DHANALAKSHMI SRINIVASANCOLLEGE OF ARTS & SCIENCE FOR WOMEN (AUTONOMOUS)
Affiliated to Bharathidasan University (Nationally Re-Accredited with 'A' Grade by NAAC)
PERAMBALUR 621212
(For the candidates admitted from the academic year 2020-2021 onwards)

M.Sc., BIOTECHNOLOGY -COURSE STRUCTURE UNDER CBCS

M.Sc., BIOTECHNOLOGY
Program Outcome-PO

- **PO-1** To upgrade their existing knowledge on scientific inventions, laboratory techniques on biotechnology.
- **PO-2** Able to contribute and fulfill the needs of biotechnology industries with specific skills and provide solutions to develop product, process and technology.
- **PO-3** Analyses to learn the recent developments in the field of advancements in societal, environmental and medical upliftment.
- **PO-4** Apply knowledge in the scientific development in the field of Instrumentation ,Marine environment and Bioinformatics.
- **PO-5** Acquire self-confidence to become entrepreneur and Research scientist with strong ethical values.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

DHANALAKSHMI SRINIVASANCOLLEGE OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)
Affiliated to Bharathidasan University

(Nationally Re-Accredited with 'A' Grade by NAAC)
PERAMBALUR 621212
(For the candidates admitted from the academic year 2020-2021 onwards)
M.Sc., BIOTECHNOLOGY -COURSE STRUCTURE UNDER CBCS

Year/ Semester	Course	Course title	Subject Code	Inst Pds/week	credit	Exam hours	Marks		Total
							Internal	External	
I Year/I Semester	Core Course-I	Cell biology	20PBT1C1	6	5	3	25	75	100
	Core Course-II	Microbiology	20PBT1C2	5	4	3	25	75	100
	Core Course-III	Biochemistry	20PBT1C3	5	4	3	25	75	100
	Core Course-IV	Lab in Cell Biology, Molecular Biology and Biochemistry.	20PBT1C4P	6	3	6	40	60	100
	Elective Course-I	A) Bioinformatics	20PBT1E1A	5	4	3	25	75	100
		B) Solid waste management	20PBT1E1B						
	Application oriented course I	Food Safety and Quality Control	20PBT1A1	3	3	3	25	75	100
		Total		**30**	**23**				**600**
I Year/II Semester	Core Course-V	Molecular Biology	20PBT2C5	6	5	3	25	75	100
	Core Course-VI	Recombinant DNA technology	20PBT2C6	5	4	3	25	75	100
	Core Course-VII	Environmental Biotechnology	20PBT2C7	5	4	3	25	75	100
	Core Course-VIII	Lab in Molecular Biology, Recombinant DNA technology and Environmental Biotechnology	20PBT2C8P	6	3	6	40	60	100
	Elective Course-II	A) Advanced Instrumentation for biotechnology	20PBT2E2A	5	4	3	25	75	100
		B) IPR, Biosafety, Bioethics	20PBT2E2B						
	Application oriented course –II	Pharmaceutical Biotechnology	20PBT2A2	3	3	3	40	75	100

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

		Total		**30**	**23**				**600**
II Year/ III Semester	Core Course-IX	Animal Biotechnology	20PBT3C9	6	6	3	25	75	100
	Core Course-X	Plant Biotechnology	20PBT3C10	6	5	3	25	75	100
	Core Course-XI	Bioprocess Technology	20PBT3C11	5	5	3	25	75	100
	Core Course-XII	Lab in Animal Biotechnology, Plant Biotechnology and Bioprocess Technology.	20PBT3C12P	8	4	6	40	60	100
	Elective Course-III	A) Immunotechnology	20PBT3E3A	5	4	3	25	75	100
		B) Marine Biotechnology	20PBT3E3B						
		Total		**30**	**24**				**500**
II Year / IV Semester	Core course XIII	Basics of Research and Entrepreneurship	20PBT4C13	6	5	3	25	75	100
	Project	Project work	20PBT4PW	24	15				200
		Total		**30**	**20**				**300**
		Grand Total		**120**	**90**				**2000**

ELECTIVE PAPERS

SEMESTER	SUBJECT NAME	SUBJECT CODE
I	A. Bioinformatics	20PBT1E1A
	B. Solid waste management	20PBT1E1B
II	A. Advanced Instrumentation for biotechnology	20PBT2E2A
	B. IPR, Bioethics and Biosafety	20PBT2E2B
III	A. Immunotechnology	20PBT3E3A
	B. Marine Biotechnology	20PBT3E3B

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE - I

CELL BIOLOGY

Semester: I | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT1C1 | Credit: 5
Total Periods: 90 | Exam hrs: 3

OBJECTIVE: Understanding the structural and functional aspects of the cell provides the student with a strong foundation in the molecular mechanisms underlying cellular function.

UNIT I CELL STRUCTURE 16

Introduction to cell: Prokaryotic, eukaryotic cell. Difference between plant and animal cell at different level. Structure and composition of Plasma membrane, Cell wall, Endoplasmic Reticulum , Ribosomes, Golgi Apparatus, Mitochondria, Chloroplast, Lysosomes, Vacuoles, Peroxisomes.

UNIT II MEMBRANE TRANSPORT 20

Types of cell Functions, Transport of nutrients, ions and Macromolecules across Membranes- passive diffusion, osmosis, reverse osmosis and active transport, permease, Na+ and K^- Pump, Ca^{2++} ATPase Pump, co-transport, symport, antiport, endocytosis and exocytosis.

UNIT III NUCLEAR MATERIAL 16

Cytoskeleton: Microtubules, microfilaments & associated proteins – actin, myosin and intermediate filaments, 3 dimensional organization of cytoskeleton. Nucleus: Nucleus, nuclear envelops, nucleoplasam, chromatin and chromosomes. Nuclear division.

UNIT IV ORGANIZATION OF CHROMOSOMES, CELL DIVISION & CELL CYCLE 19

Specialized chromosomes, chromosomal abnormalities and qualitative inheritance. Population genetics and developmental genetics using Drosophila melanogaster as model system. Somatic cell genetics. CellDivision**:** Mitosis, meiosis and binary fission.
Cell cycle: Overview of cell cycle, cell cycle clock & check points. Cancer – genetic basis of cancer; Oncogenes and tumour suppressor genes.

UNIT V MICROBIAL CELL BIOLOGY 19

Cell appendages – cilia, pili, fimbriae & flagella. Cell wall structure and bacterial surface layers. Cytoplasm. Bacteria as example for prokaryote. Eukaryotic cell organization – filamentous fungus and yeast as example.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

REFERENCE

TEXT BOOKS

1. Freifelder D. 1985. Molecular Biology, Narosa Publishing House. New Delhi.
2. Lewin B. 2007. Genes IX. Oxford University Press, London.
3. Ajoy Paul. 2011. Textbook of Cell and Molecular Biology. Books and Allied Ltd.
4. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. 2008. Molecular Biology of Cell. 6th Edition. Garland Science, Taylor & Francis group Publishers.
5. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. 1995. Molecular Cell Biology. 3rd Edition. W.H. Freeman Publishers.

REFERENCE BOOKS

1. Watson JD, Gilman M, Witkowski J and Zoller M. 1992. Recombinant DNA. Scientific American Books. 2nd Edition. New York.
2. Blackburn GM and Gait MJ. 1996. Nucleic Acids in Chemistry and Biology. Oxford University Press.
3. Lodish H, Baltimore D, Beck A, Zipursky SL, Matsudaria P and Darnell J. 1995. Molecular Cell Biology. Scientific American Books.
4. Cooper M 1995. The Cell Molecular Approach. 2nd Edition. ASM Press.
5. Lewis J Kleinsmith and Valerie M Kish. 1980. Principle of Cell and Molecular Biology 2nd Edition. Benjamin-Cummings Publishing Company.
6. De Robertis, EDP and E.M.F Robertis. 1980. Cell and Molecular Biology. 7th Edition. Saunders Company.
7. T.A. Brown. 2011. Introduction to genetics: A molecular approach. 1st Edition. Garland Science.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand the cell structure and its composistion	Kl & K2
CO2	Transport mechanism of cell and its mode of transpotation.	Kl, K2 & K3
CO3	Students can understand the Neclear material and its organiation.	K2 ,K3 &K4
CO4	Students can understand Organization of chromosomes ,Cell division and cell cycle	K2& K3
CO5	Students can understand the Cell appendages and cell organization	KI, K2 & K5

Note.Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	L	M
CO2	M	S	S	M	M
CO3	S	M	S	M	L
CO4	S	L	S	S	M
CO5	L	L	M	S	S

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE - II

MICROBIOLOGY

Semester: I
Course code: 20PBT1C2
Total Periods: 75

Max mark: 100(Int:25,Ext:75)
Credit: 4
Exam hrs: 3

OBJECTIVE

To Impart knowledge of the basic principles of Microscopy, Microbiology Techniques, Microbial growth and nutritional requirements of microbes in environment. Applications of microbes in Agriculture and Medicine.

UNIT I MICROBIAL NUTRITION AND GROWTH 15

Nutritional and Growth Factors requirement of microorganisms, Nutritional Types of Microorganisms, Uptake of Nutrition, Microbial Growth, Influence of Environmental Factors of Growth, Batch Culture, Continuous Culture, Synchronous Growth, Fed-batch Culture. Control of microbial growth by physical and chemical agents

UNIT II TECHNIQUES IN MICROBIOLOGY & MICROBIAL DIVERSITY 15

Microscopy, Staining in Microbiology, sterilization, Pure culture Methods, Culture Media and its types, Micrometry, Air Sampling, Waste water analysis, Measurement of Microbial Growth, Types of microorganisms, Methods of identification of microorganisms

UNIT III ENVIRONMENTAL MICROBIOLOGY 15

Distribution of Microbes in Air and water, Allergic disorders by air microflora, air sampling, Water treatment, Bacteriological analysis of water, Bioleaching, Bioremediation

UNIT IV AGRICULTURAL MICROBIOLOGY 15

Plant-microbes interactions, Microbial Biodeterioration, control of microbes and safe storage of agricultural products, Biofertilizers, industrially important micro-organisms, secondary metabolites from micro-organisms, Single cell Protein (SCP).

UNIT V MEDICAL MICROBIOLOGY 15

Diseases caused Bacteria (Anthrox, Tuberculosis), Virus (Small Pox, Corona), Fungi (Aspergilosis, candidiasis), and Protozoans (Malaria,) ; Host parasite interaction-recognition, Entry process and toxin Production of different pathogens in plants and animals, Vaccines, Anti-microbial agents, Antibiotics and disinfectants, National Immunization Programme

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

REFERENCE

1. Pelczar, Chan and Krieg, Microbiology, 5th Ed., McGraw Hill, 1985

2. Stanier, General Microbiology, 1st Ed., MacMillan, 1958

3. Presscott's Microbiology, 10th Edition, Authors: Joane Willey, Linda Sherwood and Christopher J. Woolverton.

4. Clinical Microbiology Made Ridiculously simple, 6th Edition, Mark Gladwin, Bill Trattler and C. Scott Mahan

5. Jawtz Melnick & Adelbergs Medical Microbiology, 27th Edition, Geo, Brooks, Karen c.Carroll, Janet Butel and Stephen Morse.

6. Green wood Medical Microbiology, 18th Edition, David Green wood, Richard C.B. Slack, Michael R. Barer and will L.Irving.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand the microbial nutrition and growth	Kl & K2
CO2	Techniques in microbiology & microbial diversity	Kl, K3 & K4
CO3	Students can understand the environmental microbiology.	K2 ,K3 &K4
CO4	Students can understand Plant-microbes interactions, Microbial Biodeterioration	K2& K3
CO5	Students can understand Diseases causing pathogens	KI, K2 & K5

Note.Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	S	S	S	S	M
CO2	S	L	L	L	L
CO3	M	S	S	S	L
CO4	M	S	S	L	S
CO5	S	S	L	L	S

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE - III

BIOCHEMISTRY

Semester: I | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT1C3 | Credit: 4
Total Periods: 75 | Exam hrs: 3

OBJECTIVE

- This paper gives an idea on different biological molecules, their origin, biological role and its degradation according to the needs and demand of the system under various conditions.Study the structure of fundamental monosaccharides and polysaccharide. Uunderstand the structure and biological function of nucleotides and lipids and their metabolic pathway

UNIT I CARBOHYDRATES 15

Carbohydrates- Monosaccharides-classification and structure, Isomerism in monosaccharides, Disaccharides- classification and types of disaccharides, its biological significance and functions, Oligosaccharides-hetero-oligosaccharides and homo-oligosaccharides, Polysaccharides-classification- hetero-polysaccharides, and homo-polysaccharides.

UNIT II PROTEINS 15

Proteins- classification of proteins, building units of proteins- Amino acids- structure,properties and function, classification of Amino acids, peptide bonds, polypeptides, Structure of proteins-primary, secondary, tertiary and quaternary structures. Enzymes -Enzyme classification and nomenclature. Enzyme kinetics, mechanism of enzyme action.

UNIT III LIPIDS 15

Lipids- structure and classification, various types of lipids – Oils and fats, Triglycerides-structure and function, phospholipids- structure, classification and functions, biological significance of various types of phospholipids, Glycolipids and lipoproteins, serum lipids and its significance, Cholesterol and its derivatives,

UNIT IV NUCLEIC ACIDS 15

Nucleic acids- classification of Nucleic acids, Building blocks of Nucleic acids, structure of Nucleotides, classification of nucleotides, Purines, Pyrimidines, structure and function of DNA and RNA, Non-genetical function of Nucleic acids and its derivatives.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

UNIT V METABOLISM 15

Metabolism of carbohydrates - Glycolysis, TCA cycle, Metabolism of proteins and amino acids – Digestion and absorption, biosynthesis and degradation of amino acid. Urea cycle regulation. Metabolism of Lipids.Glycogen metabolism-Glycogenesis, glycogenolysis. Metabolism of Nucleotides –biosynthesis, degradation and regulation of nucleotides.

REFERENCES

1. HarpersBiochemistry , RK Murray, DK Grammer, PA Mayes, VW Rodwell MC Graw Hill USA
2. Text Book of Biochemistry, DM Vasudebvan and Sreekumari Jaypee Brothers Medical Publishers New Delhi
3. Biochemistry U Satyanaryana Becks & Allied Kolkotta
4. Biochemistry Stryer, Jermy, Berg Freeman Newyork
5. Biochemistry Voet & Voet Wiely & Sons
6. Principles of Biochemistry, GL Zubay, WW Parson & DE Vance Wm C Brown Publishers, Australia
7. Bioorganicchemistry, HR Hortan, LA Moran, RS Ochs Prentice Hall USA

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Carbohydrates and its classification	Kl & K2
CO2	Classification of proteins, Amino acids and enzyme	Kl, K3 & K4
CO3	Students can understand the Lipids and its types.	K2 ,K3 &K4
CO4	Students can understand Nucleic acids structure and its derivatives	K2, K3 &K6
CO5	Students can understand the Metabolism of macromolecule	KI, K3 & K6

Note.Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	M	M	L	L	M
CO2	S	S	S	S	S
CO3	M	L	L	L	L
CO4	S	S	M	S	S
CO5	S	S	S	S	S

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE - IV

LAB IN CELL BIOLOGY, MICROBIOLOGY AND BIOCHEMISTRY

Semester: I
Course code: 20PBT1C4P
Total Hours: 90

Max mark: 100(Int:40,Ext:60)
Credit: 3
Exam hrs: 3

OBJECTIVE

This course presents the study about cells , extraction of molecules inside the cell and tools used in Genetic Engineering.

CELL BIOLOGY

1. Prokaryotic & eukaryotic cell - structure observation.
2. Identification of - parenchyma, collenchyma, sclerenchyma, columnar epithelium, squamous epithelium.
3. Leishman Staining and GiemsaStaining.
4. Osmosis and Tonicity.
5. Staining for different stages of mitosis and meiosis.
6. Total (WBC, RBC) & differential count of human blood cells.

MICROBIOLOGY

1. Sterilization techniques (physical, chemical, filtration and irradiation Techniques), media preparation, culturing methods, dilution techniques
2. Pure culture techniques
3. Staining techniques in microbiology
4. Biochemical tests for identification of unknown microorganisms.
5. Bacterial growth curve.
6. Antibiotic sensitivity test
7. Isolation of antibiotic resistant bacteria from waste /sewage water.
8. To learn culture preservation techniques (Agar slants, stabs and glycerol stocks)

BIOCHEMISTRY

1. Estimation of Reducing sugars.
2. Estimation of Proteins by Lowry's method.
3. Estimation of Amino acids
4. Estimation of lipids
5. Estimation of Vitamin C (Titration)
6. Separation of amino acids / sugars by Ascending Paper Chromatography.
7. Separation of lipids/ sugars/amino acids by Thin Layer Chromatography.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand structural organization of cells	K2& K4
CO2	Staining techniques	Kl, K3 & K4
CO3	Students can understand the sterilization techniques and Biochemical techniques.	K2 ,K3 &K4
CO4	Students can understand growth curve of bacteria	K4 &K5
CO5	Students can understand the estimation of macromolecules	K2 & K4

Note.Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	S	S	L	S	L
CO2	S	S	L	S	L
CO3	S	S	L	S	M
CO4	S	S	M	S	S
CO5	S	S	S	S	S

Indicators: 1. Strong 2. Medium 3.Low

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

ELECTIVE COURSE – I

A) BIOINFORMATICS

Semester: I | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT1E1A | Credit: 4
Total Periods: 75 | Exam hrs: 3

OBJECTIVE

To organize vast reams of molecular biology data in an efficient manner. To develop tools that aid in the analysis of such data. To interpret the results accurately and meaningfully.

UNIT – I INTRODUCTION OF BIOINFORMATICS 15

History of Bioinformatics; Role of Bioinformatics in biological sciences; Scope of Bioinformatics; Types of biological databases; Data mining and its techniques; Data warehousing. Application of Bioinformatics- gene prediction in prokaryotes, eukaryotes; other applications in the areas of health, food and medicine.

UNIT – II DATABASES 15

Nucleic acid databases – Genbank, NCBI, EMBL, DDBJ; Primary protein databases – PIR, SWISSPROT, TrEMBL; Secondary protein databases – PROSITE, PROFILES, PRINTS, Pfam; Structural classification databases – SCOP, CATH; Literature databases – PubMed, Medline; Bibliographic databases – OMIM, PubMed.

UNIT – III SEQUENCE ANNOTATION 15

Sequence Annotation – Principles and tools; Sequence retrieval system – Entrez, SRS; Sequence submission tool – BANKIT, SEQUIN, WEBIN, SAKURA. Molecular phylogeny – Concepts of tree – rooted and unrooted trees; Clustering and Phenetic method, Cladistic method, Molecular Clocks; Steps in constructing phylogenetic analysis; Softwares used for phylogeny construction, Bootstrapping strategies. Molecular viewers - Rasmol, Chime and Spdb viewer.

UNIT – IV SEQUENCE ALIGNMENT 15

Sequence alignment – concepts in alignment, Local & Global; Pairwise & Multiple; Tools for sequence alignment – BLAST, FASTA, Clustal W; Substitution matrices; Scoring matrices – PAM & BLOSUM; Dot plot; EST Clustering and analyses, Codon bias detection,

UNIT – V GENOMICS & PROTEOMICS 15

Genomics & Proteomics: Concepts in Genomics and Proteomics, Genome annotation, Homology modelling. Applications of Metabolomics & Transcriptomics; Concept of system biolog

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

TEXT BOOKS

1. Arthur M Lesk. 2005. Introduction to Bioinformatics(Ed:2). Oxford university press, New York.

2. Attwood, T.K. and Parrysmith, D.J. 2001. Introduction to Bioinformatics Pearson Education (Singapore) Pvt. Ltd., New Delhi.

REFERENCES

1. Andreas D. Baxevanis and B. F. Francis Ouellette. 2005. Bioinformatics - A Practical guide to the analysis of Genes and Proteins (Ed:3). John Wiley & Sons, Inc., Publications, US.

2. David W Mount. 2004. Bioinformatics: sequence and Genome analysis(Ed:2). Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York.

3. Rastogi, S.C., Menderatta, M. and Rastogi, P. 2004. Bioinformatics - concepts, skills and applications. CBS Publishers & Distributors, New Delhi.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand History and role of bioinformatics	Kl & K2
CO2	Nucleic acid databases and Structural classification databases	Kl,K2& K3
CO3	Students can understand the Sequence Annotation and Molecular viewers	K2 ,K3 &K4
CO4	Students can understand Sequence alignment tool	K2, K3 &K6
CO5	Students can understand the Concepts in Genomics and Proteomics	KI, K3 & K6

Note.Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	L	L	L	L	S
CO2	M	S	S	L	S
CO3	S	M	L	M	L
CO4	M	L	M	M	M
CO5	L	S	S	S	S

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

ELECTIVE COURSE – I

B) SOLID WASTE MANAGEMENT

Semester: I | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT1E1B | Credit: 4
Total Periods: 75 | Exam hrs: 3

OBJECTIVES:

The objective of this paper to give the knowledge about the methods involved in the solid waste management.

UNIT-I INTRODUCTION 15

Definition-scope and importance of solid waste management-Types of solid wastes-garbage, rubbish, agricultural, hospital and domestic wastes. Collection-transport and processing of solid wastes.Waste as a resource- organic compost-process of composting-Role of microbes in composting. Significance of organic compost.

UNIT-II DECOMPOSITION 15

Organic matter decomposition- Decomposition of litter, cellulose, hemicelluloses, lignin, water soluble components and proteins. Carbon assimilation and immobilization. Microbes associated with organic matter decomposition. Factors affecting organic matter decomposition.

UNIT III SOLID WASTE MANAGEMENT 15

Solid waste management- methods of solid waste management- open dumping, land filling, incineration, pyrolsis Biogas production-mechanism of methane gas formation. Factors affecting methane formation Utilization of Biogas.

UNIT-IV VERMICOMPOST 15

Vermicomposting-Earthworm and it's characteristics-internal anatomydigestive, excretory, respiratory and reproductive systems. Preparatory methods of vermiculture. Economic and ecological importance of vermicompost and vermi wash.

UNIT-V MUSHROOM CULTURE 15

Mushroom culture- classification-Tests for identification-Characteristics of common edible

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

mushrooms-Nutritive value of mushrooms. Culture techniques-preparation of spawn-Preparation compost- spawn running and harvesting. Preservation and storage. Recipes of mushroom.

REFERENCESTEXT BOOKS

1. Dubey, RC. (2009). A Text book of microbiology, S. Chand & Co. Ltd, New Delhi.
2. Wastewater Management Through Aquaculture by B. B. Jana (Editor); R. N. Mandal (Editor); P. Jayasankar (Editor)

REFERENCE BOOKS

1. NIIR Board, 2004, The Complete Technology Book on Biofertilizers and Organic Farming, National Institute of Industrial Research.

2. Mohoney, R. Lab Techniques in Zoology, (UK: Butterworth, 1966)
3. Vasantaraj David, S. and Kumaraswamy, T. Elements of Economic Entomology, (Chennai: Popular Book Depo, 1998).

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand the importance of solid waste management	K1& K4
CO2	Organic matter decomposition and Microbes associated with organic matter decomposition	Kl &K4
CO3	Students can understand the Solid waste management- methods	K2&K3
CO4	Vermicomposting and methods of vermiculture	K3 &K6
CO5	Students can understand the Mushroom culture	K2 & K6

Note.Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	S	S	L	L	L
CO2	L	M	M	L	L
CO3	M	S	L	M	M
CO4	M	M	M	M	M
CO5	M	S	S	S	S

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

APPLICATION ORIENTED COURSE - I

FOOD SAFETY AND QUALITY CONTROL

Semester: I | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT1A1 | Credit: 4
Total Periods: 45 | Exam hrs: 3

OBJECTIVES:

The objectives are to introduce the principles and methods of Food Quality Control and Assurance, principles and selection of panellists for sensory evaluation and Quality Management System and existing food Standards (ISO).

UNIT-1 FOOD SAFETY 09

Charecterization and risk analysis- Food hazards: Physical, Chemical and biological systems for food safety. Hazard Analysis Critical Control Point(HACCP) and its implementation.

UNIT-II QUALITY ASSUARANCE 09

Theoretical and practical considerations, description of different systems: GAP, GMP,TQM,ISO. Indian food standards- Voluntary and Obligatory standards(PFA,FPO,MMPO,AGMARK etc.) Codex alimentarius, Worldwide food safety issues.

UNIT-III SENSORY EVALUATION 09

Requirements and methods. Sensory parameters: Colour, flavour, texture, taste, aroma, general acceptability. Subjective and Objective test of sensory parameters. (Differential test, Descriptive test, Rating test, Sensitivity threshold test).

UNIT –IV CLEAN IN PLACE (CIP) 09

Different sanitizers and detergents- Sanitation and hygiene in quality assurance in different food industries (Fruits and vegetables, Meat, Milk, Cereal Based).Cost of Quality, Supplier development.

UNIT V MANUFACTURE OF FOOD PRODUCTS 09

Bread and baked goods, dairy products - milk processing, cheese, butter, ice-cream, vegetable and fruit products; edible oils and fats; meat, poultry and fish products; confectionery, beverages.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

REFERENCES:

1. Amerine MA, Pangborn RM & Rosslos EB. 1965. Principles of Sensory Evaluation of Food. Academic Press.

2. Early R.1995.Guide to Quality Management Systems for Food Industries. Blackie Academic.

3. Furia TE.1980. Regulatory status of Direct Food Additives. CRC Press.

4. Jellinek G. 1985. Sensory Evaluation of Food - Theory and Practice. Ellis Horwoood.

5. Krammer A & Twigg BA.1973. Quality Control in Food Industry. Vol. I, II. AVI Publ.

6. Macrae R, Roloson R & Sadlu MJ. 1994. Encyclopedia of Food Science & Technology & Nutrition. Vol. XVI. Academic Press.

7. Piggot J.R. 1984. Sensory Evaluation of Foods. Elbview Applied Science.

8. Ranganna S. 2001. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd Ed. Tata-McGraw-Hill.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Characterization and risk analysis of food safty	K1& K2
CO2	Quality assuarance	Kl, K3 & K4
CO3	Students can understand the sensory evaluation	K2 ,K3 &K4
CO4	Students can understand the clean in place (CIP)	K4 &K5
CO5	Students can understand the manufacture of food products	K2 &K4

Note.Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	L	M	M	L	L
CO2	M	S	L	M	L
CO3	S	M	M	S	M
CO4	M	S	S	M	M
CO5	S	S	S	S	S

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE – V

MOLECULAR BIOLOGY

Semester: II | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT2C5 | Credit: 4
Total Periods: 75 | Exam hrs: 3

OBJECTIVE

To develop skills of the students in area of molecular biology specifically central dogma of life in detail and to study various molecular techniques, to know the basic process of DNA replication, transcription & translation and to know isolation, restriction of DNA etc.

UNIT-I DNA AND RNA COMPOSITION AND STRUCTURE 15

Nucleotides- Structure, Structure of DNA, Organization of DNA in the cell, DNA double helix, Type of DNA , Forms of DNA. Organization of DNA in the cell-Prokaryotic DNA and Eukaryotic DNA. Structure of RNA, type of RNA, Catalytic RNAs - Ribozymes.

UNIT-II DNA REPLICATION, RECOMBINATION AND MUTATION 15

DNA replication –Process of Prokaryotic and Eukaryotic replication, Incubators of DNA replication, cell cycle and DNA replication, Telomeres and Telomerase. Recombination: Homologous and Non homologous recombination. Mutation – Occurrence, kinds of Mutation, \pontaneous & induced Mutation, Mutagens, detection of Mutation, Lethal Mutations, Biochemical Mutations, Phenotypic effects of Mutation, Molecular basis of Mutation, Significance & Practical applications of Mutation

UNIT-III TRANSCRIPTION 15

Transcription in Prokaryotes – Initiation, Elongation and Termination. Transcription in Eukaryotes - RNA polymerase, Promoter sites, Initiation of Transcription, Heterogeneous Nuclear RNA (hnRNA) Post transcriptional modifications- Splicing, Messenger RNA, Transfer RNA , Ribosomal RNA, Incubators of Transcription, Cellular RNA contents, Reverse Transcription.

UNIT-IV TRANSLATION 15

Viability of cells in translation. Genetic code – characteristics, codon-anticodon recognition, Wobble hypothesis, Mutations and Genetic code. Protein biosynthesis – Requirement of the components, Activation of amino acid, Protein synthesis proper – Initiation, Elongation, Termination, Incubators of protein synthesis. Chaperons and Protein Folding. Post-translational modifications of proteins. Protein targeting.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

UNIT-V GENE REGULATION **15**

Introduction. The operon concept. Trp Operon, Lac Operon and Ara Operon. Gene Expression in eukaryotes. Gene regulation in eukaryotes. Methods to study gene expression/regulation. Gene analysis by T-DNA and transposon tagging. Methods to study protein-protein interactions.

REFERENCE BOOKS:

1. Freifelder. D., Essentials of Molecular Biology, 3rd Edition, Jones and Bartlett Publications Inc., London, 1998.
2. Lewin Benjamin, Gene VIII, Pearson Education, New Jersey, 2004.
3. Watson. J.D., Molecular Biology of the Gene, 5th Edition, Pearson Education, New Jersey, 2004.
4. Peter J. Russell, Reed College, 5th Edition, Pearson Education,1998

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Nucleotides- Structure and its composition	Kl & K2
CO2	DNA replication ,Recombination and Mutation	Kl, K2 & K3
CO3	Students can understand the Transcription and Post transcriptional modifications	K2 ,K3 &K4
CO4	Students can understand Protein synthesis and Post-translational modifications	K2, K3 &K5
CO5	Students can understand the Gene regulation in eukaryotes and protein-protein interactions	KI, K3 & K6

Note: Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	M	M	L	L	S
CO2	M	S	L	S	S
CO3	S	M	M	M	S
CO4	M	M	L	L	S
CO5	L	S	S	L	S

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE – VI

RECOMBINANT DNA TECHNOLOGY

Semester: II | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT2C6 | Credit: 4
Total Periods: 90 | Exam hrs: 3

OBJECTIVES: This paper is aimed to study the various principles underlying genetic engineering that forms the basis of rDNA technology and to study the methodologies, and in brief the applications and related issues of rDNA technology.

UNIT – I INTRODUCTION 18

Introduction to Recombinant DNA technology - Enzymes in molecularbiology-Restriction endonuclease, Ligases, Reverse transcriptase, Nucleases, Polymerase, Alkaline phosphatase, Terminal transferase, T4polynucleotide kinase; Linker, Adaptors, Homopolymers. Chromatin immunoprecipitation, DNA - protein interactions, electro-mobility shift assay andmethyl interference assay.

UNIT – II VECTORS 18

Expression Cassette & Viral vectors: Promoters (Constitutive, Inducible,Tissue specific),Terminators, Reporters, Markers (Antibiotic resistant,Herbicide resistant, Antimetabolite);Vectors in gene cloning – Plasmids(pBR322, pUC), Bacteriophages (Phage lamda and M13), Cosmids, Phagemids, Yeast plasmid vector, Viral vectors (Adenovirus, Adeno associated virus, Baculovirus, Herpes virus, Retrovirus, Cauliflower mosaic virus, Tobacco mosaic virus, Potato virus. Transposons (Ac-Ds, P) Artificial chromosome (BAC,YAC, HAC),Shuttle vector, Expression vector.

UNIT – III GENE TRANSFER 18

Gene transfer Methods – Transformation – Physical method (Electroporation, Electrofushon, Microinjection, Particle bombardment, Liposome mediated transfer); Chemicalmethod (PEG mediated, DEAE Dextran mediated, $CaPO_4$ mediated genetransfer); Biological method

(Agrobacterium mediated gene transfer).Expression systems – Prokaryotes (Bacteria) and Eukaryotes (Yeast, Mammalian and Insect cell lines).

UNIT – IV GENETIC ENGINEERING 18

Screening & Selection methods – Insertional inactivation, Blue-Whiteselection, colony–insitu hybridization, In vitro selection, In vitro translation, Radioactive antibody test, DNA labelling, dotblot hybridization, Molecular beacons. GeneSilencing, RNA interference andantisense therapy. Gene Knockout. Blotting techniques – Southern,Northern, Western and South-Western.

UNIT – V MOLECULAR TECHNIQUES 18

Molecular Techniques – RFLP, RAPD, AFLP, DNA Finger printing, DNA Foot printing, Microarray (DNA & Non-DNA). Libraries - Genomic library; C-DNA library & its types; BAC library; YAC library; Methyl filtrationlibraries; COT fractionation based libraries. Bioethics & Biosafety in geneticengineering; IPR & Patenting. Applications of genetic engineering in medicine, agriculture, veterinary and industry.

REFERENCES : TEXT BOOKS

1. Glick R. and J. J. Pasternak. 2002. Molecular Biotechnology (Ed:3). ASMPress, Washington.

2. Old RW and SB Primrose. 1989. Principles of gene manipulation(Ed:4).Blackwell scientific publications, London.

3. Alberts, B., Johnson, A., Lewis, J., M., Roberts, K., and P. Walter.Molecular Biology of the Cell, Fourth Edition. Garland & Co. 2002.

REFERENCE BOOKS

1. Brown T. A. 1988. Gene cloning – An introduction. VNR (UK) co. Ltd,England.

2. Ernst L Winnacker. 2002. From genes to clones - Introduction to genetechnology. VCR Pub., Weinheim.

3. James D Watson et al., 1992. Recombinant DNA (Ed:2) WH freemanand co., New York.

4. Lodish H et al., Molecular Cell Biology, Sixth edition, W.H Freeman &Co. 2007.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Enzymes in molecularbiology	Kl & K2
CO2	Expression of Viral vectors	Kl, K2 & K3
CO3	Students can understand the artificial Gene transfer mechanisms	K2 ,K3 &K4
CO4	Students can understand Screening & Selection methods for recombinant DNA	K2& K3
CO5	Students can understand the Molecular Techniques and Applications of genetic engineering	K2, K3 & K6

Note: Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	M	M	L	L	L
CO2	L	S	M	L	M
CO3	S	S	S	M	S
CO4	M	M	L	S	M
CO5	S	L	M	L	S

Indicators: 1. Strong 2. Medium 3.Low

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE - VII

ENVIRONMENTAL BIOTECHNOLOGY

Semester: II | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT2C7 | Credit: 4
Total Periods: 75 | Exam hrs: 3

OBJECTIVES: This course will give an knowledge about the environmental issues of water pollution, solid waste management and their treatment.

UNIT – I INTRODUCTION 15

Environment - basic concepts and issues, global environmental problems - ozone depletion, greenhouse effect and acid rain due to anthropogenic activities, their impact and biotechnological approaches for management. An overview of atmosphere, hydrosphere, lithosphere and anthrosphere - environmental problems.

UNIT – II ENVIRONMENTAL POLLUTION 15

Environmental pollution - types of pollution, sources of pollution, measurement of pollution, methods of measurement of pollution, fate of pollutants in the environment, Bioconcentration, bio/geomagnification.

UNIT – III WASTE WATER TREATMENT 15

Microbiology of waste water treatment, aerobic process - activated sludge, oxidation ponds, trickling filter. Anaerobic process - anaerobic digestion, anaerobic filters, up-flow anaerobic sludge blanket reactors. Treatment schemes for waste waters of dairy, distillery, tannery, sugar and antibiotic industries

UNIT – IV SOLID WASTE MANAGEMENT 15

Types of solid wastes - Solid waste characteristics and its impact on environment. Solid waste disposal; land filling, incineration. Xenobiotic compounds - organic (chlorinated hydrocarbons, substituted simple aromatic compounds, poly aromatic hydrocarbons, pesticides, surfactants) and inorganic (metals, radio nuclides, phosphates, nitrates).

UNIT – V BIOLOGICAL PROCESS 15

Role of immobilized cells/enzymes in treatment of toxic compounds. Biopesticides, bioreactors, bioleaching, biomining, biosensors, biotechniques for air pollution abatement and odour control, Bioremediation of xenobiotics in environment - ecological consideration, decay behavior and degradative plasmids. Molecular techniques in bioremediation.

REFERENCES

1. Alan Scragg. 1999. Environmental Biotechnology. Pearson Education Limited, England.
2 Jogdand, S.N. 1995. Environmental Biotechnology. Himalaya Publishing House, Bombay.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

3. Technoglous, G., Burton,F.L. and Stensel, H.D. 2004. Wastewater Engineering – Treatment, Disposal and Reuse. Metcalf and Eddy, Inc.,Tata Mc Graw Hill, NewDelhi.
4. De, A.K. 2004. Environmental Chemistry. Wiley Eastern Ltd. NewDelhi.
5. Allsopp, D. and K.J. Seal. 1986. Introduction to Biodeterioration. ELBS/Edward Arnold, London.
6. Athie, D. and C.C. Cerri. 1990. The Use of Macrophytes in Water Pollution Control, Pergamon Press, Oxford.
7. Chin, K.K. and K. Kumarasivam. 1986. Industrial Water Technology Treatment, Resuse and Recycling . Pergamon Press, Oxford.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Environment - basic concepts and issues	Kl & K2
CO2	Environmental pollution - types of pollution	Kl, K2 & K3
CO3	Students can understand the Microbiology of waste water treatment	K2 ,K3 &K4
CO4	Students can understand Types of solid waste and its management	K2& K3
CO5	Students can understand the biological process	K2& K3

Note: Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	M	L	S	L	S
CO2	L	M	S	L	M
CO3	S	S	M	M	S
CO4	L	M	S	S	M
CO5	S	S	L	M	L

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE – VIII

LAB IN MOLECULAR BIOLOGY, rDNA TECHNOLOGY AND ENVIRONMENTAL BIOTECHNOLOGY

Semester:II | Max mark:100(Int:40,Ext:60)
Course code:20PBT2C8P | Credit:3
Total Periods:90 | Exam hrs:3

OBJECTIVE

To learn about recombinant DNA technology Restriction and ligation, protein separation, blotting techniques and amplification technique. Environmental and culturing technique.

MOLECULAR BIOLOGY

1. Extraction of DNA and RNA
2. Estimation of DNA and RNA.
3. Isolation of PlasmidDNA.
4. Mutagenesis in Bacteria: The Ames test
5. Transformation in *E.coli.*
6. Mutant isolation by gradient platetechnique.

LAB IN rDNA TECHNOLOGY

1. Isolation of genomic and Plasmid DNA from Bacteria
2. Restriction digestion of DNA
3. Ligation of DNA
4. Transformation of bacteria by Calcium chloride method
5. Blue-White screening method
6. PCR
7. Southern blotting
8. SDS - PAGE

ENVIRONMENTAL BIOTECHNOLOGY

1. Water Analysis: Measurement of Total Solids, Total-dissolved solids, Total-suspended solids, dissolved oxygen, total hardness, chloride, turbidity, nitrite, nitrate, COD, BOD, fluoride and total nitrogen.
2. Microbial assessment of air quality (open plate and air sample)
3. Potability test of water (MPN technique).
4. Phosphate and metal removal by microbes
5. Field trip to dairy, food industries, sewage treatment plants.

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand macromolecule extraction techniques	K2& K4
CO2	Mutagenesis and transformations	Kl, K3 & K4
CO3	Students can understand the isolation if nucleic acids	K2 ,K3 &K4
CO4	Students can understand amplification techniques	K4 &K5
CO5	Students can understand Water Analysis and MPN technique	K2 & K4

Note.Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	S	S	L	S	L
CO2	M	S	M	S	L
CO3	S	S	L	M	M
CO4	S	M	M	S	S
CO5	S	S	S	M	S

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

ELECTIVE COURSE - II

A) ADVANCED INSTRUMENTATION FOR BIOTECHNOLOGY

Semester: I
Course code: 20PBT2E2A
Total Periods: 75

Max mark: 100(Int:25,Ext:75)
Credit: 4
Exam hrs: 3

OBJECTIVE

This course discusses basic and advanced methods used in instrumentation investigation focusing on biology applications and to provide ample opportunity for the students to specialize in instruments in centrifugation, chromatography, electrophoresis, spectroscopy and crystallography.

UNIT I CENTRIFUGATION 15

Basic principles of sedimentation. Types of centrifuges - Preparative, analytical, high speed, low speed, ultracentrifuge, differential and density gradient. Determination of molecular weight - sedimentation velocity and sedimentation equilibrium.

UNIT II CHROMATOGRAPHY 15

General principle of chromatographic separation. Principle, instrumentation and applications of Partition Chromatography, Adsorption Chromatography, Paper Chromatography, TLC, HPTLC, Ion Exchange Chromatography, Gel permeation Chromatography, Affinity Chromatography, GC, GLC and HPLC, GC-MS, LC-MS.

UNIT III ELECTROPHORESIS 15

Basic principle and types of electrophoresis. Electrophoretic mobility. Factors affecting electrophoretic migration, Technique and uses of agarose gel electrophoresis, PAGE, SDS-PAGE, Two-dimensional electrophoresis and Isoelectricfocussing.

UNIT IV SPECTROSCOPY 15

Beer-Lambert law and its limitations. Light absorption and transmission. Extinction coefficient. Basic design of photoelectric colorimeter and spectrophotometer. Applications of uv-visible spectroscopic techniques. Flame Photometry. Atomic absorption spectrophotometry, Circular Dichroism and Optical Rotatory Dispersion, Principle and application of NMR and ESR techniques.

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

UNIT V CRYSTALLOGRAPHY 15

Principle, instrumentation and applications of X-Ray Crystallography – X-ray diffraction, Bragg equation, Reciprocal lattice, Miller indices & Unit cell, Concept of different crystal structure, determination of crystal structure (concept of rotating crystal method, powder method).

TEXT BOOKS

1. P.Palanivelu and M.Salihu. 2009. Analytical Biochemistry and Separation Techniques. 4th Edition, MKU, Madurai.

2. Friefelder, D.M. 1983. Physical Biochemistry: Applications to Biochemistry and Molecular Biology. 2nd Revised edition. W. H. Freeman, USA.

REFERENCE BOOKS

1. Upadhyay and Upadhyay Nath. 2009. Biophysical Chemistry, Principles and Techniques. Himalaya Publishing House.

2. Boyer, R.F. 2000. Modern Experimental Biochemistry, 3rd Edition, Prentice Hall publishers, USA.

3. Hammes, G. G. 2007. Physical Chemistry for the Biological Sciences, 1st Edition. Wiley-Inter science, USA.

4. Pavia, D.L., Lampman, G.M., Kriz , G.S. 2000. Introduction to Spectroscopy. 3rd Revised edition. Brooks Cole Publishing Company, USA.

5. Wilson and Walkar. 2000. A Biologist Guide to Principles and Techniques of Practical Biochemistry, 5th Edition, Cambridge University Press, UK.

6. P.Asokan. 2003. Analytical Biochemistry. 2nd Edition. China publications.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Basic principles of sedimentation and Centrifugation	Kl & K2
CO2	Students can understand concepts of chromatographic separation	Kl, K2 & K3
CO3	Students can understand the electrophoresis and its types	K2 ,K3 &K4
CO4	Students can understand spectroscopy	K2& K3
CO5	Students can understand crystallography techniques	K2& K3

Note: Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	M	M	L	S	S
CO2	L	S	S	S	M
CO3	S	S	M	M	S
CO4	M	M	S	S	M
CO5	S	S	L	M	L

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

B) IPR , BIOETHICS AND BIOSAFTY

Semester: II | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT2E2B | Credit: 4
Total Periods: 75 | Exam hrs: 3

OBJECTIVES:

This course is planned to give an understanding about Biostatistics, Bioethics, IPR and Legal Protection, Patent Filing and Infringement and Biosafety.

UNIT I INTELLECTUAL PROPERTYRIGHTS 15

Introduction to IPR , Types of IPR- Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge and Geographical Indications. Importance of IPR - patentable and non patentables, patending life, legal protection of Biotechnological inventions. Introduction to History of GATT, WTO, WIPO and TRIPS

UNIT II CONCEPT OF 'PRIOR ART' AND BASICS OF PATENTS 15

Invention in context of "prior art"; Patent databases; Searching International Databases; Country wise patent searches (USPTO, EPO, India etc.); Analysis and report formation, Types of patents; Indian Patent Act 1970; Recent Amendments; Filing of a patent application; Precautions before patenting-disclosure/non-disclosure; WIPO Treaties; Budapest Treaty; Madrid agreement; Hague agreement; PCT and Implications; Role of a Country Patent Office; Procedure for filing a PCT application

UNIT III PATENT FILING AND INFRINGEMENT 15

Patent application- forms and guidelines, fee structure, time frames; Types of patent applications: provisional and complete specifications; PCT and convention patent applications; International patenting-requirement, procedures and costs; Financial assistance for patenting-introduction to existing schemes; Publication of patents - Patent infringement- meaning, scope, litigation, case studies and examples

UNIT IV BIOETHICS 15

Introduction to ethics and bioethics, framework for ethical decision making. Benefits and risksof genetic engineering – ethical aspects of genetic testing – Reproductive cloning , therapeutic cloning ; Ethical, legal and socioeconomic aspects of gene therapy, germ line,

Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

somatic,embryonic and adult stem cell research-GM crops and GMO's – biotechnology and biopirvcy –Ethical implications of human genome project, human cloning, designer babies, biowarfare

UNIT V BIOSAFETY AND GUIDELINES 15

Introduction- biosafety issues in biotechnology – historical background- Biological Safety Cabinets; Primary Containment for Biohazards; Biosafety Levels; Biosafety Levels of Specific Microorganisms; Recommended Biosafety Levels for Infectious Agents and Infected Animals; **Biosafety guidelines** –Guidelines and regulations (National and international including Cartegana Protocol) Definition of GMOs & LMOs; Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO applications in food and agriculture

REFERENCES:

1. Ethics in engineering, Martin. M.W. and Schinzinger.R. III Edition, Tata McGraw-Hill, New Delhi. 2003.
2. BAREACT, Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., 2007
3. Kankanala, K . C. 2007. Genetic Patent Law & Strategy, 1st Edition. Manupatra Information Solution Pvt. Ltd.,.Noida, India.
4. Jose B. Cibelli, Robert P. Lanza, Keith H. S . Campbell, Michael D.West. 2002. Principles of Cloning, Academic Press, SanDiego, Gurdon.
5. Hoosetti, B.B.2002. Glimpses of Biodiversity. Daya, New delhi.
6. Senthil Kumar Sadhasivam and Mohammed, Jaabir. 2008. IPR, Biosafety and Biotechnology Management. Jasen Publications, Tiruchirapalli, India.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Types of IPR- Patents	Kl & K2
CO2	Students can understand concepts of prior art and Patent databases	Kl, K2 & K3
CO3	Students can understand the patent filing and infringement	K2 &K3
CO4	Students can understand bioethics	K2& K3
CO5	Students can understand biosafety and guidelines	K1& K2

Note: Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
CO1	L	L	L	M	S
CO2	L	M	L	L	M
CO3	M	M	M	L	L
CO4	M	S	L	M	M
CO5	S	S	S	S	S

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

APPLICATION ORIENTED COURSE – II

PHARMACEUTICAL BIOTECHNOLOGY

Semester: II | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT2A2 | Credit: 4
Total Periods: 45 | Exam hrs: 3

OBJECTIVES

- To study about the drug formulation, designing and action on living system.To study the active ingredients like incipient and excipients. To study the application of biopharmaceuticals in industries.

UNIT I INTRODUCTION 09

Pharmaceutical industry & development of drugs-Drug development process, Research and discovery, Contribution of scientific knowledge to drug discovery .Drug screening, Strategies for drug design and production, Structure-activity relationship Computer-aided design of drugs, Drug Regulation And Approval, Drug approval processes . Drug applications, Safety testing in animals; types of therapeutic agents and their uses- Designing A Therapeutic Regimen, Therapeutic measures of nutrition, Biological Therapy Drug Therapy; economics and regulatory aspects.

UNIT II DRUG ACTION,METABOLISM AND PHARMACOKINETICS 09

Mechanism of drug action-Membrane Transport, Intracellular Activation, Drug Targets, Repair of Drug-Induced Injury; physico-chemical principles of drug metabolism; radioactivity; Pharmacokinetics-Basic Pharmacodynamic Concepts, Therapeutic Drug Monitoring, Pharmacokinetic Models, Compartmental Models.

UNIT III MANUFACTURE OF DRUGS, PROCESS AND APPLICATIONS 09

Types of reaction process and special requirements for bulk drug manufacture - Hazardous Industrial Chemicals and Drug-related Substances, Industrial chemicals, Drug-related substances, Pharmaceutical Operations, Related Hazards and Workplace Control Measures, Fermentation, Biological and natural extraction, Pharmaceutical manufacturing of dosage forms, Facility design and process-engineering issues, Pharmaceutical unit operations, Environmental Issues.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

UNIT IV PRINCIPLES OF DRUG MANUFACTURE 09

Compressed tablets; dry and wet granulation; slugging or direct compression; tablet presses; coating of tablets; capsule preparation; oval liquids–vegetable drugs–topical applications; preservation of drugs; analytical methods and other tests used in drug manufacture; packing techniques; quality management.

UNIT V BIOPHARMACEUTICALS 09

Various categories of therapeutics like vitamins, laxatives, analgesics, contraceptives, antibiotics, hormones and biological-Functions and uses.

TEXT BOOKS

1. Gareth Thomas. Medicinal Chemistry.Anintroduction.JohnWiley.2000.

2. Katzung B.G. Basic and Clinical Pharmacology, Prentice Hall ofIntl.1995.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Types of IPR- Patents	Kl & K2
CO2	Students can understand concepts of prior art and Patent databases	Kl, K2 & K3
CO3	Students can understand the patent filing and infringement	K2 &K3
CO4	Students can understand bioethics	K2& K3
CO5	Students can understand biosafety and guidelines	K1& K2

Note: Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	L	L	L	M	S
CO2	L	M	L	L	M
CO3	M	M	M	L	L

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CO4	M	S	L	M	M
CO5	S	S	S	S	S

Indicators: 1. Strong 2. Medium 3.Low

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE IX

ANIMAL BIOTECHNOLOGY

Semester: III | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT3C9 | Credit: 6
Total periods: 90 | Exam hrs: 3

OBJECTIVES

It gives introduction to the various transformation techniques employed in animal systems. It also describes the application of genetically modified animals in the various fieldsof science. The techniques of animal cell culture and its industrial and medical applications are described.

UNIT - I INTRODUCTION 18

Animal Cell, Tissue and Organ Culture History – Definitions – steps for preparation of cell culture room, Animal cell culture- Equipments and facilities for animal cell culture. Media and its preparation, pH and pH maintenance in culture media, role of carbon dioxide, serumand-serum free media, artificial media. Techniques for establishing of cell lines– cryo preservation. Vectors for Animal cell culture – Cloning vectors – viral vectors and yeast vectors.

UNIT – II TRANSGENIC ANIMALS DEVELOPMENT AND USES 18

Artificial insemination (IUI, ICSI) – Embryo transfer – cloning (DOLLY, MOLLY and POLLY). Nuclear transplantation, Invitro fertilization technology. Genetic Engineering in animals: Mice, cattle, goat, fish and sheep and transgenic pets. Tendered meat production. Transgenic breeding strategies – Molecular farming (products with strategic importance).

UNIT - III PEST AND ANIMAL MANAGEMENT 18

Biotechnology of silkworms. Transgenic silk production – Baculo viruses vector and foreign gene expression. Embryonic stem cell preservation and its uses in endangered animals. Animal management: Cat, Dog, Pig, Horse using appeasing pheromones and their products. Blue cross in India – Society for prevention of cruelty against animals. Ethical limits of Animal use –Human

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

Rights and Responsibilities.

.M. Vasanthy

Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS
AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

UNIT – IV MOLECULAR MARKERS 18

Use of nucleic acid probes and antibodies in clinical diagnosis and tissue typing. Mapping of human genome – HGP (Human genome project). Genetic engineering approaches for the correction of genetic disorders.Human cloning.

UNIT – V GENE THERAPY AND PATENTING 18

DNA barcoding. Human gene therapy and Future of gene therapy. Accumulation of defective genes in future generation. Patenting Biotechnology inventions – patenting multi-cellular organisms – patenting of fundamental research. Indian and USA patents.

REFERENCE

1. Harrison, M.S. and Bal, I.R. (1997) General techniques of all culture Cambridge University press.
2. . R. Sasidhara(2006) Animal Biotechnology. MJP publishers
3. Darling D.C. and Morgan S.J. (1994) Animal cells, culture Media. Wiley, New York.
4. In-vitro cultivation of animal cells (1994) 1stEd. Butter worth – Heinemann Ltd.
5. R. Ian Freshney (2010). Culture of Animal cells & Manual of basic technique. 6th Edition. Wiley – Blakwell publication.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Animal cell culture, cell lines and Vectors for Animal cell culture	Kl & K2
CO2	Students can understand the concept and application of Genetic Engineering in animals	Kl, K2 & K3
CO3	Students can understand the pest and animal management	K2 &K3
CO4	Students can understand nucleic acid probes and antibodies	K2& K4
CO5	Students can understand the Human gene therapy and patenting	K2, K3 & K6

Note: Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analyzing, K5 — Evaluating, K6-Creating

Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
CO1	M	L	M	L	S
CO2	S	M	L	M	M
CO3	L	M	S	M	S
CO4	M	S	L	S	M
CO5	S	S	M	S	S

Indicators: 1. Strong 2. Medium 3.Low

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE X
PLANT BIOTECHNOLOGY

Semester: III | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT3C10 | Credit: 4
Total Periods: 90 | Exam hrs: 3

OBJECTIVES:

This course will give an idea about the basic principles and techniques involved in plant cells and to understand the concepts of transformation and achievements of biotechnology in Plant systems.

UNIT I PLANT GENOME ORGANIZATION 15

Plant genome organization – organization of chloroplast genome, nuclear encoded and chloroplast encoded genes for chloroplast proteins. Organization of mitochondrial genome – encoded genes for mitochondrial proteins.

UNIT II PLANTTISSUE CULTURE 15

Tissues culture media - Composition and preparation; Plant Propagation - Conventional &In vitro techniques; Conventional plant breeding methods - Selection, hybridization, mutation and polyploidy; Cell and tissue culture techniques for plants – Micro propagation, Callus culture, somatic embryogenesis, suspension culture, embryo culture, haploid culture, protoplast culture, protoplast fusion; Somaclonal variation; Artificial seeds; hardening.

UNIT III PLANT TRANS FORMATION TECHNOLOGY 15

Ti and Ri plasmids, binary & co-integrated vector systems; viral vectors and their applications; 35S and other promoters; genetic markers; reporter genes; virulence genes; Cloning Strategies; Gene transfer methods in plants – Direct DNA transfer methods, Agrobacterium mediated nuclear transformation, Chloroplasttransformation.

UNIT IV GENETIC TRANSFORMATION 15

Application of genetic transformation techniques for improving productivity and performance of plants: herbicide resistance, insect resistance, virus resistance, disease resistance, PR Proteins,antifungal proteins, nematode resistance, abiotic stress tolerance, Heat Shock Proteins, Male Sterile Lines, Nitrogen Fixation, long shelf life of fruits & flowers.

UNIT V PHYTOCHEMICAL PRODUCTS 15

Secondary metabolic pathways in plants . Industrial phytochemical products from plants: Alkaloids, Biodegradable Plastics, Therapeutic proteins, Antibodies, plant vaccines, herbal drugs, bioethanol and biodiesel. Extraction & purification of phyto-chemicals

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

REFERENCE:

1. An Introduction to genetic engineering in plants, Mantel. S.H, Mathews. J.A, Mickee, R.A, 1985 Black well Scientific Publishers, London.
2. In Vitro culture of plants by R.L.M. pierik, 1987. Martinus Nijhoff publishers , Dordrecht
3. Palnt cell culture, A practical approach,(2nd ed). Edited by R.A. Dixon and R.A. Gonzales. 1994. Oxford University Press, Oxford.
4. Plant Molecular Biology by Grierson and son Ltd, New york
5. Palnt Molecular Genetics by Monica. A.Hughes,1999, Pearson Education Ltd, England

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Plant genome organization	Kl & K2
CO2	Students can understand the Tissues culture media preparation	Kl, K2 & K3
CO3	Students can understand the Application of genetic transformation techniques	K2 &K3
CO4	Students can understand plant trans formation technology	K2& K4
CO5	Students can understand the Secondary metabolic pathways	K2, K3 & K4

Note: Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analyzing, K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	M	L	L	L	S
CO2	S	M	M	M	M
CO3	L	M	S	S	S
CO4	M	S	S	S	M
CO5	S	L	M	M	S

Indicators: 1. Strong 2. Medium 3.Low

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE XI

BIOPROCESS TECHNOLOGY

Semester: III | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT3C11 | Credit: 5
Total Hours: 75 | Exam hrs: 3

OBJECTIVES

This course is designed to have an understanding about the basics of Bioreactor and the Fermentation techniques, Upstream and Downstream Processing and their application

UNIT I INTRODUCTION 15

Principles of Microbial growth – introduction, the ways of growing microorganisms, ways to increase yield of microbes, Batch, fed-batch and continuous cultures (definition and kinetics).

UNIT II BIOREACTOR 15

Bioreactor / Fermenter – types, working & operation of Bioreactors, Fermenters (Stirred tank, bubble columns, airlift. Bioreactors, Static, Submerged and agitated fermentation), advantages & disadvantages of solid substrate & liquid fermentations, Quality control.

UNIT III UPSTREAM AND DOWNSTREAM PROCESS 15

Upstream processing (Strain selection, Sterilization, pHmaintainance and antifoaming), Downstream processing – extraction, separation, concentration, recovery & purification, operations (Insulin, Vitamins), Quality Control.

UNIT IV ENZYME TECHNOLOGY 15

Enzyme technology – nature of enzymes, application of enzymes, limitations of microbial cells used as catalysts in fermentation, multi-enzyme reactors, protein engineering of enzymes, cloning strategy for enzymes, technology of enzyme production, industrial applications of immobilized enzymes.

UNIT V INDUSTRIAL APPLICATIONS OF BIOTECHNOLOGY 15

Biotechnology in specific medical & industrial applications - Microbial process for immunization (Production of monoclonal antibodies and Hormones), Deterioration of paper, textiles, painted surfaces and their prevention, Biofilms, microbial biopolymers, biosurfactants.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

REFERENCES

1. Sullia S. B & Shantharam S: (1998) General Microbiology, Oxford & IBH Publishing Co. Pvt. Ltd.
2. Bisen P.S (1994) Frontiers in Microbial Technology, 1st Edition, CBS Publishers.
3. Glaser A.N & Nilaido.H (1995) Microbial Biotechnology,W.H Freeman & Co.
4. Prescott & Dunn (1987) Industrial Microbiology 4th Edition, CBS Publishers & Distributors.
5. Prescott & Dunn (2002) Industrial Microbiology, Agrobios (India) Publishers.
6. Biotechnology 12TH Edition, by satyanarayana

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Principles of Microbial growth	Kl & K2
CO2	Students can understand types OF Bioreactor	Kl, K2 & K3
CO3	Students can understand Upstream processing and Downstream processing	K2 &K3
CO4	Students can understand Enzyme technology	K2& K3
CO5	Students can understand the industrial applications of biotechnology	K2, K3 & K4

Note: Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analyzing, K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	M	M	L	L	S
CO2	S	S	M	S	S
CO3	L	S	L	M	M
CO4	M	S	S	M	M
CO5	S	S	M	M	L

Indicators: 1. Strong 2. Medium 3.Low

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE XII

LAB IN ANIMAL BIOTECHNOLOGY, PLANT BIOTECHNOLOGY, BIOPROCESS TECHNOLOGY

Semester: III
Course code: 20PBT3C12P
Total Hours: 120

Max mark: 100(Int:40,Ext:60)
Credit: 4
Exam hrs: 3

ANIMAL BIOTECHNOLOGY

1. Preparation of culture media and Sterilization
2. Leukocyte culture
3. Fibroblast culture
3. Isolation of DNA from Animal Tissue
4.. Isolation of DNA from human cheek cells
5. Size analysis of DNA by Agarose gel electrophoresis

PLANT BIOTECHNOLOGY

1. Tissue Culture Techniques: Media composition and preparation-sterilizationTechniques.
2. Micropropagation through node and shoot tip explants
3. Initiation and maintenance of callus
4. Phytochemical analysis of total protein, sugar in cultured tissue
5. Detecting antibacterial secondary metabolite production by cultured tissue
6. Qualitative analysis of secondary metabolites in cultured cells
7. Protoplast isolation and fusion
8. Culture of Agrobacterium, plasmid isolation and identification by agarose gel Electrophoresis.

BIOPROCESS TECHNOLOGY

1. Isolation of Industrially important Microbes.
2. Production of Ethanol and Wine by yeast.
3. Production of amylase.
4. Production of citric acid by solid state fermentation.
5. Immobilization of yeast cell by alginate beads
6. Visit to Fermentation Industry.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand animal cell culture medium and culturing of animal cell	K2& K4
CO2	Students can understand Tissue Culture Techniques	Kl, K3 & K4
CO3	Students can understand Protoplast isolation and fusion	K2 ,K3 &K4
CO4	Students can understand Isolation of Industrially important Microbes	K4 &K5
CO5	Students can understand production of Industrially important products	K2 & K4

Note.Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analysing; K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	S	S	L	S	S
CO2	M	S	M	S	M
CO3	S	S	L	M	M
CO4	S	M	M	S	S
CO5	S	S	S	M	S

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

ELECTIVE COURSE-III

IMMUNOTECHNOLOGY

Semester: III | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT3E3A | Credit: 5
Total Periods: 75 | Exam hrs: 3

OBJECTIVES: This course is designed to make the learner understand about the basic concepts of Immunotechnology, generation antibodies and vaccines using recent technology.

UNIT I - INTRODUCTION TO IMMUNOTECHNOLOGY 15

Immune cells, Haematopoiesis, Introduction to Immune response, Principles of Immunization; Hybridoma Technology-Production of Monoclonal Antibodies, Isolation and Purification of Monoclonal Antibodies (Affinity Chromatography), Immuno-chemistry, haptens, Toxins-Toxiods, Hapten-carrier system.

UNIT II - ANTIBODY RELATED TECHNIQUES 15

Immunoglobulins and its types; Role and properties of adjuvants, Immune modulators; B cell epitopes; Antigen – Antibody interaction, epitope mapping; Immuno assays RIA, ELISA, Western blotting, ELISPOT assay, immunofluorescence, Surface plasmon resonance, Biosensor assays for assessing ligand –receptor interaction

UNIT III - NEW GENERATION ANTIBODIES 15

Multigene organization of immunoglobulin genes; Antibody engineering; Phage display libraries; Antibodies as in vitro and in vivo probes, Immuno oncology, Scope of stem cells– definition of stem cells–concepts of stem cells–differentiation, maturation ,proliferation, pluripolericy, self – maintainance and self – renewal– problems in measuring stem cells– preservation protocols.

UNIT IV - CMI AND IMAGING TECHNIQUES 15

CD nomenclature, Identification of immune Cells; Principle of Microscopy (Immunofluorescence, Immuno-electron microscopy, Flurochromes). Staining techniques for live cell imaging and fixed cells; Flow cytometry. In vivo cell tracking techniques; Microarrays, Applications; Cell Functional Assays – lymphoproliferation, Cell Cytotoxicity, mixed lymphocyte reaction, Apoptosis, Cell cloning.

UNIT V – CLINICAL IMMUNOLOGY 15

Hypersensitivity, Immunity to Infection, Autoimmunity, Transplantation, Tumor immunology, immunodeficiency; Types and Mechanism of vaccines; Transfusion of immuno-competent cells, Stem cell therapy.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

REFERENCES

1. Benjamin E. Coico and G. Ssunskine (2000) Immunology a short course, IV edn. (Chapters 1-13) Wiley – Liss Publication, NY
2. Kuby. J (1997) Immunology, 3Ed. WH Freeman & Co. NY
3. Goldsby R.A. Kindt T.I. and Osborne B.A. (2000) Kuby Immunology IV edn. WH Freeman & Co. NY.
4. Janeway C.A. Travers P. Wolport M and Capra J.D (1999) Immunology IV edn. Current Biology, NY
5. Roitt, I (2000), Essential Immunology, IV edn. Blackwell Sci. NY
6. Brown, F, Chanock, R.M., Lerner R.A. (Editiors) (1986) Vaccines 86; New approaches to Immunization
7. Fathman, C.G. Fitch F.W. (1982) Isolation, Characterization and utilization of TIymphocytes clones, Academic Press, London
8. Goding, J.W. (1998) Monoclonal antibodies: Principles and practice, Academic Press, London

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Immune cells, Haematopoiesis	Kl & K2
CO2	Students can understand Immunoglobulins and its types	Kl, K2 & K3
CO3	Students can understand Multigene organization of immunoglobulin genes	K2 &K3
CO4	Students can understand CMI and imaging techniques	K2& K3
CO5	Students can understand the Hypersensitivity, Immunity to Infection	K2, K3 & K4

Note: Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analyzing, K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	M	M	L	L	S
CO2	S	S	M	S	S
CO3	L	S	L	M	M
CO4	M	S	S	M	M
CO5	S	S	M	M	L

Indicators: 1. Strong 2. Medium 3.Low

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

ELECTIVE COURSE-III

A) MARINE BIOTECHNOLOGY

Semester: III | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT3E3B | Credit: 4
Total Periods: 75 | Exam hrs: 3

OBJECTIVES: To impart knowledge on marine microbes. This paper is also designed to provide knowledge on active compound in marine microbes and their applications in various aspects.

UNIT I BASICS OF MARINE BIOTECHNOLOGY 15

Biotechnology in marine science- history of marine biotechnology application in aquaculture, pharmaceutical, environment remediation, biofouling and biocorroison.

UNIT II MOLECULAR TOOLS 15

PCR – principle and synthesis; its applications; types of PCR – Multiplex PCR – uses a number of pairs of primers to allow analysis of a number of fragments in a single sample . Respective sequence- RT-PCR-Single cell PCR.

UNIT III BIOACTIVE COMPOUNDS 15

Bioactive marine natural products -, anti- bacterial, anti-fungal, anti-viral anti tumor compounds, anti inflammatory / analgesic compounds, anti viral agents, antihelminthic from macroalgae, marine bacteria, dinoflagellates, coelenterates(corals),bryozoans, sponges and tinicates. Extraction, isolation, purificationand characterization of bioactive compounds from marine organisms.

UNIT IV ALGAL BIOTECHNOLOGY 15

Algal biotechnology - single cell protein, hydrocolloids, agarose, carrageen alginates and other by products. Marine Enzyme sources and their applications, Marine Lipid sources and their applications.

UNIT V MARINE BIOFLOULING 15

Biofouling and control technology- Biofouling organisms-Problems by biofouling- Antifouling paints and its environmental pollution-Biotechnological approach to biofouling control. Recent Approaches to control Fouling Organisms.

REFERENCES

1. Bhakuni, D.S., Rawat, D.S. (2005). Bioactive Marine Natural Products. Springer.
2. Qubiroga, H.(2006) Marine biodiversity, Springer, 353pp.
3. Attaway, D.H. and Z. Oskar (1993) Marine Biotechnology Vol I. Pharmaceutical and bioactive natural products. Springer publications, Plenum Press, USA. 524pp.
4. Fingerman, M., Nagabhushanam, R and M. Thompson (1998) Recent advances in marine biotechnology. Vol. 2.

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Biotechnology in marine science	Kl & K2
CO2	Students can understand molecular tools	Kl, K2 & K3
CO3	Students can understand Bioactive marine natural products	K2,K3 &K6
CO4	Students can understand Algal biotechnology	K2& K3
CO5	Students can understand the Biofouling and control technology	K2, K3 & K6

Note: Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analyzing, K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	M	M	M	L	L
CO2	S	M	L	S	S
CO3	L	S	M	M	M
CO4	M	M	S	L	M
CO5	S	S	S	M	M

Indicators: 1. Strong 2. Medium 3.Low

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

CORE COURSE - XIII

BASICS OF RESEARCH AND ENTREPRENEURSHIP

Semester: IV | Max mark: 100(Int:25,Ext:75)
Course code: 20PBT4C13 | Credit: 5
Total Periods: 90 | Exam hrs: 3

OBJECTIVE

This Paper is a way to systematically solve a research problem. It aims to give the work plan of research. It provides training in choosing methods materials, scientific tools and techniques relevant to the solution of the problem. The purpose of this course is to give an understanding about biotechnology based entrepreneurship among students.

UNIT I DATA COLLECTION AND ANALYSIS 18

Data collection and analysis – Web browsing and searching – Electronic biological databases – NCBI, PubMed, Sequence and Structure databases. Ethics in publication – Checking for Plagiarism - Research Publications,

UNIT II JOURNALS 18

Journals: standard of research journals - impact factor - citation index. Information retrieval - access to archives and databases, search engines - google, pubmed -national informatics center network services. Online data base library.

UNIT III SELECTION OF PROBLEMS 18

Research: selection of problems - stages in the execution of research; preparationof manuscript - report writing - format of journals - proof reading - sources of information; journals, reviews, books, and monographs-bibliography.

UNIT IV INTRODUCTION TO ENTREPRENEURSHIP 18

Entrepreneurship definition, factors necessary for entrepreneurship, desirables in a startup, mistakes to be avoided, pillars of bio-entrepreneurship, promoting bio-entrepreneurship, biotech company roadmap, legal, regulatory and other business factors.

UNIT V IDENTIFICATION OF PROJECT 18

Project management: Search for a business idea, concept of project and classification, project identification, project formulation, project design and network analysis, project report, project appraisal, Assessment of Bio projects and Generation of Fund.

.M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.

REFERENCE:

1. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
2. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press.
3. Research Methodology – C.R.Kothari
4. Select references from the Interne
5. Yali Friedman. 2008. Best Practices in Biotechnology Education. Logos Press.
6. Robert Nicholas Trigiano and Dennis John Gray. 2004. Plant Development and Biotechnology CRC Press. 358 pages.
7. Vasant Desai. 2005. Dynamics of Entrepreneurial Development and Management. 6th Edition. Himalaya Publishing House, 2005.
8. Prasannan. Projects: Planning Analysis, Selection, Implemantation & Review. 7th Edition

Course Outcome mapping with Knowledge level

Course Outcome	CO Statement	Knowledge level
COl	Students can understand Data collection and analysis for research	Kl K2&K5
CO2	Students can understand standard of research journals	K2 & K3
CO3	Students can understand selection of research problems	K2,K3 &K6
CO4	Students can understand Entrepreneurship	K2& K6
CO5	Students can understand the Project management	K2, K3 & K5

Note: Kl-Remembering,K2 —Understanding; K3 —Applying, K4 —Analyzing, K5 — Evaluating, K6-Creating

Mapping with Programme outcome

Course outcome	PO1	PO2	PO3	PO4	PO5
COl	M	M	M	L	M
CO2	S	M	M	L	S
CO3	M	L	L	M	M
CO4	M	S	M	M	S
CO5	L	M	S	L	S

Indicators: 1. Strong 2. Medium 3.Low

M. Vasanthy
Dr.M.Vasanthy Nachiappan
(University Representative)
Assistant Professor in Environmental Biotechnology ,
Bharathidasan University, Trichy

Mr. G. Jayakumar,
(Industrialist)
Deputy Manager Environmental
A.R. Dairy Food Pvt.Ltd.
10/5C, Madurai road,
Begampur (PO).

Dr.K.S. Jayachandran,
(Subject Expert),
Assistant Professor in Bioinformatics,
Bharathidasan University Trichy.

HEAD
DEPARTMENT OF BIOTECHNOLOGY,
DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS),
PERAMBALUR 621 212.