially important micro organisms
6.Extraction and purification of enzyme
a)Ammonium sulphate precipitation b)Dialysis
7.Specific activity of an amylase enzyme-Effect of pH, Enzyme, Substrate concentration and Enzyme concentration
8.SDS PAGE

References:

1. Douglas A Skoog,F.James Holler,Timothy A.Nieman, ,(1997),Principles of Instrumental Analysis, 5th edition,Brooks Cole publishing company
2. J Jayaraman, (1999), Laboratory manual of Biochemistry, Sixth edition ,New age international publishers.
3. Keith Wilson,John Waler, (2005), Principles and Techniques of Practical Biochemistry, 5TH Edition,Cambridge University Press.
4. Dr.P.Palani velu-Analytical biochemistry and separation techniques ,MKU,Madurai.
5. S.Sadasivam & A.Manickam,(2004),Biochemical methods,Second edition,New age international publishers.
6. KeithWilson,,John Waler, (2000) ,Principles and techniques of practical biochemistry ,First edition, Cambridge University Press.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
Choice Based Credit System
PG Programme - M.Sc., Biotechnology – 2015-2017
SEMESTER - I

SUBJECT ELECTIVE COURSE-I: BIOINFORMATICS – 15PBTO11 Duration: 90 Hours
Credits: 4

Objectives:

- To make the students understand the basic concepts of bioinformatics.
- To enable the students acquire knowledge about biological databases.
- To make the student familiar with the different types of tools used in bioinformatics.

Course Outcome:

- Practical and the theoretical knowledge of DNA sequences, genomes, protein sequences and protein structure information that will prepare them for careers in bioinformatics, academia, industry and research.
- Understand the vast quantities of data generated in the fields of molecular and biological sciences (databases available for different organisms).
- Understand the basic algorithms of bioinformatics.
- Fundamentals of sequence retrieval and alignment.
- Analyse the phylogenetic relationship between the different organisms
- Basic applications of structural biology and molecular docking and knowledge on drug designing
- Acquiring problem-solving skills and gain experience in understanding, handling and developing important software used in pharmaceutical, chemical and biotechnology industries.

UNIT: I (18 Hours)

Introduction to Bioinformatics – Definitions, concepts, scope, Applications. Genome Projects: Human genome project and its current status, Mouse Genome project. Role of Bioinformatics in various fields.

UNIT: II (18 Hours)

Biological Databases: Nucleic acid sequence databases – EMBL, GenBank, and DDBJ. Protein Sequence Databases – PIR, Swiss-PROT, Tr-EMBL. Structural Databases – PDB, PubChem. Specialized database- Biodiversety databases, pathway databases. File formats – GenBank, FASTA file formats.

UNIT: III (18 Hours)

Sequence Alignment: Pairwise Alignment- Definition, Local alignment - BLAST, global alignment - FASTA. Multiple sequence alignment : Definition, ClustalW and T-coffee. Phylogenic tree: Definitions, PHYLIP, Tree constructing Methods: Distance Based Method- the Neighbour joining, Fitch morgolish, Maxim parsimony method.

UNIT: VI (18 Hours)

Drug Designing: computer based drug designing, Structure based drug designing. Molecular docking. Chemoinformatics- Chemdraw, Marvin Sketch, Chemspider. ADME/TOXBox study- analyzes the effect of drugs. Codon Analysis software, Micro array analysis software.

UNIT: V (18 Hours)

Protein primary structure Analysis (using EXPASY tools): Amino acid composition analysis, Molecular weight. Protein secondary structure Analysis: Hydrophobicity and Hydropathy profiles, helical wheel. Protein secondary structure Prediction – GOR, *Ab initio*.

Text Books:

1. Bioinformatics sequence and genome analysis, David M. Mount (2009), Gold Spring Harbor Press Publishers, England.
2. Introduction to Bioinformatics, Parry Smith and TK Attwood (2001), 8th edition, Pearson education. UK

Reference:

3. Instant notes on Bioinformatics, T.K.Westhead, VIVA Publishers. New Delhi.
4. Molecular Modeling, Andrew Leach (2003), 2nd Edition. USA.

SRI KALISWARI COLLEGE, (AUTONOMOUS) SIVAKASI.
Choice based Credit System
PG Programme-M.Sc., Biotechnology-2015-2017
Semester-I

SUBJECT ELECTIVE COURSE – I **Duration: 90 Hours**
BIOPHYSICS AND STRUCTURAL BIOLOGY -15PBTO12 **Credits: 4**

Objectives:

- To make the students understand the basic principles of Biophysics.
- To make the students grab with the fundamentals of Biophysical techniques.
- To make the students understand with application of structural biology.

Course Outcome:

- Differences between the four different protein levels.
- Understand the role of macromolecules in biological membranes.
- Ability to understand the theoretical aspects of biophysical techniques.
- Understand the role of structural biology in biology.
- Knowledge in the application of structural biology.

Unit: I (18 Hours)

Scope and methods of Biophysics-Levels of Molecular organization.

Unit: II (18 Hours)

Understanding structures of Proteins at different levels - Primary, Secondary, Tertiary and Quaternary - Conformational analysis and forces. Understanding structures of Nucleic acids at different level.

Unit: III (18 Hours)

Analysis of Interactions – Proteins, Nucleic acids and polysaccharides – Association of macromolecules, Lipids in biological membranes – Proteins in biological membranes – Molecular mechanics and Dynamics**.**

Unit: IV (18 Hours)

Structural biology role and importance – Technique: CD/ORD. Fluorescence spectroscopy, Raman spectroscopy, Electron microscopy, NMR, X ray crystallography.

Unit: V (18 Hours)

Application of structural biology: Understanding regulation and kinetics of Biological activity - specific examples.

R**eferences:**

1. C.Branden, J.Tooze (1991),Introduction to protein structure Garland publishing Inc.
2. L.Stryer (1999), Biochemistry WH Freeman & Co., New york
3. Cantor and Schimmel (1980),Biophysical chemistry Part I, II and III Freeman&CO., Newyork.
4. S.Neidle (1987),Nucleic acid structure VCH Publishing Weinheim.

SRI KALISWARI COLLEGE, (AUTONOMOUS), SIVAKASI.
Choice Based Credit System
PG Programme-M.Sc., Biotechnology-2015-2017.
Semester-II

CORE-V: MICROBIOLOGY-15PBTC21 **Duration: 90 Hours**
Credits: 5

Objectives:

- To enable students to understand the diversity of microbes and importance of classification of microorganisms
- To make understand the students the influence of microorganisms and microbiological applications on everyday life.
- To impart the knowledge of different types of microorganisms that are invisible tour naked eyes.

Course Outcome:

- Enable students to understand the diversity of microbes and importance of classification of microorganisms
- Knowledge of different types of microorganisms that are invisible to our naked eyes.
- Understand the host-pathogen relationships
- Knowledge on infections caused by bacteria, virus and fungi
- Analyze the physiology of the bacteria and control mechanisms to prevent their growth
- Understand the students the influence of microorganisms and microbiological applications on everyday life.
- Role of microorganisms in composting, biogas production, sewage treatment and biodegradation

Unit: I (18 hours)

History and scope of Microbiology. Structure and functions of bacteria, fungi,algae,protozoa, and viruses. Principles, structure and applications of microscopes.

Unit: II (18 hours)

Classification of bacteria, fungi, algae, protozoa and viruses. Molecular taxonomy and current methods of microbial identification for systemic studies.

Unit:III (18 hours)

Host - Pathogen relationships. Bacterial pathogens –*Streptococcus and Escherichia.* Viral pathogens – Rabies virus, Hepatitis B virus,OncogenicViruses-Human T-Cell Leukemia Virus,Bacteriophages, *Aspergillus fumigates,Candida albicans*, *Plasmodium vivax*, *Entamoeba histolytica*,Nosocomial infections.

Unit : IV (18 hours)

Physiology of bacterial growth, growth conditions, Microbial Nutrition,– macro, micro nutrients & growth factors. Factors influencing and affecting microbial growth– pH, temperature and light. Control of microorganisms – physical and chemical agents, antimicrobial chemo therapy.

Unit :V (18 hours)

Composting-Role of microorganism in composting, Vermicomposting, Biogas production, Microbial Leaching, Biodegradation of Xenobiotics,Sewage microorganisms,Sewage treatment-Primary and secondary treatment.

Text books:

1. L.M. Prescott, J.P. Harley and D.A. Klein, (2005), Microbiology, Sixth edition, McGraw Hill, Boston.
2. M.J. Pelzer Jr., E.C.S. Chan and N.R. Kreig, (1993),Microbiology,McGraw Hill Inc., New York.

3. Ananthanarayanan and J.Panicker (2005), Text book of Microbiology, Eighth edition,Orient Long Man publishers.

References:

1. Michael T. Madigan John M. Martin & Jack Parker, 1984, Biology of Microorganisms Prentice Hall International, Inc., London.
2. Gerard J. Tortora, Berdell R. Funke, Christine & L. Case, 2001, Microbiology - An Introduction Benjamin Cummings, U.S.A.
3. Danial Lim ,1998, Microbiology, McGraw-Hill Companies , New York.
4. D. Greenwood, R. Slack and J. Peutherer, (1997), Medical Microbiology ELST with Churchill Livingstone, Hong Kong.

SRI KALISWARI COLLEGE,(AUTONOMOUS) SIVAKASI.
Choice Based Credit System
PG Programme-M.Sc., Biotechnology-2015-2017
Semester-II

CORE- VI: BIOPROCESS TECHNOLOGY-15PBTC22 **Duration: 90 Hours**
Credits: 5

Objectives:

- To make the students understand with the scope and applications of Industrial Biotechnology.
- To provide the basic fermentors and its types to the students.
- To enrich the students in production of secondary metabolites.
- To enrich the students in innovative microbial food products.

Course Outcome:

- Understand the scope and applications of industrial biotechnology.
- Methods of potential improvement of efficient strains to increase the yield of microbial products
- Information of basic fermentors and its types.
- Knowledge on immobilization of enzymes and cells and downstream processing of biologicals
- Knowledge on the process of production of secondary metabolites.
- Awareness on innovative fermented food products.

To understand the importance of single cell protein and single cell oils

Unit: I (18 Hours)

Basic principles of Biochemical Engineering. Isolation and screening of industrially important microbes. Improvement of strains for increased yield and other desirable characteristics.

Unit: II (18 Hours)

Concepts of basic models of fermentation-Batch, Fed batch and continuous fermentation. Bioreactor designs. Air and media sterilization, Aeration and Agitation in bioprocess. Scale up fermentation process. Instrumentation and control bioprocess. Computer applications in control of bioprocess.

Unit: III (18 Hours)

Immobilsation of enzymes and cells. Factors affecting bioprocessing and regulation. Downstream process of biologicals.

Unit: IV (18 Hours)

Bioprocess for the production of biomass, primary, secondary metabolites, and extracellular enzymes. Biotechnologically important extracellular products. Industrial application of enzymes.

Unit: V (18 Hours)

Economics of large scale fermentation. Fermented foods-Yoghurt, Butter milk, Cheese. Microbial foods-Single cell protein (SCP), Single cell oils (SCO).

Text books:

1. Wulf Crueger and Anneliese Crueger.(2000),Biotechnology: A Textbook of Industrial Microbiology, Punima Publishing Corporation, India.

References:

1. M. M. Young, Reed Elsevier. (2004).Comprehensive Biotechnology The Principles, Applications and Regulations of Biotechnology in Industry, Agriculture and Medicine, Vol 1, 2, 3 and 4 , India Private Ltd, India.
2. Mansi E.M.T.EL. and C.F.A.Bryle,(2002),FermentationMicrobiology and Biotechnology Taylor & Francis Ltd, UK.
3. P.F. Stanbury.A.Whitaker and S.J.Hall. (1997),Principles of Fermentation Technology Aditya Books Pvt Ltd, India.
4. Flickinger M.C & Drew, .(1999) , Encyclopedia of Bioprocess Technology,Vol 1-5 S.W Publishers.Fermentation Technology.
5. Behrens, D. & Kramer, P. (1990)Bioprocess engineering: Down Stream processing & recovery of bioproducts, safety in biotechnology and regulations.

SRI KALISWARI COLLEGE(AUTONOMOUS),SIVAKASI
Choice Based Credit System
PG Programme-M.Sc., Biotechnology- 2015-2017
Semester-II

CORE- VII: RECOMBINANT DNA TECHNOLOGY-15PBTC23 **Duration: 90 Hours**
Credits: 5

Objectives:

- To learn the construction of recombinant molecule.
- To acquire knowledge on transformation.
- To gain knowledge on PCR, RFLP and RAPD.

Course Outcome:

- Basic principles of recombinant DNA technology and its pros and cons
- Knowledge on the bacterial vectors, viral vectors for the construction of recombinant molecule
- Understand how to transform the recombinant molecule into the desire host
- Acquire knowledge on methods of gene transfer into bacteria, plant, animal.
- Gain knowledge on molecular techniques such as PCR, RFLP and RAPD.
- Awareness on the important discovery of gene sequencing
- Detect DNA, RNA, Protein by blotting techniques
- Understand the application of rDNA in industrial enzyme production

Unit: I (18 Hours)

Introduction to rDNA technology- Vectors/Cloning Vehicles-Plasmids, Cosmids-Ri-Ti Plasmid-BAC,YAC, Expression vectors-Shuttle vectors. Enzymes-Exonuclease-Endonuclease-Restriction enzymes-DNA Modifying enzymes. Methylase, Alkaline phosphotase, topoisomerase, Ligases and polymerases.

Unit: II (18 Hours)

Gene Cloning-Sticky and Blunt ends-Ligation-Adapators-Linkers-Homopolymer tailing. PCR Based Cloning. Probes-Radiolabelled and non-radiolabelled probes. Construction of Genomic and cDNA Libraries.

Unit: III (18 Hours)

Methods of introducing rDNA into Bacteria, Plant and Animal. Physical-Electroporation, Microinjection-Particle Gun Bombardment-Lipofection. Chemical methods. Screening of recombinants-alpha complementation-Blue white selection.

Unit: IV (18 Hours)

DNA Analysis- DNA Sequencing-types. PCR: Reverse Transcriptase-PCR, Real-Time PCR, Inverse PCR, Nested PCR, *In situ* PCR. LCR, RFLP, RAPD, DNA fingerprinting.

Unit: V (18 Hours)

Applications of rDNA- Blotting techniques-Southern, Northern and Western blots. Screening of recombinants. Production of recombinant Products-Insulin, HGH, Interferon. Industrially important proteins-Proteases, Amylases.

Text books:

1. T. A. Brown, (2006), Gene Cloning and DNA Analysis. An Introduction, Blackwell Scientific Publications.
2. Glick, B.R., and Pasternack, J.J., (1998), Molecular Biotechnology, Second Edition ASM Press, Washington, DC.

References:

1. S. B. Primrose and R. M. Twyman, (2006), Principles of Gene Manipulation and Genomics Blackwell Scientific Publications.
2. U.Sathyanarayana, (2005), Text of Biotechnology, Books and Allied (P) ltd.

SRI KALISWARI COLLEGE, (AUTONOMOUS), SIVAKASI
Choice Based Credit System
PG Programme-M.Sc., Biotechnology-2015-2017.
Semester-II

CORE-VIII: LAB IN MICROBIAL GENETICS-15PBTC2P **Duration: 90 hours**
Credits: 4

Objectives

- To enable the students to acquire the knowledge about basic technical skills in microbiology lab.
- To enable the students in the culturing, identification and maintenance of microbes

Course Outcome:

- Enable the students to acquire the knowledge about basic technical skills in microbiology lab.
- Enable the students in the culturing, storage and maintenance of microbes
- Knowledge on biochemical identification of microbes
- Knowledge on analysis of water quality and food samples
- Methods of transformation of DNA by conjugation
- Isolation of bacteriophage from sewage samples
- Knowledge on antibiotic susceptibility of bacteria
- Hands on experience to every students.

1. Sterilization and preparation of media, Enumeration of bacteria and fungi from environmental samples - Soil, Water, Air.
2. Techniques for isolating pure bacterial culture.
3. Preservation and maintenance of microbial cultures.
4. Staining Techniques - Gram staining
   Flagella staining
   Endospore staining
5. Biochemical tests - IMVIC tests
   Starch hydrolysis,Catalase test,Oxidase test
   Acid and gas production test
6. Water quality analysis - MPN method.
7. Microbial analysis of food samples.
8. Measurement of growth rate
9. Antibiotic susceptibility testing.

10. Bacterial Conjugation
11. Isolation of bacteriophage and plaque analysis.
12. Isolation of auxotrophic mutants.

REFERENCES

1. Miller, J.H. (1992),A Short Course in Bacterial Genetics,
2. Ronald M.Atlas *et al*., (1997),Experimental Microbiology,Benjamin and Cummings Publication.
3. J.G. Cappuccino and N. Sherman, (2002),Microbiology: A Laboratory Manual Addison-Wesley.
4. Kannan.N., (1995), Lab manual in Microbiology Panima publishers,New Delhi..
5. J.G.Holt,N.R.Krieg, (2000), Ninth edition,Bergey's Manual of Determinative Bacteriology, Lippincott Williams & Wilkin Publishers.

SRI KALISWARI COLLEGE (AUTONOMOUS),SIVAKASI
Choice Based Credit System
PG Programme-M.Sc., Biotechnology- 2015-2017
Semester-II

CORE-IX **Duration: 90 Hours**
LAB IN RECOMBINANT DNA TECHNOLOGY-15PBTC2Q **Credits: 4**

Objectives:

- To perform DNA Isolation from different organisms.
- To provide hands on experience to in all experiments.

Course Outcome:

- Hands on experience on molecular techniques to every students.
- Perform DNA isolation from different organisms such as plant, bacteria and human blood.
- Practical knowledge in transformation of recombinant DNA into bacteria
- Amplify the gene of interest by polymerase chain reaction (PCR)
- Perform cloning of the gene of interest in vector and screening of the recombinants and non recombinants
- Identify the gene of interest by southern hybridization
- Identify the protein of interest by western blotting

1. Agarose Gel Electrophoresis.
2. Isolation of DNA from Bacteria, Plant and blood.
3. Isolation of Plasmid DNA.
4. Restriction Digestion.
5. Transformation and Blue white screening using IPTG and X –Gal.
6. Polymerase Chain Reaction.
7. Southern Hybridization.
8. SDS-PAGE.

References:

1. Joseph Sambrook, David N Rusell ,Joe Sambrook, (2001), Molecular Cloning : A Laboratory Manual (3-Volume set), Cool Spring Harbor press.
2. Bernard Perbal, (1988), A Practical guide to Molecular Cloning 2nd Edition, Wiley-Interscience.

3. Fred M.Ausbel, Rogerbrent, Robert E.Kingston, David D. Moore.J.G. Seidman, John A.Smith Kevinsgruhl, (1988), Current Protocols in Molecular Biology, John Wiley and sons .Inc.

SRI KALISWARI COLLEGE, (AUTONOMOUS) SIVAKASI.
Choice Based Credit System
PG Programme-M.Sc., Biotechnology-2015-2017
Semester-III

CORE- X: ANIMAL BIOTECHNOLOGY -15PBTC31 **Duration: 90 Hours**
Credits: 5

Objectives:

- To make understand the basic principles of Animal tissue culture.
- To make the students grab with the fundamentals of Animal genomics.
- To make the students understand with production of recombinant products.

Course Outcome:

- Understand the basic principles of animal tissue culture.
- Knowledge on the concept of transgenesis and methods of transferring genes using various vectors into the host
- Understand fundamentals of animal genomics.
- Understand the ethical issues related to animal biotechnology
- Understand about the production of recombinant products.
- Knowledge on biotechnological application for HIV diagnosis and gene therapy
- Basic concepts and importance of intellectual property rights- patents, copyright, tradesecrets, trademark
- Understand the principles of genetically modified organisms

Unit: I (18 Hours)

Transgenesis: Methods of transferring genes: Retroviral, DNA microinjection and Engineered Embryonic stem cell methods. Transgenic animals (Mice, Cow, Pigs, Sheep, Goat, Birds, Fish and Insects).Ethical issues in Animal Biotechnology. Artificial insemination and Embryo transfer.

Unit: II (18 Hours)

Methods for construction of recombinant animal vectors for gene transfer. Biology of animal viral vectors-SV40, adenovirus, retrovirus, vaccinia virus, herpes virus, adeno associated virus and baculo virus. Baculo virus as biocontrol. YAC&BAC Vectors.

Unit: III (18 Hours)

Production of recombinant proteins-Vaccines, Blood products, hormones, Regulatory proteins. Phage display technology. Biotechnological applications for HIV Diagnostics and therapy. Human genome mapping.

Unit: IV (18 Hours)

Gene therapy- Ex vivo and in vivo, Viral and Non viral. Signal transduction-Acetyl choline, G Proteins, Visual pigments, Growth factor receptors. Oncogenes and Antioncogenes.

Unit: V (18 Hours)

Introduction to IPR. Types: Patents, Copyrights, Trademarks,Tradesecrets. Biotechnological examples of Patents, Trademark, Tradesecrets and Copyrights.

Text books:

1. Biotechnology by Sathynarayana, (2007). U.S.Chand and Company.

References:
1. Old and Primrose, (2000),Principles of Gene Manipulations 6TH Edition, Blackwell science Publication.
2. Brown T.A., (2001) Gene Cloning and Analysis. Blackwell science limited.
3. Glick. B.R., Pasternack , (1998) Molecular biotechnology. Second edition. J.J., Washington.
4. http://books. Cambridge. Org/052138737 htm.
5. http:// online sfs.edu// 7 Erane/GE essays/gedanger.htm.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
Choice Based Credit System
PG Programme- M.Sc., Biotechnology – 2015 -2017
Semester III

CORE -XI **Duration: 90 Hours**
IMMUNOLOGY & IMMUNOTECHNOLOGY-15PBTC32 **Credits : 5**

Objectives:
- To make the students understand the fundamentals of immune system.
- To enrich the students with basic concepts of lymphoidal organs and its functions.
- To make the students familiar about the therotical aspects of Monoclonal antibodies and hybridoma technology.

Course Outcome:
- Understand the cells and organs involved in the immune system of our body
- Familiar with the body's natural defense (immunity), its mechanism and active immunity by vaccination
- Understand the mechanisms of humoral and cell mediated immune response
- Practical skills on different immunotechniques for disease diagnosis and identification
- Basis of transplantation immunology and immunosuppressive agents
- Understand how to combat the disease and immunotherapies available
- Awareness on the current applications of immunological research in practice

Unit: I (18 hours)

Overview of the immune system, types of immunity. Humoral immune response: clonal selection, primary and secondary immune response. Cell mediated immune response: phagocytosis, subtypes of T cells and their function. Cellular interaction in immune response.

Unit: II (18 hours)

Lymphoid organs, cells of the immune system. Origin, development and differentiation of lymphocytes. Antigen-antibody reactions: Precipitation and Agglutination. Structure and functions of class I and class II molecules.

Unit: III (18 hours)

Types of antigen, requirements for immunogenicity, antibody specificity, Immunoglobulins: Types, structure, function and biological properties. Interleukins, complement systems – activation and biological role.

Unit: IV (18 hours)

Cell mediated cytotoxicity, autoimmune diseases, immunosuppression and immunological tolerance. Tumour antigens and immune response to tumors, transplantation and rejection, HLA system and disease association, HLA tissue typing, hypersensitivity reactions.

Unit: V (18 hours)

Hybridoma techniques and monoclonal antibody production. Myeloma cell lines. Fusion of myeloma cells with antibody producing B cells and selection of hybrids. Cloning, production and characterization of monoclonal antibody.

Text books:

1. Fathimunisha Begam (2008) Monoclonal antibodies-the hopeful drugs. MJP Publishers.
2. Kaufmann, Sher and Ahmed. (2002) Immunology of Infectious Diseases ASM Press.

References:

1. J.W. Goding (1983) Monoclonal antibodies: Principle and practice. Academic Press.
2. Springer T.A.(1985) Hybridoma technology in the Biosciences and medicine. Plenum Press, New York.
3. C.Garrison Fathman and F.W. Fitch. (1982) Isolation, characterization and utilization of T-lymphocyte clones. Academic Press.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
Choice Based Credit System
PG Programme- M.Sc., Biotechnology – 2015 - 2017
Semester III

CORE - XII **Duration: 90 Hours**
LAB IN IMMUNOLOGY AND ANIMAL TISSUE CULTURE-15PBTC3P **Credits: 4**

Objectives:

- To practice the students in handling of animals, antigen preparation and bleeding techniques
- To impart the practical knowledge on antigen-antibody techniques
- To learn the immunodiagnostic techniques of infectious diseases

Course Outcome:

- Handling of animals, antigen preparation and bleeding techniques
- Practical knowledge on antigen-antibody techniques
- Identification of the blood groups using antibody specific to each blood group antigens and to study the principle of transfusion
- Isolation and separate B and T lymphocytes from total human blood using nylon wool column
- Skills on performing immunodiagnostic techniques of infectious diseases
- Enumerate immune cells from human blood using haemocytometer
- Detect the specific protein (antigen) present in the unknown protein sample using western blotting
- Detect the presence or absence of antigen/antibody present in the unknown sample using ELISA
- Isolate and purify the monoclonal antibody from polyclonal antibody using column
- Knowledge on preparation of animal cell culture media, culturing and maintenance of cell lines

1. Preparation of antigens- protocol of immunization, methods of bleeding
2. Preparation of serum and complement
3. Antigen-antibody reactions
   Haemagglutination, Passive haemagglutination
   Immunodiffusion- Single immunodiffusion, double immunodiffusion and radial Immunodiffusion
   Electrophoresis – Classical, countercurrent and rocket immunoelectrophoresis
4. Lymphocyte subset identification and enumeration
5. Isolation of immunoglobulin
6. ELISA
7. Western Blotting
8. Preparation of media, preparation of primary culture, maintenance of secondary culture. (Demo)
9. Cell synchronization-preservation & revival of cells. (Demo)

References:

1. Weir. D.M. (1986) Handbook of experimental Immunology Vol I to IV, Blackwell Scientific Publishers.
2. Hay ,F.C. and O.M.R. Westwood. (2000) Practical Immunology, 4th Edition. Blackwell Publishers.
3. Thompson, R.A. (1977) Techniques in clinical Immunology. Blackwell Scientific Publishers.
4. Bhatia, A. (2000) Manual of Practical Immunology. First Edition, Palani Paramount Publication.
5. Talwar, G.P. (1982) A handbook of Practical Immunology. Vikas Publishing House Pvt. Ltd.

SRI KALISWARI COLLEGE(AUTONOMOUS),SIVAKASI
Choice Based Credit System
PG Programme-M.Sc., Biotechnology-2015-2017
III Semester

SUBJECT ELECTIVE COURSE -III **Duration:90 Hours**
ENZYMES AND ENZYME TECHNOLOGY-15PBTO31 **Credits :4**

Objectives:

- To provide the basic knowledge about enzymes, classification and nomenclature etc.,
- To make think and ability to carry out the Enzyme kinetics problems.
- To familiarize the student on mechanism of enzyme action.

Course Outcome:

- Awareness on Enzyme Nomenclature and its types.
- Understand the mechanism of enzyme inhibition.
- Role of active site and its orientation effects.
- Knowledge on commercial applications of enzymes.
- Technique of immobilizing enzymes.

Unit :I (15 Hours)

Enzyme classification-IUBsystem, overview and specific examples, Characteristics of an enzyme, ES complex, effect of temperature, pH and substrate concentration on reaction rate, Activation energy, transition state theory.

Unit :II (15 Hours)

Michaelis menton equation, steady state kinetics, Significance of Km and Vmax. Bisubstrate reactions. Enzyme inhibition-types of inhibitors-competitive, non competitive and un competitive - mode of action and experimental determination.

Unit :III (15 Hours)

Enzyme specificity and the concept of active site, determination of active sites,Proximity and orientation effects, types of catalysis-general acid base, nucleophilic and electro philic attack,metal ion catalysis.

Unit: IV (15 Hours)

Lysozyme, Chymotrypsin, DNA polymerase, RNase, Zymogens and enzyme activation. Allosteric interactions and product inhibition, membrane bound enzymes-isolation, lipid - protein interaction assay and effect of fluidity on enzyme activity.

Unit :V (15 Hours)

Immobilization of various enzymes by various methods and their applications. coenzymes, clinical and industrial uses of enzymes, Enzyme engineering.

Text Books:

1.Trevor Palmer, (2004) Enzymes(Biochemistry, Biotechnology, Clinical chemistry),Second Edition, Harwood publishing Limited.
2. Sriram Sridhar, (2005),Enzymes Biotechnology, First edition, Dominant publishers and Distributors, New Delhi.

References:

1. Malcolm and Dixon and Edwin C Webb ,(1964), Enzymes, Fifth edition, USA Academic press, New York.
2. Nicholas C Price and Lewis Stevens, Fundamentals of Enzymology (1999), Third Edition Oxford university Press.
3.Alan Fersht, (1985), Enzyme structure and mechanism, Second Edition, W.H.Freeman &Company, New York.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI.
Choice Based Credit System
PG Programme-M.Sc., Biotechnology – 2015 - 2017
Semester-III

SUBJECT ELECTIVE COURSE- II: **Duration: 90 Hours**
MOLECULAR ONCOLOGY-15PBTO32 **Credits: 4**

Objectives:

- To make the students understand the basic concepts of Cancer
- To enrich the students in differentiating Oncogenes and Proto genes.
- To make the students understand the Concepts of Cancer therapy.

Course Outcome:

- Understand the basic concepts and types of cancer
- Understand the molecular biology of tumor invasion and metastasis
- Ability in differentiating Oncogenes and Proto oncogenes.
- Understand the molecular mechanisms of apoptosis and signaling pathways
- Understand the classical and advance methods of diagnosis of cancer
- Awareness on the current trends of cancer research and therapies available
- Understand the cancer markers and its applications.

Unit: I (18 Hours)

History, scope and current scenario of cancer research. Cancer – Types and their prevalence – Carcinoma, Lymphoma and Malignancy - Classification based on origin/organ:

breast, colon, lung, prostrate, cervical and oral cancers. Molecular biology of tumour invasion and metastasis.

Unit: II (18 Hours)

Molecular mechanism of oncogenesis – Proto oncogenes, oncogene, oncoproteins, other tumour suppressor proteins and receptors proteins involved in cancer. Molecular significance of RAS, COX cPLA RTK, SMADs, Ras cascade, NF-κ, and extracellular matrix signaling, hypoxia.

Unit: III (18 Hours)

Apoptosis and cancer : Mechanism of apoptosis - proteins involved in apoptosis- Signaling pathways : types and their impact on apoptosis and oncogenesis - Angiogenesis related pathways – Relationship between cancer and antiapoptotic proteins.

Unit: IV (18 Hours)

Principle and methods of cancer diagnosis: – Biochemical, Genetic, Cytotoxic and cell growth and viability tests. Current status of cancer proteomics.

Unit: V (18 Hours)

Cancer therapy – at cellular level- at gene level- at protein level. Principles of cancer biomarker and their applications – chemotherapeutics for cancer, Phytotherapy for cancer. Development of anti cancer drugs.

Textbooks:

1. Prohit.P.R (2006) The Gene, Narosa publishing house.

References:

1. Ian F. Tannock, Richard P. Hill, (2008),The Basic Science of Oncology; Third edition; McGraw- Hill, New York.
2. Miguel H. Bronchud, Maryann Foote, Giuseppe Giaccone, Olufunmilayo olopade, Paul Workman, (2008), Principles of Molecular Oncology,Third edition, Humana Press,New Jersey.
3. Klaus-Michael Depatin, Simone Fulda,(2008),Apotosis and Cancer Therapy,WILEY-VCH Verlag GmbH & Co. , New York.
4. M. A. Hayat (2010), Methods of Cancer Diagnosis, Therapy, and Prognosis,Vol-7,Springer, Netherland.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
Choice Based Credit System
PG Programme - 2015-2017
SEMESTER - III

NON MAJOR ELECTIVE COURSE-I **Duration: 90 hours**
CONCEPTS IN BIOTECHNOLOGY– 15PBTN31 **Credits: 4**

Objective:

- To enable the students to understand about the basic concepts of Modern Biotechnology
- To impart knowledge to the students about the plant tissue culture, gene manipulation and genetic engineering.
- It explains the methods of microbial screening.

Course Outcome:

- Enable the students to understand about the basic concepts of modern biotechnology
- Knowledge about the plant tissue culture, gene manipulation and genetic engineering
- Knowledge on the methods of microbial screening
- Production of microbial biomass such as spirulina, yeast, metabolites such as vitamins, amino acids, antibiotics
- Understand the concept of transgenesis and artificial insemination
- Awareness on the process of fermentation and fermentor

Unit :I (18 hours)

Plant tissue culture: plant cell, tissue and organ culture and its applications. Totipotency, De differentiation and redifferentiation. Types of Cultures-Callus, Cell Suspension, Protoplast. Somatic embryogenesis and organogenesis. Culture media-Types, role of hormones. Somaclonal Variation and its application.

Unit:II (18 hours)

Basic techniques in molecular biology, Restriction enzymes, DNA polymerases, DNA ligase, Taq DNA polymerases. Cutting and joining DNA. Plasmid Vectors.

Unit:III (18 hours)

Introduction to Transgenesis-Transgenic animals.Methods of transferring genes-Reteroviral, DNA microinjection and embryonic stem cell method with example.Artificial insemination and embryo transfer.

Unit:IV (18 hours)

Isolation and screening of Industrial important microbes, Strain improvement, media formulation and Sterilization.

Unit:V (18 hours)

Production of microbial biomass (Spirulina, Yeast), SCP, Primary and Secondary metabolites including Vitamins(Riboflavin), Amino acids (Glutamic acid), Antibiotic (Penicillin). Introductory Concept to Down Stream processing.

Reference Books:

1. Plant Biotechnology and plant genetic engineering by Grierson. D, (1994). Blackie Publishers, London.
2. Applied plant Biotechnology by Ignachimuthu, S.(1996). Tata Mc Grawhill. New Delhi.
3. Principles of Gene Manipulation by Sandy B. Primrose Richard Twyman, R.W. Old. Black Well Scence. Inc, UK.
4. Microbial biotechnology by Glazer and Nikaids (1995) Freeman Press.
5. Fundamentals of Biotechnology by Paul prave, Uwe Faust, Wolfgang Sitting (1987) WCH Weinhein.

6. Agricultural Biotechnology by Purohit, S.S. (2003) Agrobios, India.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI.
Choice Based Credit System
PG Programme -2015-2017
Semester-III
NON MAJOR ELECTIVE COURSE-I: CANCER BIOLOGY-15PBTN32 Duration: 90 Hours
Credits: 4

Objectives:

- To make understand the basic principles of Cancer& Cell cycle.
- To make the students grab with the fundamentals of Cancer therapy.

Unit: I (18 Hours)

Introduction: Cancer cells and its properties. Classification of Cancer:Carcinoma-Sarcoma-Leukemia- Lymphoma..

Unit:II (18 Hours)

Cell cycle-Phases of cell cycle. Carcinogenic agents-Physical, Chemical agents.

Unit: III (18 Hours)

Chromosomal aberrations-Addition, Inversion, Deletion, Translocation.Gene mutation and cancer.

Unit: IV (18 Hours)

Oncogenes: Properties& Characteristics-Breast, Lung, Liver cancer-Causes and preventive methods.

Unit: V (18 Hours)

Different forms of therapy: Chemotherapy, Radiation therapy and Immuno therapy-Advantages and Limitations. Drug development and the clinical trials.

Textbooks:

1. Momna hejmadi.(2010)Introduction to Cancer biology, Momna hejmadi&Ventus publishing

References:

1. Benjamin Lewis (2000).Genes VIII
2. Rober.A.Weinberg. (2006),The Biology of Cancer

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI.
Choice Based Credit System
PG Programme-M.Sc.,Biotechnology 2015- 2017
Semester-III

CORE- XII: PLANT BIOTECHNOLOGY -15PBTC32 **Duration: 75Hours**
Credits: 4

Objectives:

- To gain knowledge of Plant Genome Organization & organelles organization.
- To study the perception of Plant Tissue Culture and the techniques involved.
- To learn Plant Genetic engineering and its application .

Course Outcome:

- Knowledge of plant genome organization & organelles organization
- Knowledge on the regulation of gene expression in plant development
- Perception of Plant Tissue Culture and the techniques involved
- Principle of plant genetic engineering and its application such as edible vaccines, plantibodies, resistance to bacterial, fungal and viral infections
- Influence of plant hormones in plant tissue culture
- Understand the molecular mechanism of agrobacterium mediated gene transfer
- Basic knowledge on gene silencing using RNAi technology
- Analyze the plant-pathogen interaction

Unit: I (15Hours)

Plant genome organization- Introduction-Structural features of a higher plant gene-Gene families in plants.Regulation of gene expression in plant development. Organisation of chloroplast genome,nucleus encoded and chloroplast encoded genes for chloroplast proteins,targeting of proteins to chloroplast.Organisation of mitochondrial genome,nuclear and mitochondrial encoded genes for mitochondrial proteins. RNA editing in plant mitochondria, Mitochondrial genome and cytoplasmic male sterility.

Unit: II (15Hours)

Plant hormones-Auxin,Cytokinin-Culture Media-Sterilization-Totipotency-Dedefferentiation-rediferrentation-Micropropagation-Somatic embryogenesis-Somoclonal variation-Somatic hybridization-Types of culture-Callus,Suspension,Protoplast and anther culture.

Unit: III (15Hours)

Molecular biology of Agrobacterium mediated transfer-Ti plasmid- -Ti plasmid derived vector-Molecular aspects of nitrogen fixation-Gene transfer methods-Physical and chemical methods. Classification of Plant viruses and Stress response.

Unit: IV (15Hours)

Selectable markers-reporter genes-promoters used in plant Genetic Engineering-Bacterial resistance-fungal resistance- pest resistance -Herbicide resistance -Delay of fruit ripening. Production of Therapeutic Proteins-Plantibodies-Edible vaccines.

Unit:V (15Hours)

Gene silencing- Terminator gene technology-RNA_i –Golden rice. Molecular Biology of plant pathogen interaction -Molecular markers in Marker assited plant breeding-Metabolic engineering- Modification of improved nutritional content-Aminoacid and lipid.

Text Books:

1. Greison and S.Covey (2001),Plant Molecular Biology,Blackie
2. Purohit, S.S., (2003) ,Agricultural Biotechnology Agrobios India.

References:

1. A.Slater.,N.Scott and M.Flower (2003),Plant Molecular Biology and Biotechnology Oxford university press.Oxford.
2. P.J. Lea and R.C..Leegood(1993),Plant Biochemistry and Molecular biology John Wiley &Sons.
3. Ignacimuthu, S. (1996),Applied Plant Biotechnology, Tata McGrawhill
4. Buchmann,B.B.W.Gruissen and R.L.Jones(2000), Biochemistry and Molecular Biotechnology of plants American Soceity of Plant Biology ,Rockwillie,MD,USA

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI.

Choice Based Credit System
PG Programme-M.Sc.,Biotechnology- 2015 - 2017
Semester-III

CORE- XIV: LAB IN PLANT TISSUE CULTURE- 15PBTC32 Duration:75 hours
Credits: 4

Objectives:

- To provide knowledge of plant tissue culture
- To understand techniques involved in plant tissue culture& to generate invitro propagated plants
- To learn Agrobacterium mediated transfer.

Course Outcome:

- Basic knowledge of plant tissue culture such as surface sterilization, media preparation, contamination and other handling procedures
- Understand techniques involved in plant tissue culture & to generate *in vitro* propagated plants
- Knowledge on hardening techniques
- Handling skills on agrobacterium mediated gene transfer
- Isolation and purification of protoplasts
- Hands on experience to all students
- Importance on marketing of plants from plant tissue culture and horticulture

1. Preparation of MS,B5 and Nitch and Nitch medium, Stock and Hormone preparation(2,4-D,NAA,BAP)
2. Surface Sterilization.
3. Micropropagtation
4. Callus induction
5. Anther Culture
6. Regeneration of Shoots and roots.
7. Hardening.
8. Suspension culture.
9. Isolation and purification of protoplasts.
10. Introduction to Agrobacterium Mediated Gene Transfer

References:

1. Plant tissue culture,Techniques and Experiments.Robert H.Smith (2000)Elsevier Science and technology Books.
2. Methods in plant Molecular Biology.A Laboratory Course Manual.Edited by Pal Maliga,Daniel F K Lessug Anthony R,Loil helm Gruissm and Joseph E varner, (1994) Cold Spring Harbour Laboratory press.

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI
Choice Based Credit System
PG Programme - M.Sc., Biotechnology – 2015-2017
SEMESTER - IV

SUBJECT ELECTIVE COURSE-III: **Duration: 90 Hours**
GENOMICS & PROTEOMICS– 15PBTO41 **Credits: 4**

Objectives:

- To provide students with a theoretical knowledge of Proteome, genomes.
- To help the students to understand the various proteomic and genomic analysis techniques.
- To enable students to acquire problem-solving skills and gain experience used in biotechnology, pharmaceutical, chemical and industries.

Course Outcome:

- Understand the theoretical knowledge of proteome, genomes.
- Understand the various proteomic and genomic analysis techniques.
- Understand the principle of DNA sequencing and mapping of the genome
- Basic ideas about protein size, pI, identification and analysis by 2D techniques
- Acquire problem-solving skills and gain experience used in biotechnology, pharmaceutical, chemical and industries.
- Applications of DNA array and protein array
- Importance of pharmacogenomics in the identification of drug targets

Unit:I (18 Hours)

Structure and organization of prokaryotic and eukaryotic genomes - nuclear, mitochondrial and chloroplast genomes; Tools for genome analysis–RFLP, RAPD. SAGE, FISH to identify chromosome landmarks.

Unit:II (18 Hours)

Human genome project-landmarks on chromosomes generated by various mapping methods; Physical map-cytogenetic map, contig map, restriction map. DNA sequencing: Chemical, enzymatic and automated DNA sequencing and sequence assembly.

Unit:III (18 Hours)

DNA Micro array technology Basic principles and design: cDNA and oligonucleotide arrays; Applications: Global gene expression analysis, Comparative transcriptomics, Differential gene expression; Genotyping/SNP detection; Detection technology; Computational analysis of micro array data.

Unit:IV (18 Hours)

Overview of protein structure-primary, secondary, tertiary and quarternary structure; Relationship between protein structure and function; Outline of a typical proteomics experiment; Identification and analysis of proteins by 2D analysis; Protein-protein interactions, Yeast two hybrid system, Phage display; Protein interaction maps; Protein arrays-definition, applications-diagnostics, expression profiling.

Unit:V (18 Hours)

Proteomics and drug discovery; High throughput screening for drug discovery; Identification of drug targets; Pharmacogenomics and pharamacogenetics and drug development; Toxicogenomics; Metagenomics. Phylogenetics and Phenomics. Metabolomics. Mass spectrometry and HPLC Principle, instrumentation and application.

References:

1. Genomes, Brown TA (2006), 3rd Edition, Garland Science. UK

2. Principles of Gene Manipulation and Genomics , Primrose S & Twyman R (2006) , 7th Edition, Blackwell, UK.

3. Molecular Biotechnology, Glick BR & Pasternak JJ (1998), 3rd Edition, ASM Press. Washington

SRI KALISWARI COLLEGE (AUTONOMOUS), SIVAKASI.
Choice Based Credit System
PG programme – M.Sc., Biotechnology – 2015-2017
Semester-IV

SUBJECT ELECTIVE COURSE – III: **Duration: 90 Hours**
ENVIRONMENTAL BIOTECHNOLOGY- 15PBTO42 **Credits: 4**

Objectives:

- To impart knowledge on application of biotechnological processes for betterment of environment.
- To make the students understand the various types of environmental biotechnology techniques.

Course Outocome:

- Understand the basic concepts of environment and role of biotechnology in it.
- Knoweldge about the biological treatment of waste water.
- Understand the role of bioremediation in environment
- Ability to analyse the role of biotechnology in managing the hazardous compounds present in environment.

Unit: I (18 Hours)

Environment: Basic concepts and issues (Ozone hole, Global warming, El Nino, pollution, eutrophication). Waste and sources of wastes, Environmental Monitoring and Impact Assessment, Role of biotechnology in management of environmental problems,

Unit: II (18 Hours)

Biological Treatment of Wastewater – Aerobic System - activated sludge process, trickling filters, biological filters, rotating biological contractors (RBC), Fluidized bed reactor (FBR), expanded bed reactor, Inverse fluidized bed biofilm reactor (IFBBR) packed bed reactors air- sparged reactors, Biological Treatment of Wastewater – Anaerobic System - contact digesters, packed column reactors, UASB.

Unit: III (18Hours)

Constraint and priorities of Bioremediation, Biostimulation of naturally occurring microbial activities, *in situ, ex situ,* intrinsic & engineered bioremediation, Solid phase bioremediation - land farming, prepared beds, soil piles, phytoremediation.

Unit: IV (18 Hours)

Biofuels and biological control of air pollution, plant derived fuels, biogas, landfill gas, bioethanol, biohydrogen; use of biological techniques in controlling air pollution; Removal of chlorinated hydrocarbons from air.

Unit: V (18 Hours)

Xenobiotic compounds - organic (chlorinated hydrocarbons, substituted simple aromatic compounds, polyaromatic hydrocarbons, pesticides, surfactants) and inorganic (metals, radionuclides, phosphates, nitrates). Hazardous wastes – Application of biotechnological principles in waste management of hazardous chemicals.

Text books:

1. Jördening, H.J., and Winter, J, (2006), Environmental Biotechnology: Concepts and Applications, John Wiley & Sons, Ltd. West Sussex, UK.
2. Mohapatra, P.K., (2006), Textbook of Environmental Biotechnology I. K. International Pvt Ltd, India.
3. Evans, G.M., and Furlong, J.C., (2003), Environmental Biotechnology: Theory and Application, John Wiley & Sons, Ltd. West Sussex, UK.

References:

1. Wright, M. W., (1999), An Introduction to Environmental Biotechnology, Kluwar Acad Publ. Group, Springer, London.
2. Marandi, M.R., and Ali Shaeri, (2009), Environmental Biotechnology, SBS Publishers & Distributors, India.
3. H. K. Moffatt, Emily Shuckburgh, (2012), Environmental Hazards: The Fluid Dynamics and Geophysics of Extreme Events, World Scientific Pub Co Inc., UK.
4. Pandey, A., (2009), Handbook of Plant-Based Biofuels, CRC Press, USA.

*