Sri Kaliswari College (Autonomous), Sivakasi

(Affiliated to Madurai Kamaraj University

Re-Accredited with 'A' grade (CGPA 3.30) by NAAC)

Programme Scheme, Scheme of Examinations and Syllabi

(For those who join from June 2018 and afterwards)

Department of Biotechnology

PG – Biotechnology

Curriculum Design and Development Cell

Annexure K

Sri Kaliswari College (Autonomous), Sivakasi

(Affiliated to Madurai Kamaraj University

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Programme Scheme, Scheme of Examinations and Syllabi

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PG– Biotechnology

Curriculum Design and Development Cell

HOD **Dean of Science** **Dean of Academic Affairs** **Principal**

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

Members of Board of Studies (2018-2021)

S.No.	Board Members	Name and Designation
i.	Chairman of the Board	Dr.M.Sujatha Head, Department of Biotechnology, Sri Kaliswari College, Sivakasi.
ii.	University Nominee	Dr.H.Shakila, Associate Professor and Head, Department of Molecular Microbiology, School of Biotechnology, Madurai Kamaraj University, Madurai.
iii.	Academic Expert 1	Dr.A.Veeraravi, Professor, Department of Biotechnology, Science campus, Alagappa Universtiy, Karai
iv.	Academic Expert 2	Dr. E. Kannapiran, Professor, Department of Animal Health Management, Alagappa University, Karaikudi.
v.	Industrial Expert	Mr.C.Mariappan, Senior Assistant Manager, T. Stanes and Co., Ltd., Coimbatore.
vi.	Alumnus	Mr.T.Victor Athisayam, UGC-BSR JRF, Department of Plant Biotechnology, School of Biotechnology, Madurai Kamaraj University, Madurai.
Faculty Members in the Department		
vii.	Dr.R.Narayana Prakash	Senior Faculty in Biotechnology
viii.	Mr.T.Sriram	Associate Professor in Biotechnology
ix.	Mr.K.Siva	Assistant Professor in Biotechnology
x.	Ms.APreethi	Assistant Professor in Biotechnology
xi.	Dr.S.Prakash	Assistant Professor in Biotechnology
xii.	Mrs.P.Devi	Assistant Professor in Biotechnology
xiii.	Dr.K.Manikandan	Assistant Professor in Biotechnology
xiv.	Ms.G.Mareeswari	Assistant Professor in Biotechnology

Sri Kaliswari College (Autonomous), Sivakasi

(Affiliated to Madurai Kamaraj University

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Programme Scheme, Scheme of Examinations and Syllabi

(For those who join from June 2018 and afterwards)

Department of Biotechnology

PG Programme – M.Sc. Biotechnology

Curriculum Design and Development Cell

Department of Biotechnology
M.Sc. Biotechnology (Semester) – (2018-2020)
Objectives, Outcomes, Regulations

Programme Objectives:

- To enable the students acquire knowledge about biological databases.
- To enable the student acquire the knowledge about technical skills in biotechnology.
- To enable the students to understand about the basics of Molecular biology & Molecular genetics.

Programme Outcomes

Knowledge

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

PO 2: Synthesis of knowledge and critical thinking

Skills

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

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

Attitude

PO 1: Acquisition of professional ethics and human values.

PO 2: National Integration and Social Commitment to Society.

Programme Specific Outcomes:

- **Knowledge**: Core course of biotechnology like Biochemistry, Molecular biology, rDNA technology helps to improve the basic knowledge.
- **Skill Development**: Project and practical training in various fields of biotechnology.
- **Higher level ability**: Technical skills like SDS PAGE, PCR, Cloning, Transforamtion, Micropropagation develop higher level ability .
- **Progression to higher studies**: Indepth knowledge on Animal biotechnology, Molecular biology, Biochemistry, rDNA technology, Microbial biotechnology equip the students to go for higher studies.
- **Entrepreneurship and Employment**: Ability to design experiment during research project, Opportunities in learning bee keeping , Mushroom cultivation helps in becoming entrepreneur.

Regulation

Duration of the Programme: Two years (Equivalent to four semesters)

Eligibility:

Candidates who have completed B.Sc., degree in Botany, Zoology, Biochemistry, Microbiology, Biotechnology or any branch of life sciences, Chemistry, Mathematics and Physics with any subject in life sciences as ancillary subject.
Candidates secured at least 60% of marks in aggregate are eligible to apply.
A relaxation of 10% marks in the aggregate will be given to SC/ST/PH students.

Medium of Instruction : English
Age Limit : No age limit

Transitory Permission:

Students joined from 2018 - 2020 may be permitted to write their examinations in this pattern up to April 2023.

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

Choice Based Credit System

PG Programme – M.Sc

2018 - 2020

Scheme of Examination / Question Paper Pattern

Theory Examination

The Internal and External marks should be allotted in the ratio 25:75.

Internal Marks :

i.	Test (3 Tests)	: 15 Marks (Average of the best two tests)
ii.	Assignment	: 5 Marks (Average of two)
iii.	Seminar / Group Discussion/ Peer Teaching	: 5 Marks
	Total	**: 25 Marks**

External Question Paper Pattern :

Time: 3 Hours Max.Marks: 75

The question paper for external exam will have three parts.

Part – A (10 X 1 =10)

Question No.1 to 10 – All are Multiple Choices (2 Questions from Each Unit)

Part – B (5 X 7 =35)

Choosing Either (a) or (b) Pattern – Alternative Choice (One question from Each Unit)

Question No. 11. (a) or 11. (b) - From Unit I
12. (a) or 12. (b) - From Unit II
13. (a) or 13. (b) - From Unit III
14. (a) or 14. (b) - From Unit IV
15. (a) or 15. (b) - From Unit V

Part – C (3 X 10 =30)

Answer any Three out of Five Questions (One Question from Each Unit)

Question No. 16 – 20.

16 - From Unit I
17 - From Unit II
18 - From Unit III
19 - From Unit IV
20 - From Unit V

Blue Print for Question Paper Setting

Component / Unit	Knowledge			Understanding			Higher objective			Total Marks
	PART A	PART B	PART C	PART A	PART B	PART C	PART A	PART B	PART C	
UNIT I	**1** (1) **2** (1)				**11a** (7)	**16** (10)		**11b** (7)		26
UNIT II	**3** (1) **4** (1)	**12a** (7)				**17** (10)		**12b** (7)		26
UNIT III	**6** (1)	**13a** (7)			**13b** (7)		**5** (1)		**18** (10)	26
UNIT IV	**8** (1)		**19** (10)		**14a** (7) **14b** (7)		**7** (1)			26
UNIT V	**9** (1) **10** (1)	**15a** (7)			**15b** (7)	**20** (10)				26
Total	8	21	10		35	30	2	14	10	130

- Knowledge based - 30%
- Understanding - 50%
- Higher Objective - 20%

Practical Examination (Non - Computer)

Internal Marks :

i. Regular Practicals : 30 Marks
ii. Record : 10 Marks
Total : 40 Marks

External Marks :

i. Major Experiment : 20 Marks
ii. Minor Experiment : 10 Marks
iii. Spotters : 20 Marks
iv. Record : 10 Marks
Total : 60 Marks

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

Choice Based Credit System-Curriculum Structure

PG Programme - M.Sc Biotechnology

2018-2020

Course	Sem I	Sem II	Sem III	Sem IV	Credits
Core Courses	**6(5)** **6(5)** **6(4)** **6(4)**	**6(5)** **6(5)** **6(4)** **6(4)**	**6(5) 6(5)** **6(5)** **6(5)**	**6(6)** **6(6)** **18(10)**	**78**
Major Elective	**6(4)**	**-**	**6(4)**		**8**
Non Major Elective	**-**	**6(4)**		**-**	**4**
Total hours(per week)	**30**	**30**	**30**	**30**	**90** **120**

Sri Kaliswari College (Autonomous), Sivakasi.
Department of Biotechnology
Choice Based Credit System-Curriculum Pattern
PG Programme- M.Sc Biotechnology
2018 – 2020

Semester	Course Code	Course Name	Hours	Credits
I	18PBT C11	**Core Course I:** Biochemistry	6	5
	18PBT C12	**Core Course II:** Microbiology	6	5
	18PBT C13	**Core Course III:** Cell and Molecular Biology	6	4
		Core Course IV: Practical I:		
	18PBT C1P	Lab in Biochemistry and Microbiology	6	4
		Major Elective Course-I:		
	18PBT O11	1.Biophysics and Biostatistics	6	4
	18PBT O12	2. Bioinformatics		
		Total	**30**	**22**
II	18PBT C21	**Core Course V:** Immunology and Immunotechnology	6	5
	18PBT C22	**Core Course VI:** Recombinant DNA technology	6	5
	18PBT C23	**Core Course VII:** Microbial Genetics.	6	4
	18PBT C2P	**Core Course VIII: Practical II:**		
		Lab in Immunology,Recombinant DNA Technology and Microbial Genetics	6	4
		Non Major Elective Course I:		
	18PBTN21	1.Concepts in Biotechnology	6	4
	18PBTN22	2.Cancer Biology		
		Total	**30**	**22**
III	18PBT C31	**Core Course IX:** Plant Biotechnology	6	5
	18PBT C32	**Core Course X:** Animal Biotechnology	6	5
	18PBT C33	**Core Course XI:** Genomics and Proteomics	6	5
	18PBT C3P	**Core Course XII: Practical III:** Lab in Plant Biotechnology and Animal Biotechnology	6	5
		Major Elective Course II:		
	18PBT O31	1**.** Enzymes and Enzyme Technology.	6	4
	18PBT O32	2. Molecular Oncology		
		Total	**30**	**24**

IV	18PBT C41 18PBT C42 18PBT J41	**Core Course XIII:** Marine Biotechnology **Core Course XIV:** Bioprocess technology **Core Course XV:** Project	6 6 18	6 6 10
		Total	**30**	**22**
Total			**120**	**90**

Semester	**I**	**II**	**III**	**IV**	**TOTAL**
Credits	**22**	**22**	**24**	**22**	**90**

Dean of Science **Dean of Academic Affairs** **Principal**

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
PG Programme - M.Sc
Semester I
(2018-2020)
Core Course – I: Biochemistry (18PBTC11)
(For those who join from June 2018 and afterwards)

Credits : 5 **Int. Marks : 25**
Hours/Week : 6 **Ext. Marks : 75**
Duration : 90 hrs **Max. Marks : 100**

Course Objectives:

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

Course Outcomes:

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

UNIT I **(18 hrs)**

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

UNIT II **(18 hrs)**

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

UNIT III **(18 hrs)**

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

UNIT IV **(18 hrs)**

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

UNIT V **(18 hrs)**

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

Text Books:

1. J.L.Jain, Sunjay Jain, Nitin Jain, "Fundamentals of Biochemistry", S.Chand and company Ltd. Sixth Edition, 2007.
2. Eric E.Conn, Paul K.Stumpf, George Breening and Roy H, "Outlines of Biochemistry", John Wiley and Sons, 2005.
3. Lehninger.A.L, Nelson. D.L, Cox M.M, "Principles of Biochemistry", W.H. Freeman and company, NewYork, Fourth Edition, 2004.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	3	3.1 - 3.5	36 – 52
II	1	5	5.1 - 5.5	73-75
		6	6.1 - 6.6	76-82
		7	7.1 - 7.4	78-80
		8	8.1-8.4	85-96
		21	21.5	131
		22	22.1 - 22.6	458-521
III	3	21	21.1 - 21.4	700 - 752
IV	3	18	18.1 - 18.5	500 - 520
V	3	22	22.1 - 22.5	854 – 870

Reference Books:

1. Voet .D, Voet J.G, and Pratt C.W, "Fundamentals of Biochemistry", John wiley and sons, Newyork, 1999.
2. R.K. Murray, D.K.Granner,P.A. Mayes and V.W.Rodwell, "Harper's Biochemistry", Mc Graw Hill Publications, Twenty fifth Edition, 2005.
3. Lubert Stryer, "Biochemistry" Stanford university, W.H.Freeman company, New York, 1999.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
PG Programme - M.Sc
Semester I
(2018-2020)
Core Course - II: Microbiology (18PBTC12)
(For those who join from June 2018 and afterwards)

Credits : 5 **Int. Marks : 25**
Hours/Week: 6 **Ext. Marks : 75**
Duration : 90 hrs **Max. Marks : 100**

Course Objectives:

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

Course Outcomes:

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

UNIT I (**18 hrs**)

History and scope of Microbiology - Recent Advances in Microbiology- Principles, Structure and Applications of Microscopes. Classification of Microorganisms - Domain, Kingdom Concept -Classification of Bacteria- (Bergey's Manual) - Fungi (Alexopoulus) – Algae - Viruses (Baltimore classification).

UNIT II (**18 hrs**)

Physiology of Bacterial Growth -Growth Conditions, Microbial Nutrition– Macro, Micro Nutrients & Growth Factors. Factors influencing and affecting Microbial Growth– pH, Temperature and Light. Control of Microorganisms – Physical and Chemical Agents, Antimicrobial Chemo therapy, Respiration, Fermentation and Photosynthesis.

UNIT III **(18 hrs)**

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

UNIT IV **(18 hrs)**

Agricultural Microbiology - Microbial Communities in Rhizosphere - Rhizobium, Nitrogen fixing Bacteria and their role in Nitrogencycle, Nif Gene. Biofertilizer- Types and Its Application, Phosphate Solubilization Microbes as a Biofertilizer, Composting-Role of Microorganism in Composting, Vermicomposting. Biopesticides- Types of Microbial pesticides. Mycorrhizae and Actinorrhizae.

UNIT V **(18 hrs)**

Environmental Microbiology- Biogas production, Microbial Leaching, Biodegradation of Xenobiotics, Solid waste management-Sewage treatment- Primary , Secondary and Tertiary treatment. Molecular Taxonomy and Current Methods of Microbial Identification for Systemic Studies - Epigenetics.

Text Books:

1. P.D.Sharma, Microbiology, "A Text Book For University Students", Third Edition, Rastogi Publications, 2015-2016.
2. Ananthanarayanan and J.Panicker, "Text book of Microbiology", Nineth Edition, University Press Publishers, 2013.
3. R.C.Dubey and D.K. Maheswari, "Text book of Microbiology", S.Chand Publication, 1999.
4. Michael J.Pelczar, C.S.Chan and Noel R.Krieg, "Microbiology", McGrew Hill publication,1993
5. Ananthanarayanan and J.Panicker, "Text Book of Microbiology for nurses", University Press Publishers, 2010.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1		3 -20, 21-28
	2	4	4.47	439 -443
	3	2		37-41
	4	17		44-45
		19		403-405
II	1	4		81-90,98-104
III	2	3	3.22,3.29	208 - 220, 273- 280
		4	4.57, 4.58, 4.60	532 - 535, 543 -548, 565-569
		5	5.64	609 -610,610 -612
	5	5	5.31	123-125
		6	6.36	135-138
		7	7.40	142-145
IV		22		537-545
IV		23		547 -555
V		17,18		445-452,452- 453,445-458

Reference Books:

1. Jack Parker, John M. Martinko, Michael M. Madigan, "Brock Biology of Microorganism", Prentice Hall PTR, 2002.
2. Stuart Hogg, "Essential Microbiology", John Wiley and sons Ltd, 2005.
3. Gerard J. Tortora, Berdell R. Funke, Christine & L. Case, "Microbiology - An Introduction", Benjamin Cummings, U.S.A., 2001.
4. Danial Lim, "Microbiology", McGraw-Hill Companies, New York, 1998.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
PG Programme – M.Sc
Semester I
(2018-2020)
Core Course – III: Cell and Molecular Biology (18PBTC13)
(For those who join from June 2018 and afterwards)

Credits	**: 4**	**Int. Marks**	**: 25**
Hours/Week	**: 6**	**Ext. Marks**	**: 75**
Duration	**: 90 hrs**	**Max. Marks**	**: 100**

Course Objectives:

- To recognize the structure and functions of a cell and cell organelles.
- To comprehend the molecular structure and function of DNA and RNA.

Course Outcomes:

1. Understand the basic structure and function of cell and cell organelles in Prokaryotes and Eukaryotes.
2. Understand the history of genetic transformation principle of DNA.
3. Analyse the Watson and Crick helical structure of DNA and to understand the different forms of DNA, mRNA, rRNA and tRNA.
4. Explore the mechanisms of DNA replication, transcription and protein translation in both Prokaryotes and Eukaryotes.
5. Role of Physical, Chemical and Biological agents that causes mutation and DNA damage.
6. Analyse the mechanisms of DNA repair.

UNIT I **(18 hrs)**

Genome organization of Prokaryotic and Eukaryotes-Nucleus and Nucleolus-Ultra structure and composition-Structure and organization of Eukaryotic chromosomes-Heterochromatin and Euchromatin-Mitochondria and Chloroplast genome organization and its inheritance-Molecular events of cell division and cell cycle-regulation of cell cycle events-Apoptosis and Necrosis.

UNIT II **(18 hrs)**

Plasma membrane-Transport across membrane-Passive diffusion, osmosis, Active transport, Ion Channels, ABC transporters, Na^+ and K^+ pump, Ca^{2+} ATPase pump, co-transport, symport, antiport-Cell to cell interactions-Cell adhesion-Integrins-Selectins-Cadherins-Cell Junction-Tight and gap junctions-Desmosomes-Plasmodesmata-Cell signaling-Role of secondary messengers-Protein localization and Targeting.

UNIT III **(18 hrs)**

Watson and Crick model of double helix of DNA-Denaturation and Renaturation-Experimental evidence that DNA as genetic material-DNA replication in Prokaryotes and Eukaryotes-Enzymology-types of DNA polymerase and mechanism of DNA replication-Structure and function of RNAs-rRNA, tRNA, mRNA and noncoding RNAs.

UNIT IV **(18 hrs)**

Mechanism of transcription in Prokaryotic and Eukaryotic genes-Post transcriptional modifications of mRNA-5'capping, 3'Poly-A tail, RNA Splicing and its mechanism-Alternative splicing-Genetic code-Wobble hypothesis-Mechanism of translation in Prokaryotes and Eukaryotes-Polysomes-Post translational modification of proteins-Protein turnover and degradation-Regulation of gene expression in Prokaryotes and Eukaryotes.

UNIT V **(18 hrs)**

Genetic recombination-Mutations-Spontaneous and Induced mutation-Mutagenesis by Physical and Chemical agents-DNA repair mechanisms-Gene Silencing-Definition, types-transcriptional and post transcriptional gene silencing-RNAi pathway (si RNA and mi RNA).

Text Books:

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K. and Walter, P. "Molecular Biology of the cell", Garland science, New York, Third Edition, 2001.
2. Rastogi, V.B. "Fundamentals of Molecular Biology", Ane Books Pvt. Ltd., New Delhi, 2010.
3. Freifelder, D. "Molecular Biology", Jones and Barlett Publishers, USA, 2004.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	15	15.1-15.2	721 - 758
		17	17.1-17.41	863-906
		18	18.1-18.28	911-943
II	1	19	19.1-19.16	949 - 971
	2	7	7.1-7.10	167 - 187
		5	5.1-5.14	124 - 138
		5	6.1-6.5	139 - 157
III	2	8	8.1-8.18	188 - 229
		11	11.1-11.9	260 - 283
		12	12.1-12.6	289 - 299
		13	13.1-13.13	301 - 327
		15	15.1-15.10	350 - 361
IV	2	16	16.1-16.7	367 - 386
	3	11	10.1-10.5	277 - 292
		20	11.1-11.7	293 - 313
V	3	20	20.1-20.9	641 - 673

Reference Books:

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K. and Walter, P., "Biology of the cell", Garland Science, New York, 2010.
2. Cooper, G.M. "The Cell – A Molecular Biological Approaches", ASM Press, Washington, 2009.
3. Lewin, B. "Genes XII", Oxford University Press, Oxford, 2010.
4. Garrett, R.H., Gresham, C.M. "Molecular aspects of Cell Biology", International edition, Saunders College Pub, 1995.
5. Pavlella, P. "Introduction to Molecular Biology", McGraw-Hill Companies Inc., New York, 1998.
6. Roy, S.C and De, K.K. "Cell Biology", New Central Book Agency, Calcutta, 2010.
7. Walker, J.M., and Gingold, E.B. "Molecular Biology and Biotechnology", Panima University Press, Oxford Publishing Co., New Delhi, 2002.
8. Lodish, H., Baltimore, D., Berk, A., Zipursky, B.L., Mastsydaira, P. and Darnell, J. "Molecular Cell Biology", Scientific American Books Inc. New York, 2004.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
PG Programme - M.Sc
Semester I
(2018-2020)

Core Course– IV: Practical I: Lab in Biochemistry and Microbiology (18PBTC1P)
(For those who join from June 2018 and afterwards)

Credits : 4 **Int. Marks : 40**
Hours/Week : 6 **Ext. Marks : 60**
Duration : 90 hrs **Max.Marks : 100**

Course Objectives:

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

Course Outcomes:

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

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1. Theory and applications of Colorimeter, spectrophotometer, pH meter and buffers.
2. Methods of Protein estimation (Lowry's, Bradford's method).
3. Thin layer chromatography, paper chromatography and Column chromatography.
4. Extraction and purification of enzyme using Ammonium sulphate precipitation.
5. Specific activity of an amylase enzyme-Effect of pH, Temperature and Substrate concentration.
6. SDS PAGE.
7. DPPH antioxidant assay.
8. Enumeration of Microorganisms from soil, water, air ,food samples and staining techniques
9. Biochemical tests-IMViC tests
10. Growth curve analysis and measurement of growth rate.
11. Antibiotic susceptibility testing.
12. Isolation of auxotrophic mutants.

Reference Books:

1. J Jayaraman, “Laboratory manual of Biochemistry”, New age international publishers, Sixth Edition, 1999.
2. Keith Wilson, John Waler, “Principles and Techniques of Practical Biochemistry”, Cambridge University Press, Fifth Edition, 2005.
3. Dr.P.Palanivelu, “Analytical biochemistry and separation techniques”, Twenty first Century Publications, 2000.
4. S.Sadasivam and A.Manickam, “Biochemical methods”, New age international publishers, Second Edition, 2004.
5. KeithWilson,,John Waler, “Principles and techniques of practical biochemistry”, Cambridge University Press, First Edition, 2000.
6. Ronald M.Atlas *et al*.,”Experimental Microbiology”, Benjamin and Cummings Publication, 1997.
7. J.G. Cappuccino and N. Sherman, “Microbiology: A Laboratory Manual”, Addison-Wesley, 2002.
8. Kannan.N., “Lab manual in Microbiology” , Panima publishers, New Delhi,1995.
9. J.G.Holt,N.R.Krieg,”Bergey’s Manual of Determinative Bacteriology”, Ninth Edition, 2000.

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

PG Programme - M.Sc

(2018-2020)

Semester I

Major Elective Course-I: Biophysics and Biostatistics (18PBTO11)

(For those who join from June 2018 and afterwards)

Credits	**: 4**	**Int. Marks**	**: 25**
Hours/Week	**: 6**	**Ext. Marks**	**: 75**
Duration	**: 90 hrs**	**Max. Marks**	**: 100**

Course Objectives:

- To make the students understand the basic principles of Biophysics.
- To make the students grab with the fundamentals of Biophysical techniques and understand with application of structural biology.
- To expose students to various bio statistical tools used in biotechnology research.

Course Outcomes:

1. Differences between the four different protein levels.
2. Understand the role of macromolecules in biological membranes.
3. Ability to understand the theoretical aspects of biophysical techniques.
4. Understand the role of structural biology in biology.
5. Knowledge in the application of structural biology.
6. Knowledge in mean, median and mode and the difference in tabulation.
7. Understand about diagrams and tabulations and their role in experimental studies.
8. Knowledge about ANOVA and their application in research studies.

UNIT I **(18 hrs)**

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

UNIT II **(18 hrs)**

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

UNIT III **(18 hrs)**

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

UNIT IV **(18 hrs)**

Data Collection- Formation of Frequency Distribution, Mean, Median and Mode, Variations, Standard Deviation, Standard Error, Chi - Square Test. Basic Concept of Probability.

UNIT V

Analysis of Variance-One way ANOVA, Two ANOVA. Duncan's Multiple Range test(DMRT)-Students t test-Correlation and Regression.

Text Books:

1. Vasantha Pattabhi and N.Gautham, "Biophysics", Narosa Publishing House, 2003
2. N.Arumugam and V.Kumaresan, "Biophysics and Bioinstrumentation", Saras Publications, 2013.
3. Ramakrishnan. P, "Biostatistics", Saras publications, India, 2010.

Unit	Text Book No.	Chapter	Section	Page No.
I	2	1	1.1 - 1.5	1 - 4
I	1	10	10.3	161 - 172
II	1	10	10.2	144 - 158
III	2	20	20.1 - 20.5	178 - 200
IV	2	22	22.1	283 - 295
		23	23.1	303 - 310
	3	6	6.3 - 6.15	116-149,162-178
V	2	25	25.1 - 25.12	315 - 316
	3	10	10.6 - 10.8	325, 326-331, 334-337, 346- 361

Reference Books:

1. C. Branden, J.Tooze, "Introduction to protein structure", Garland publishing Inc, 1991.
2. L. Stryer, "Biochemistry", WH Freeman and Co., New York, 1999.
3. Cantor and Schimmel, "Biophysical chemistry Part I, II and III", Freeman and CO., NewYork, 1980.
4. S. Neidle, "Nucleic acid structure", VCH Publishing Weinheim, 1987.
5. Veer Bala Rastogi, "Fundamentals of Biostatistics", Ane books, New Delhi, India, 2004.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
PG Programme - M.Sc
Semester I
(2018-2020)
Major Elective Course- I: Bioinformatics (18PBTO12)
(For those who join from June 2018 and afterwards)

Credits	**: 4**	**Int. Marks**	**: 25**
Hours/Week	**: 6**	**Ext. Marks**	**: 75**
Duration	**: 90 hrs**	**Max.Marks**	**: 100**

Course Objectives:

- To provide students with a practical and the theoretical knowledge of DNA sequences, genomes, protein sequences and protein structure information that will prepare them for careers in bioinformatics, academia, industry and research.
- To understand the vast quantities of data generated in the fields of Molecular and Biological Sciences.
- To help students to acquire problem-solving skills and gain experience in understanding, handling and developing important software used in pharmaceutical, chemical and biotechnology industries.

Course Outcomes:

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

UNIT I **(18 hrs)**

Introduction to Bioinformatics: Definitions-Concepts-Scope-Applications-Genome Projects-Human Genome Project and its Current Status-Mouse Genome Project-Role of Bioinformatics in various fields.

UNIT II **(18 hrs)**

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

UNIT III **(18 hrs)**

Sequence Alignment: Pairwise Alignment-Definition-Local alignment-BLAST-Global alignment-FASTA-Multiple sequence alignment-Definition- Clustal W and T-coffee- Phylogenic tree- Definition- PHYLIP-Tree constructing Methods-Distance Based Method-the Neighbour joining- Fitch Morgolish- Maxim parsimony method.

UNIT IV **(18 hrs)**

Drug Designing: Computer Based Drug Designing- Structure Based Drug Designing- Molecular Docking- Chemoinformatics- Chemdraw- Marvin Sketch- Chemspider-QSAR Studies in Drugs-ADME/TOXBox study- analyzes the effect of drugs- Micro array analysis software.

UNIT V **(18 hrs)**

Protein Primary Structure Analysis: Structure analysis using EXPASY tools-Amino acid composition analysis- Molecular weight- Protein Secondary Structure Analysis- Hydrophobicity and Hydropathy Profiles- Helical Wheel- Protein Secondary Structure Prediction – GOR- Ab initio.

Text Books:

1. Paul G and Teresa K.Attood, "Bioinformatics and molecular Evolution", Blackwell Publishing,2012.
2. David M. Mount, "Bioinformatics sequence and genome analysis", Gold Spring Harbor Press Publishers, England, 2009.
3. Irfan A Khannum Atiya," Recent Advance in Bioinformatics", Ukaaz Publication, 2003.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1-1.9	283-330
		12	12.1-12.6	330-333
II	2	1	7.2-7.9	31 - 382
		2	2.1-2.9	41-49
		4	4.9-4.11	189-191
		6	6.1-6.9	281-298
		7	7.2-7.9	426,381-467

III	2	9	9.1-9.30	443-450
		10	10.2-10.4	941-949
IV	3	6	6.1-6.4	42 - 60
V	3	7	7.1-7.5	341 - 349

Reference Books:

1. Andrew Leach, "Molecular Modeling", Black Well Publication, Second Edition, USA, 2003.
2. T.K. Westhead, " Instant notes on Bioinformatics"-VIVA Publishers. New Delhi, 2012.

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

PG Programme - M.Sc

Semester II

(2018 - 2020)

Core Course – V: Immunology and Immunotechnology (18PBTC21)

(For those who join from June 2018 and afterwards)

Credits : 5	**Int. Marks : 25**
Hours/Week : 6	**Ext. Marks : 75**
Duration : 90 hrs	**Max. Marks : 100**

Course Objectives:

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

Course Outcomes:

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

UNIT I **(18 hrs)**

Overview of the immune system-Types of immunity-Lymphoid organs-Cells of the immune system-Origin, development and differentiation of B and T lymphocytes-Antigen-Properties, Types, Immunogenicity and Antigenicity-Adjuvants-Haptens-Immunoglobulins-Types, structure, function and biological properties-Production, Purification and Characterization of antibodies.

UNIT II **(18 hrs)**

Humoral immune response-Clonal selection-Primary and Secondary immune response-Cell mediated immune response-Memory response-Phagocytosis-Subtypes of T cells-TCR and their function- Cytokines-Role, Types-Interferons, Interleukins and Tumour necrosis factor-Cytokine related diseases-Complement systems-Activation and biological role-Structure and functions of Class I and Class II MHC molecules.

UNIT III **(18 hrs)**

Antigen-Antibody interactions-Precipitation and Agglutination-Immunotechniques-Flow cytometer-Flow cytometry analysis-Western Blotting-ELISA-Radioimmunoassay-Experimental

animal model systems for toxicology and gene expression studies: Fish, mice-Immunohistopathology and Immunohaematology-CD Markers-Ethical guidelines.

UNIT IV **(18 hrs)**

Immunodeficiency diseases-Autoimmune diseases-Immune response to Infections-Bacteria, Virus, Parasites, Helminths-Cancer immunology-Transplantation and rejection-Immunosuppression and immunological tolerance-HLA tissue typing-Hypersensitivity reactions.

UNIT V **(18 hrs)**

Hybridoma techniques and Monoclonal antibody production-Cloning, production and characterization of Monoclonal antibody-Immunization techniques and Vaccines-Types, Toxoids, Antitoxins, Recombinant DNA vaccines.

Text Books:

1. Goldsby, R.A., Kindt, T.J., Osborne, B.A. and Kuby, J. "Immunology", W.H. Freeman and Company, New York, Fifth Edition, 2000.
2. Tizard, I.R. "Immunology - An introduction", Cengage learning Pvt Ltd, India, Fourth Edition, 2010.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1 - 1.5	1 - 17
		2	2.1 - 2.5	24 - 52
		3	3.1 - 3.4	57 - 68
		4	4.1 - 4.9	76 - 100
II	1	7	7.1 - 7.7	161 - 179
		9	9.1 - 9.7	200 - 218
		12	12.1-12.7	276 -299
		13	13.1-13.6	299-316
		14	14.1-14.6	319-334
III	1	6	6.1 - 6.12	137 - 156
IV	1	23	23.1-23.7	523-547
	2	2	2.1 - 2.7	14 - 25
		19	19.1-19.6	227-302
		20	20.1-20.7	306-317
		25	25.1-25.5	377-395
		29	29.1-29.9	454-465
		30	30.1-30.10	468-483
		31	31.1-31.5	488-501
V	2	24	24.1 - 24.5	359 - 373
	1	4	4.8 - 4.9	98 - 100

Reference Books:

1. Delves, P.J., Martin, S. J. Burton, D. R. and Roitt, I. M. "Essential Immunology",
   Blackwell publishing, Eleventh Edition, 2006.
2. Parija, S. C. "Textbook of Microbiology and Immunology", Elsevier India, Second
   Edition, 2013.
3. Zabriskie, J.B. "Essential Clinical Immunology", Cambridge University Press, UK,
   2009.
4. Motick, E. J. "A Historical Perspective on Evidence-Based Immunology", Elsevier,

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
PG Programme - M.Sc
Semester II
(2018 - 2020)

Core Course- VI: Recombinant DNA Technology (18PBTC22)
(For those who join from June 2018 and afterwards)

Credits : 5 **Int. Marks : 25**
Hours/Week : 6 **Ext. Marks : 75**
Duration : 90 hrs **Max. Marks : 100**

Course Objectives:

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

Course Outcomes:

1. Basic principles of recombinant DNA technology and its pros and cons.
2. Knowledge on the bacterial vectors, viral vectors for the construction of recombinant molecule.
3. Understand how to transform the recombinant molecule into the desire host.
4. Acquire knowledge on methods of gene transfer into Bacteria, Plant, Animal cells.
5. Gain knowledge on molecular techniques such as PCR, RFLP and RAPD.
6. Awareness on the important discovery of gene sequencing.
7. Detect DNA, RNA and Protein by Blotting techniques.
8. Understand the application of rDNA in industrial enzyme production.

UNIT I **(18 hrs)**

Vectors/Cloning Vehicles-Plasmids-Construction of pBR322, pUC18/19-Phagemids-Cosmids-Shuttle vectors-Lambda vectors (insertion and replacement vectors)-Artificial chromosome vectors (BACs, YACs)-Enzymes involved in Genetic Engineering-Expression vectors in *E. coli*- pGal, pET28 series of vectors and in Eukaryotes-Animal virus derived vectors-SV40, Vaccinia, Baculovirus and Retroviral vectors-Plant based vectors-Ti plasmid-Marker/Reporter genes-Gene fusion.

UNIT II **(18 hrs)**

Gene Cloning-Sticky and Blunt ends-Ligation-Adaptors, Linkers, Homopolymer tailing-PCR Based Cloning-Gateway cloning system-TA cloning system-Probes-Radiolabelled and non-radiolabelled probes-Construction of Genomic DNA, cDNA and Metagenomic library-Screening of recombinants-Alpha complementation-Blue white selection.

UNIT III **(18 hrs)**

Cloning host- *E. coli, Bacillus* sp., *Pseudomonas* sp. and Yeast-*Saccharomyces cereviseae, Pichia pastoris*-Methods of introduction of rDNA into Bacteria-Yeast, Plant and Animal cells-Physical and Chemical methods-Blotting techniques-Southern, Northern and Western blots.

UNIT IV **(18 hrs)**

Cloning and Production of recombinant DNA Products-Antibiotics, Biopolymers, Insulin, Human growth hormone, Interferon, Interleukin and various industrially important proteins-Proteases, Amylases and its applications-Purification strategies of expressed recombinant proteins-Intellectual Property Rights-Patent of Recombinant products.

UNIT V **(18 hrs)**

Site directed mutagenesis and Protein Engineering-DNA Sequencing-Enzymatic and Chemical method-Pyrosequencing, Next-Gen sequencing (NGS)-PCR and its applications-Reverse Transcriptase PCR, Real-Time PCR, Gradient PCR, Inverse PCR, Nested PCR, *in situ* PCR-RFLP, RAPD, DNA fingerprinting and forensic studies.

Text Books:

1. Rastogi, V.B. "Fundamentals of Molecular Biology", Ane Books Pvt. Ltd., New Delhi, 2010.
2. Glick, B.R., Pasternak, J.J. and Patten, C.L. "Molecular Biotechnology: Principles and Applications of Recombinant DNA", ASM Press, Washington, USA, Fourth Edition, 2010.
3. Brown, T. A. "Gene Cloning and DNA Analysis-An Introduction", Blackwell Scientific Publications, 2006.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	17	17.1 - 17.8	387 - 425
II	2	3	3.1 - 3.6	49 - 95
III	2	6	6.1-6.8	195-233
		7	7.1 -7.5	240 - 286
IV	2	13	13.1-13.5	501-546
		16	16.1-16.3	652-681
		22	22.1 - 22.4	897 - 920
V	2	9	9.1 - 9.2	345 - 375
	3	9	9.1-9.3	177 - 199

Reference Books:

1. Primrose, S.B. and Twyman, R.M. "Principles of Gene Manipulation and Genomics", Blackwell Scientific Publications, 2006.
2. Sathyanarayana, U. "Text of Biotechnology", Books and Allied Pvt. Ltd, 2005.

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

PG Programme - M.Sc

Semester II

(2018 - 2020)

Core Course - VII: Microbial Genetics (18PBTC23)

(For those who join from June 2018 and afterwards)

Credits : 4 **Int. Marks : 25**

Hours/Week : 6 **Ext. Marks : 75**

Duration : 90 hrs **Max. Marks : 100**

Course Objectives:

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

Course Outcomes:

1. Understand the mechanism of regulation of gene expression.
2. Basic concept of gene transfer methods- conjugation, transformation and transduction.
3. In depth knowledge about the jumping genes and the process of transposition mechanism.
4. Understand the genetics of viral phage, replication and integration in the host genome.
5. Awareness on genetic organization of the chromosomes and its abnormalities.
6. Basic concepts in genetics of Drosophila, as a model organism.
7. Understand Gene linkage, Crossing over and Chromosomal mapping.

UNIT I **(18 hrs)**

Basic concept of Microbial genetics-Genome organization and Basic functions- *E. coli* and *Saccharomyces cereviseae.*

UNIT II **(18 hrs)**

Regulation of Gene expression in Prokaryotes-Operon concept- *lac*, *trp*, *ara* operon-Bacterial transformation-Transduction-General and Specialized-Conjugation process-F plasmid, R plasmid, Control of plasmid copy number-Plasmid incompatibility.

UNIT III **(18 hrs)**

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

UNIT IV **(18 hrs)**

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

UNIT V **(18 hrs)**

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

Text Books:

- Rastogi, V.B. "Fundamentals of Molecular Biology", Ane Books Pvt. Ltd., New Delhi, 2010.
- Watson J.D., Baker, T.A., Bell S.P., Gann, A., Levine M., and Losick, R., Cummings, B. "Molecular Biology of the Gene", Pearson Publisher, Fifth Edition, 2004.
- Freifelder, D. "Molecular Biology", Jones and Barlett Publishers, USA, 2004.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	7	7.1 - 7.10	167 - 187
	2	21	21.1-21.4	681-695
II	2	16	16.1 - 16.5	483 - 525
	3	15	15.1-15.19	453-497
		19	19.1 - 19.5	619 - 639
III	3	17	17.1-17.8	551-590
		18	18.1 - 18.4	595 - 616
IV	2	11	11.1 - 11.22	310 - 336
	3	21	21.1 - 21.9	679 - 705
V	2	21	21.1 - 21.4	699 - 703
		1	1.1 - 1.8	5 -17

Reference Books:

1. Malacinski, G.M. "Essentials of Molecular Biology", Jones and Bartlett Publishers, Fourth Edition, 2002.
2. Russel, P.J. "Genetics – A Molecular Approach", Benjamin Cummings, New York, Second Edition, 2006.
3. Cullis, T., Burton., Guhman, S., Griffiths, A. and Suzuk, D. "Genetics: A Beginner's guide", One world publication Ltd., 2003.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
PG Programme - M.Sc
Semester II
(2018-2020)

Core Course-VIII: Practical II: Lab in Immunology, Recombinant DNA Technology and Microbial Genetics (18PBT C2P)

(For those who join from June 2018 and afterwards)

Credits	**: 4**	**Int. Marks**	**: 40**
Hours/Week	**: 6**	**Ext. Marks**	**: 60**
Duration	**: 90 hrs**	**Max. Marks**	**: 100**

Course Objectives:

- To enable the students to acquire the knowledge about basic technical skills in molecular techniques.
- To carry out gene cloning technique in *E. coli* as Cloning host.
- To provide hands on training on Genetic Engineering experiments.
- To impart the practical knowledge on antigen-antibody techniques.
- To learn the immunodiagnostic techniques of infectious diseases.

Course Outcomes:

- Methods of transformation of DNA by conjugation.
- Isolation of Bacteriophage from sewage samples.
- Perform Nucleic acid isolation from different organisms such as Plant, Bacteria and Human blood.
- Practical knowledge on transformation of recombinant DNA into Bacteria.
- Perform cloning of the gene of interest in suitable vector and screening of the recombinants and non-recombinants.
- Handling of animals, antigen preparation and bleeding techniques.
- Practical knowledge on Antigen-Antibody techniques.
- Skills on performing immunodiagnostic techniques of infectious diseases.
- Detect the specific protein (antigen) present in the unknown protein sample using ELISA.
- Isolate and purify the monoclonal antibody from polyclonal antibody using column.

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1. Bacterial Conjugation.
2. Isolation of Bacteriophage and plaque analysis.
3. Bacterial gene induction.
4. Isolation of genomic DNA and RNA from Bacteria, Plant, Animal tissue and blood and Quantification by spectroscopic method.
5. Isolation of Plasmid DNA by alkaline and boiling lysis method.
6. Polymerase Chain Reaction (PCR).
7. Restriction Digestion, Ligation and Transformation in *E. coli* and Blue-White screening.

8. Immunization and methods of bleeding.
9. Estimation of RBC and WBC count in blood sample.
10. Antigen-antibody interactions:
    a. Haemagglutination.
    b. Immunodiffusion- Single, Double and Radial Immunodiffusion.
    c. Electrophoresis – Classical, Countercurrent and Rocket Immunoelectrophoresis.
11. Isolation and separation of B and T lymphocytes and Rosette assay.
12. Isolation and purification of immunoglobulin G using affinity chromatography.
13. Enzyme linked immunosorbent assay (ELISA).
14. Biomarkers assay-SGOT, SGPT, BUN, CK from Blood serum.

Reference Books:

1. Reddy, P.H. and Govil, S. "Life sciences protocol manual", DBT Star college scheme, DBT, New Delhi, 2018.
2. Sambrook, J. and Green, M.R. "Molecular Cloning: A Laboratory Manual", Cold Spring Harbor Laboratory Press, Fourth Edition, 2012.
3. Holt, J.G. and Krieg, N.R. "Bergey's Manual of Determinative Bacteriology", Lippincott Williams and Wilkin Publishers, Ninth Edition, 2000.
4. Cappuccino, J. G. and Sherman, N. "Microbiology: A Laboratory Manual", Addison-Wesley, 2002.
5. Atlas, R.M. "Experimental Microbiology", Benjamin and Cummings Publication, 1997.
6. Sittampalam, G.S., *et al*., "Assay Guidance Manual", Eli Lilly and Company and the National Center for Advancing Translational Sciences, Bethesda, MD, 2017.
7. Hay, F.C., Westwood, O.M.R. "Practical Immunology", Blackwell Publishers, USA, Fourth Edition, 2002.
8. Bhatia, A. "Manual of Practical Immunology", Palani Paramount Publication, India, First Edition, 2000.

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

PG Programme - M.Sc

Semester II

(2018 - 2020)

Non Major Elective Course-I: Concepts in Biotechnology (18PBTN21)

(For those who join from June 2018 and afterwards)

Credits : 4	**Int. Marks : 25**
Hours/ Week : 6	**Ext. Marks : 75**
Duration : 90 hrs	**Max. Marks : 100**

Course Objectives:

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

Course Outcomes:

1. Enable the students to understand about the basic concepts of modern Biotechnology.
2. Knowledge about the Plant tissue culture, gene manipulation and Genetic Engineering.
3. Knowledge on the methods of microbial screening.
4. Production of Microbial Biomass such as *Spirulin*a, yeast, metabolites such as vitamins, amino acids, antibiotics.
5. Understand the concept of transgenesis and artificial insemination.
6. Awareness on the process of fermentation and fermentor.

UNIT I **(18 hrs)**

Introduction-Definitions-Scope and branches of Biotechnology-Applications and recent developments in Biotechnology-Basic steps involved in Gene Cloning-Plasmid Vectors-pBR322 and pUC19-Electrophoresis Techniques.

UNIT II **(18 hrs)**

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

UNIT III **(18 hrs)**

Introduction to Transgenesis-Transgenic animals-Methods of transferring genes-Retroviral, DNA microinjection and Embryonic stem cell method with example-Artificial insemination and Embryo transfer.

UNIT IV **(18 hrs)**

Isolation and screening of Industrial important microbes-Strain improvement-Physical, Chemical and rDNA technology-Production of microbial biomass (*Spirulina*)-SCP-Primary and

Secondary metabolites including-Vitamins (Riboflavin)- Amino acids (Glutamic acid)-Antibiotic (Penicillin).

UNIT V **(18 hrs)**

Biotechnology in Pollution Control-Definition-Role of Biotechnology in Pollution control-Biological waste water treatment-Sewage treatment-Primary, Secondary, Tertiary treatment-Degradation of Xenobiotics-Biomining and Bioleaching.

Text Books:

1. Dubey, R.C. "Advanced Biotechnology", S.Chand and Co. Pvt. Ltd., New Delhi, 2014.
2. Jordening, H.J. and Winter, J. "Environmental Biotechnology- Concepts and Applications", WILEY-VCH Verlag GmbH and Co. KGaA, Weinheim, 2005.

Unit	Text Book No.	Chapter	Page. No
I	1	1	3-24
		6	114-148
		2	27 – 51
II	1	12	277 – 340
III	1	11	251 – 274
IV	1	16	365 – 385
		17	386 – 411
		18	412 – 441
		25	569 – 598
V	2	1	35-36
		3	79 – 85

Reference Books:

1. Sathyarayana, U. "Biotechnology", Books and Allied Pvt Ltd., Kolkata, India, Ninth Edition, 2006.
2. Primrose, S.B. and Twyman, R.M. "Principles of Gene Manipulation and Genomics", Blackwell Publishing, USA, Seventh Edition, 2006.
3. Primrose, S.B., Twyman, R.M. and Old, R.K. "Principles of Gene Manipulation", Black Well Science. Inc, UK, Sixth Edition, 2004.
4. Walker, J. M. and Rapley, R. "Molecular Biology and Biotechnology", Royal Society of Chemistry, UK, 2009.
5. Kumar, H.D. "Modern concepts of Biotechnology", Vikas Publishing House Pvt. Ltd, India, 1998.
6. Ravi, P. "Introduction to Biotechnology", Atlantic Publishers, India, 2007.

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

PG Programme - M.Sc

(2018-2020)

Semester II

Non Major Elective Course-I: Cancer Biology (18PBTN22)

(For those who join from June 2018 and afterwards)

Credits	**: 4**	**Int. Marks**	**: 25**
Hours/Week	**: 6**	**Ext. Marks**	**: 75**
Duration	**: 90 hrs**	**Max. Marks**	**: 100**

Course Objectives:

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

Course Outcomes:

1. Knowledge on basic properties of cell and cell division.
2. Knowledge on classification of cancer.
3. Perception of Oncogenes and its characteristics.
4. Basic knowledge on different types of cancer therapy.
5. Knowledge on the basics of anticancer drugs.

UNIT I **(18 hrs)**

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

UNIT II **(18 hrs)**

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

UNIT III **(18 hrs)**

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

UNIT IV **(18 hrs)**

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

UNIT V **(18 hrs)**

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

Text Books:

1.Frederick O.Stephens and Karl R. Ainger, "Basic of Oncology" Springer, 2009.
2. Bruce Alberts, Dennis bray, Julian Lewis, Martin raff, "Molecular biology of the Cell", Garland Publishing, 2000.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1 – 1.5	1 – 9
I	2	24	24.1 - 24.5	1256 – 1257
II	2	18	18.1 - 18.5	911 – 941
III	2	24	24.1 - 24.6	1273 – 1277
IV	2	15	15.1 - 15.4	768 – 769
V	1	8	8.3.3,8.3.4, 8.4.2	87 – 128

Reference Books:

1. Benjamin Lewis, "Genes VIII", Narosa Publishers, 2000.
2. Rober.A.Weinberg, "The Biology of Cancer", Wiley Cox Publishers, 2006.
3. Momna Hejmadi, "Introduction to Cancer biology", Momna hejmadi and Ventus Publishing, 2010.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
PG Programme - M.Sc
Semester III
(2018 - 2020)
Core Course - IX: Plant Biotechnology (18PBTC31)
(For those who join from June 2018 and afterwards)

Credits	**: 5**	**Int. Marks**	**: 25**
Hours / Week	**: 6**	**Ext. Marks**	**: 75**
Duration	**: 90 hrs**	**Max. Marks**	**: 100**

Course Objectives:

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

Course Outcomes:

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

UNIT I **(18 hrs)**

Plant genome organization: Introduction-Structural features of a higher plant gene - Gene Families in plants - Regulation of gene expression in plant development - Organisation of Chloroplast Genome - Nucleus encoded and Chloroplast encoded Genes for Chloroplast Proteins - Targeting of Proteins to Chloroplast - Organization of Mitochondrial Genome - Nuclear and Mitochondrial encoded Genes for Mitochondrial Proteins.

UNIT II **(18 hrs)**

Plant hormones- Culture media-Sterilization-Totipotency- De-differentiation- Re-diferrentation- Micropropagation- Somatic Embryogenesis-Somoclonal Variation-Somatic Hybridization-Types of Culture-Callus – Suspension - Protoplast and Anther Culture.

UNIT III **(18 hrs)**

Molecular biology of Agrobacterium mediated transfer - Ti Plasmid - Ti Plasmid derived vector-Molecular aspects of nitrogen fixation - Gene transfer methods - Physical and Chemical Methods - Classification of plant viruses and Stress response.

UNIT IV **(18 hrs)**

Selectable markers - Reporter genes - Promoters used in plant genetic engineering - Bacterial resistance - Fungal resistance - Pest resistance - Herbicide resistance - Delay of Fruit ripening - Production of Therapeutic Proteins – Plantibodies - Edible Vaccines.

UNIT V **(18 hrs)**

Gene Silencing –Transient and stable Gene expression - RNAi -. Molecular biology of Plant pathogen interaction - Molecular markers in marker assisted plant breeding - Metabolic Engineering - Modification of improved nutritional content - Carbohydrates and Lipid. Genetically modified crops – Mustard, Golden rice, Brinjal. Merits and Demerits of GM crops. RNA Editing in plant mitochondria - Mitochondrial Genome and Cytoplasmic Male Sterility.

Text Books:

1. Adrian slater, Nigel W.Scott and Mark R.Fowler "Plant Biotechnology- The genetic manipulation of Plants", Oxford university press, Second Edition, 2008.
2. Dr.R.C.Dubey, "Advanced Biotechnology", S.Chand and Company Pvt.Ltd, 2014.

Unit	Text book No.	Chapter	Section	Page No.
I	1	1	1.1 - 1.5	1 – 27
		7	7.1	156 – 159
II	2	18	18.1-18.4	828 – 829, 836 – 841,845 - 846 849 - 853, 854 -861,862 - 873
III	1	3	3.1 - 3.5	54 -73
		4	4.1 - 4.3	77 – 79
		8	8.2	184 – 186
		7	7.4	162 – 170
IV	1	10	10.1	237 – 258
		11	11.3	282 285
	2	19	19.1,19.3,19.5, 19.8	887 – 901,903 – 911,917 – 931, 934 – 938
V	1	7	7.1	156 – 160
		11	11.1 -11.2	267 – 276

Reference Books:

1. A. Slater., N. Scott and M. Flower, “Plant Molecular Biology and Biotechnology”, Oxford university press.Oxford,2003.
2. Buchmann, B.B.W. Gruissen and R.L. Jones, “Biochemistry and Molecular Biotechnology of plants”, American Society of Plant Biology, Rockwillie, MD, USA, 2001.
3. Purohit, S.S, “Agricultural Biotechnology”, Agrobios India, 2003.

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

PG Programme-M.Sc

Semester III

(2018-2020)

Core Course- X: Animal Biotechnology (18PBTC32)

(For those who join from June 2018 and afterwards)

Credits	**: 5**	**Int. Marks**	**: 25**
Hours / week	**: 6**	**Ext. Marks**	**: 75**
Duration	**: 90 hrs**	**Max. Marks**	**:100**

Course Objectives:

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

Course Outcomes:

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

UNIT I **(18 hrs)**

Transgenesis: Methods of Transferring Genes: Retroviral, DNA Microinjection and Engineered Embryonic Stem Cell methods. Transgenic Animals (Mice, Cow, Pigs, Sheep, Goat, Birds, Fish and Insects). Ethical issues in Animal Biotechnology. Artificial Insemination and Embryo transfer.

UNIT II **(18hrs)**

Methods for Construction of Recombinant Animal Vectors for Gene Transfer. Biology of Animal Viral Vectors-SV40, Adenovirus, Retrovirus, Vaccinia Virus, Herpes Virus, Adeno Associated Virus and Baculo Virus. Baculo Virus as Biocontrol. YAC and BAC Vectors.

UNIT III **(18 hrs)**

Gene therapy- *ex vivo* and *in vivo*, Viral and Non viral. Signal Transduction-Acetyl choline, G Proteins, Visual Pigments, Growth Factor Receptors. Production of Recombinant Proteins-Vaccines, Blood Products, Hormones, Regulatory Proteins.

UNIT IV **(18 hrs)**

Animal Tissue Culture – History, Primary Culture and Established Cell Line Culture – Equipments and materials for Animal Cell Culture Technology – Basic Techniques of Mammalian Cell Culture – Characteristics of Normal and Transformed Cell Lines – Growth media- Biology and Characterization of Cultured Cells.

UNIT V **(18 hrs)**

Introduction to IPR. Types: Patents, Copyrights, Trademarks,Tradesecrets. Biotechnological examples of Patents, Trademark, Tradesecrets and Copyrights. Bioterrorism- Anthrax and Small pox.

Text Books:

1. Sathynarayana. U, "Biotechnology'', U.S.Chand and Company, 2007.
2. Das. H.K, "Text book of Biotechnology", Wiley DreamTech India Pvt. Ltd. 2004
3. Dubey R.C, "Advanced Biotechnology", S.Chand and Company Pvt. Ltd, 2014.
4. Primrose S.P and Twyman R.M, " Principles of gene Manipulation and Genomics", Blackwell science publication, Seventh Edition, 2006.
5. B.D.Singh, "Biotechnology", Kalyani Publishers, India, 2014.

Unit	Text Book No.	Chapter	Section	Page No.
I	3	20	20.3	959 – 965
	1	41	14.1	480 - 493
II	3	20	20.9	945 - 953 954 – 955
	4	12	12.1 - 12.8	238 – 250
III	1	13	13.1 - 13.9	157 – 169
		15	15.1 - 15.7	189 – 198
IV	2	15	15.2.1 - 15.4.6 15.5.1 - 15.6.8	857 - 870 871 – 886
V	5	21	21.1 - 21.14	767 - 788

Reference Books:

1. Old and Primrose, "Principles of Gene Manipulations", Sixth Edition, Blackwell Science Publication, 2000.
2. Brown T.A., "Gene Cloning and Analysis", Blackwell science Ltd, 2001.
3. Manjula shenoy, "Animal Biotechnology", Laxmi publications Pvt. Ltd, New Delhi, 2007.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
PG Programme - M.Sc
Semester III
(2018-2020)

Core Course-XI: Genomics and Proteomics (18PBTC33)
(For those who join from June 2018 and afterwards)

Credits	**: 5**	**Int. Marks**	**: 25**
Hours/Week	**: 6**	**Ext. Marks**	**: 75**
Duration	**: 90 hrs**	**Max. Marks**	**: 100**

Course Objectives:

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

Course Outcomes:

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

UNIT I **(18 hrs)**

Genomics: Structure and Organization of Prokaryotic and Eukaryotic genomes- Nuclear-Mitochondrial and Chloroplast Genomes- Tools for Genome Analysis–RFLP- RAPD- SAGE-FISH to identify chromosome landmarks.

UNIT II **(18 hrs)**

Human genome project: Landmarks on Chromosomes Generated by Various Mapping Methods-Physical Map-Cytogenetic Map- Contig Map, Restriction Map-DNA Sequencing-Chemical- Enzymatic and Automated DNA Sequencing and Sequence Assembly-Tools used in Human genome project.

UNIT III **(18 hrs)**

DNA Micro array: DNA Micro Array Technology- Basic Principles and Design- cDNA and Oligonucleotide Arrays-Applications-Global gene expression analysis- Comparative transcriptomics- Differential gene expression- Genotyping/SNP detection- Detection Technology- Computational Analysis of Micro Array Data.

UNIT IV **(18 hrs)**

Overview of Protein structure: Relationship between Protein structure and function-Outline of a Typical Proteomics Experiment-Identification and analysis of proteins by 2D Analysis- Protein-Protein Interactions-Yeast Two Hybrid System- Phage Display- Protein Interaction Maps- Protein Arrays-Definition- Applications- Diagnostics-Expression Profiling.

UNIT V **(18 hrs)**

Proteomics and Drug Discovery: High Throughput Screening For Drug Discovery-Identification of Drug Targets- Pharmacogenomics and pharamacogenetics and Drug Development- Toxicogenomics- Metagenomics- Phylogenetics and Phenomics- Metabolomics-Mass spectrometry-MALDI TOF and HPLC Principle-Instrumentation and Application.

Text Books:

1. SB Primrose S and Twyman R, "Principles of Genome Analysis and Genomics", Blackwell, Washington, 2008.
2. T.A. Brown, "Genomes", Oxford Academic Publication, 2011.
3. Lehninger, "Principles of Biochemistry", Palgrave Publication, 2009.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	2	2.1 - 2.7	16- 23
		3	3.1 - 3.9	67-71
		4	4.3 -4.8	89- 92
		9	9.2 - 9.8	160- 172
II	2	3	3.3.1- 3.4.1, 3.1-3.9	82- 89
		4	4.3- 4.4, 4.1.1- 4.2.3	121-138, 104-119,
III	2	3	3.2.2-3.9.7	71-81
		6	6.1- 6.4	183-189
IV	3	6	6.1-6.7, 6.8	116-158
		7	7.3-7.4	169-179,183
V	3	6	6.2.1-6.2.9	175-183

References Books:

1. Glick BR and Pasternak JJ, "Molecular Biotechnology", ASM Press, Third Edition, Washington, 1998.
2. David Bowell and Joseph Sambrook, "DNA Microarays", Cold Spring Harbor Laboratory Press Publication, New York.

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

PG Programme - M.Sc

Semester III

(2018 - 2020)

Core Course -XII: Lab in Plant Biotechnology and Animal Biotechnology (18PBTC3P)

(For those who join from June 2018 and afterwards)

Credits	**: 5**	**Int. Marks**	**: 40**
Hours / Week	**: 6**	**Ext. Marks**	**: 60**
Duration	**: 90 hrs**	**Max. Marks**	**: 100**

Course Objectives:

- To provide knowledge of plant tissue culture and animal tissue culture.
- To understand techniques involved in plant tissue culture and to generate *in vitro* propagated plants and to learn Agrobacterium mediated transfer.
- To give knowledge to the students brain with innovative tools of animal transfer methods.

Course Outcomes:

1. Basic knowledge of plant tissue culture such as surface sterilization, media preparation, contamination and other handling procedures.
2. Understand techniques involved in plant tissue culture and to generate *in vitro* propagated plants.
3. Knowledge on hardening techniques.
4. Handling skills on Agrobacterium mediated gene transfer.
5. Isolation and purification of protoplasts.
6. Importance on marketing of plants from plant tissue culture and horticulture.
7. Understand the basic principles of animal tissue culture and handling procedures.

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1. Preparation Of MS, B5 And Nitch and Nitch Medium, Stock And Hormone Preparation(2,4-D,NAA,BAP) and Surface Sterilization.
2. Micro Propagation.
3. Anther Culture.
4. Callus Induction and Regeneration of Shoots and Roots.
5. Hardening.
6. Suspension Culture.
7. Isolation and Purification of Protoplasts.
8. Introduction to Agrobacterium Mediated Gene Transfer.
9. Preparation of Animal tissue culture Media, Equipments and sterilization.
10. Preparation of Chick embryo Cell lines.
11. Cell toxicity and Viability assay.
12. Cryopreservation.

Reference Books:

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

Sri Kaliswari College (Autonomous), Sivakasi

Department of Biotechnology

PG Programme - M.Sc

Semester III

(2018-2020)

Major Elective Course-II: Enzymes and Enzyme Technology (18PBT O31)

(For those who join from June 2018 and afterwards)

Credits : 4 **Int. Marks : 25**

Hours/Week : 6 **Ext. Marks : 75**

Duration : 90 hrs **Max. Marks : 100**

Course Objectives:

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

Course Outcomes:

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

UNIT I **(18 hrs)**

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

UNIT II **(18 hrs)**

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

UNIT III **(18 hrs)**

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

UNIT IV **(18 hrs)**

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

UNIT V **(18 hrs)**

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

Text Books:

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

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1-1.10	10-15
	1	5	5.1-5.5	44-50
II	1	8	8.1-8.8	90-98,
	2	9	9.1-9.9	101-115
III	1	6	6.1-6.5	55-62
IV	1	7	7.1-7.5	65-70
V	1	9	9.1-9.3	98-102

Reference Books:

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

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
PG Programme - M.Sc
Semester III
(2018-2020)

Major Elective Course-II: Molecular Oncology (18PBTO32)

(For those who join from June 2018 and afterwards)

Credits : 4 **Int. Marks : 25**
Hours/Week : 6 **Ext. Marks : 75**
Duration : 90 hrs **Max. Marks : 100**

Course Objectives:

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

Course Outcomes:

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

UNIT I **(18 hrs)**

History, scope and current scenario of cancer research. Cancer – Types and their prevalence – Carcinoma, Lymphoma and Malignancy - Classification based on origin/organ: breast, colon, lung, prostrate, cervical and oral cancers. Molecular biology of tumour invasion and metastasis.

UNIT II **(18 hrs)**

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

UNIT III **(18 hrs)**

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

UNIT IV **(18 hrs)**

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

UNIT V **(18 hrs)**

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

Text Books:

1. Prohit.P.R, "The Gene", Narosa publishing House, 2006.
2. Frederick O. Stephens and Karl R. Ainger, "Basic of Oncology", Springer, 2009.

Unit	Text Book No.	Chapter	Section	Page No.
I	2	10	10.1-10.4.7	125-139
	2	11	11.1-11.7.9	143-216
II	1	2	2.1-2.4.3	17-21
	1	10	10.1-10.5	457-472
III	2	1	1.5.2	10
IV	2	7	7.1-7.7	65-86
V	2	8	8.6.1-8.6.8	87-118

Reference Books:

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

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
UG Programme - B.Sc
Semester IV
(2018 - 2021)
Core Course-XIII: Marine Biotechnology (18PBTC41)
(For those who join from June 2018 and afterwards)

Credits : 6 **Int. Marks : 25**
Hours/ Week : 6 **Ext. Marks : 75**
Duration : 90 hrs **Max. Marks : 100**

Course Objectives:

- To make the student understand the major components of marine environment.
- To enable the students with biomedicinal compounds from marine Bioresources.
- To enrich the students in areas of Probiotics and transgenic fish.

Course Outcomes:

1. Awareness on the physical and chemical elements present in marine environment.
2. Knowledge on the biodiversity of different organisms in marine environment.
3. Understand the bioactive compounds of the marine resources.
4. Application of marine organisms for production of antibiotics.
5. Knowledge on Probiotics microbes to enhanced the aquaculture biotechnology.

UNIT I **(12 hrs)**

Introduction of Marine Biotechnology- Definition, tools and application- Physical and chemical oceanography-Marine Environment- Deep Sea- Coral reef- Estuaries - Mangrove ecosystems-Diversity of Plankton- Phytoplankton - Zooplankton.

UNIT II **(12 hrs)**

Ecology of marine flora and fauna- Microscopic (Bacteria, Fungi, Microalgae) - Macroscopic (Sponge and fishes)- Marine Plants-Seaweeds- Sea grasses- Mangrove and their associate plants- Live feed culture Technology- *Artemia*- Rotifer- Microalgae.

UNIT III **(12 hrs)**

Drugs from Marine organisms-Sponge- Coral- Seaweeds- Sea grasses- Mangrove-Drugs from Marine Microbes-Bacteria- Fungi- Actinomycetes-Drugs from marine microalgae-Cyanobacteria - Blue green algae.

UNIT IV **(12 hrs)**

Biotechnological application of Marine Enzymes- Amylase, Protease, Lipase, Cellulases, from micro algal, Bacteria, Fungi, Actinomycetes-Marine Polysaccharides-Alginic acid- Agar-Agar -Carrageen from marine seaweeds.

UNIT V **(12 hrs)**

Aquaculture Biotechnology-Microbial disease- Vibriosis – Aeromonosis- Viral Disease-WSSV (White Spot Syndrome Viral infection) - IHHNV (Infections Hypodermal and Hematopoietic Necrosis Virus)-Probiotics Microbe- Bacteria -Fungi used for Fin and Shell fish's production.

Text Books:

1. Kim, S. K. "Hand book of Marine Biotechnology", Springer Dordrecht Heidelberg, London New York, 2015.
2. Lavens, P. and Sorgerloos, P. "Manual on the production and use of live food for aquaculture", Food and Agriculture Organization (FAO) of the United Nations, Rome, 1996.
3. Pillay, T.V.R. and Kutty, M.N. "Aquaculture Principles and Practices", Blackwell Publishing Asia Pvt. Ltd, Australia, Second Edition, 2005.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	1	1.1-1.6	1-8
		2	2.1-2.7	13-23
		7	7.1-7.5	179-204
	2	2	2.1-2.3	7-29
		5	5.1-5.3	252-280
II	1	2	2.1-2.7	13-23
		5	5.1-5.5	51-58
		6	6.1-6.3	65-141
		8	8.1-8.7	219-243
		26	26.1-26.4	651-658
		27	27.1-27.5	663-672
	2	2	2.1-2.3	7-29
		3	3.1-3.5	49-64
		4	4.1-4.2	79-119
III	1	32	32.1-32.4	759-782
		47	47.1-47.6	1371-1385
IV	1	14	14.1-14.6	413 - 425
		39	39.1-39.6	919 - 933
		53	53.2-53.3	1197 - 1207
V	1	18	18.4	478-481
	3	9	9.1-9.2	201-222

Reference Books:

1. Hart, P.J.B. and Reynolds, J.D. "Hand Book of Fish biology and Fisheries-Fish Biology Vol-1," Blackwell Science Pvt. Ltd, USA, 2004.
2. Ravi Shankar, P. "Fish Biology and Ecology", University College of Science, Osmania University, Hyderabad, 2006.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
PG Programme - M.Sc
Semester IV
(2018 - 2020)
Core Course - XIV: Bioprocess Technology (18PBTC42)
(For those who join from June 2018 and afterwards)

Credits	**: 6**	**Int. Marks**	**: 25**
Hours / Week	**: 6**	**Ext. Marks**	**: 75**
Duration	**: 90 hrs**	**Max. Marks**	**: 100**

Course Objectives:

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

Course Outcomes:

1. Understand the scope and applications of industrial biotechnology.
2. Methods of potential improvement of efficient strains to increase the yield of microbial products.
3. Information of basic fermentation process.
4. Knowledge on immobilization of enzymes and cells and downstream processing of biological.
5. Knowledge on the process of production of secondary metabolites.
6. Awareness on innovative fermented food products.
7. To understand the importance of single cell protein and single cell oils.

UNIT I **(18 hrs)**

Isolation and screening of industrially important microbes - Improvement of strains for increased yield and other desirable characteristics - Preservation of industrial important microorganisms - General concept of fermentation process –Concepts and bioreactor designs - media sterilization, aeration and agitation - stirrers and impellers in bioreactor.

UNIT II **(18 hrs)**

Types of Fermentation -Batch, Fed Batch and Continuous Fermentation - **Bioreactor types** - Airlift Bioreactors - Stirred Tank Bioreactors - Fluidized Bed Bioreactor - Packed-Bed Reactors - Trickle Bed Bioreactor - Bubble Column Fermentor - Multiphase Bioreactors - Disposable Bioreactors And Wave Bioreactor - Scale up Fermentation Process - Instrumentation and Control Bioprocess - Computer Applications in Control of Bioprocess.

UNIT III **(18 hrs)**

Immobilzation of enzymes and cells - General principles of enzyme biosensors – Amperometric Biosensors – Potentiometric Biosensors – Conductimetric Biosensors –

Thermometric Biosensors - Factors affecting bio Processing and regulation - The Recovery and Purification of the Fermentation Products.

UNIT IV **(18 hrs)**

Bioprocess for the Production of Biomass - Primary, Secondary Metabolites, and Extracellular Enzymes -Biotechnologically important extracellular Products - Industrial application of enzymes - Industrial production of Bio Fuel.

UNIT V **(18 hrs)**

Economics of large scale fermentation - Fermented Foods -Yoghurt, Butter Milk, Cheese - Fermented Beverages – Wine And Beer - Fermented Vegetables - Microbial Foods-Single Cell Protein (SCP) - Single Cell Oils (SCO) - Biodegradation and Bioremediation.

Text Books:

1. Peter F. Stanbury, Allan Whitaker, Stephen J. Hall, "Principles of Fermentation technology", Aditya Books Pvt. Ltd. New Delhi, 1997.
2. U. Sathyanarayana, "Biotechnology", Books and allied Pvt. Ltd, Kolkata.

Unit	Text Book No.	Chapter	Section	Page No.
I	1	3	-	35 – 65
		4	-	93
		5	-	123-145
		7	-	167 – 185
II	1	8	-	215 – 232, 232 - 237
	2	5	19	259 – 262, 239 – 242,268
III	1	10	-	277 – 300
		9	-	254
	2	5	21	288 – 297, 297- 301
IV	2	5	31	393 – 395
			19	255 – 257
			23	311 – 371
			31	395 -398
V	1	12	-	331 -346
	2		28	362 – 370

		5	59	718 – 729
			29	371 – 378

Reference Books:

1. Young M.M, Reed Elsevier, "Comprehensive Biotechnology-The Principles, Applications and Regulations of Biotechnology in Industry, Agriculture and Medicine", Vol 1, 2, 3 and 4, India Private Ltd, India, 2001.
2. Mansi E.M.T.EL. and C.F.A. Bryle, "Fermentation Microbiology and Biotechnology", Taylor and Francis Ltd, UK, 2002 .
3. Flickinger M.C and Drew, "Encyclopedia of Bioprocess Technology", Vol 1-5, S.W Publishers, 2000.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
PG Programme – M.Sc
Semester IV
(2018 - 2020)
Core Course – XV: Project (18PBTJ41)
(For those who join from June 2018 and afterwards)

Credits : 10 **Int.Marks : 20**
Hours/Week : 18 **Ext.Marks : 80**
Duration : 270 hrs **Max.Marks:100**

Course Objectives:

- To enable students understand the purpose and importance of research in Biotechnology.
- To plan and carry out research work by collecting review, collecting materials, and find the results by various techniques.

Course Outcomes:

1. Inculcate Research interest among students
2. Get familiarized with basic concepts of research.
3. Identify and state the research topic.
4. Design and conduct research study accordance with the identified research need.
5. Develop skill to search online and offline sources to carryout research.
6. Apply academic skills to present the research study findings in a formal academic oral presentations and a written research paper

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Project work:

Each learner can select for his/her research project in the thrust areas of Biotechnology in consultation with his/her guide and the Head of the Department.

The learner can undergo his/her project work in the reputed Biotechnology laboratories or in the Biotechnology laboratory itself. The learner should attend the Review meetings without fail.

The project report should be submitted to the Principal through the Head of the Department of Biotechnology one week prior to the commencement of the summative examination. If a candidate fails to submit his/her project report on the date presented above, he/she may be permitted to submit the same 4 days prior to the date of viva-voce examination with a fine as prescribed by the college.

Each learner shall submit 2 copies of his/her project report for valuation.

The project report shall contain at least 45 pages excluding bibliography and appendices.

The project report shall be valued for a total of 80 marks out of which 40 is internal mark and 40 is external mark. Out of the external mark 40, the external examiner and guide share 30 and 10 marks respectively. The sum of marks awarded by both the examiners shall be considered to be the final mark. For the pass in the project report the

learner shall secure a minimum of 25 marks. If the learner fails to get the minimum pass mark in the project report he/she shall be permitted to submit his/her project report once again within a period of 6 months after the publication of the result.

For those candidates who have passed in the evaluation of the project report there will a viva-voce examination of the above. The viva-voce carries a minimum of 20 marks and it will be conducted jointly by the guide and the external examiner.

The learner should secure a minimum of 10 marks for a pass in the viva-voce examination failing which he/she would be required to reappear for the same after a month but within a period of 3 months for which he/she will have to pay a fee as prescribed by the college.

Further for a pass in this paper as a whole, a learner should secure at least 50 marks in project report and viva-voce put together.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
Research Programme - M. Phil
Semester I
(2018- 2019)
Core Course- I: Research Methodology (18HBTC11)
(For those who join from June 2018 and afterwards)

Credits	**: 5**	**Int. Marks**	**: 40**
Hours/Week	**: 6**	**Ext. Marks**	**: 60**
Duration	**: 90 hrs**	**Max. Marks**	**: 100**

Course Objectives:

- To make the students to understand the basics of research and its concepts.
- To impart the knowledge on biotechnological techniques.
- To gain the knowledge on the importance of statistics and computer in biotechnological research.

Course Outcomes:

1. Understand the basics of research
2. Ability to design an experiment
3. Ability to write research manuscript
4. Understand the theoretical aspects of biotechnological techniques.

UNIT I **(18 hrs)**

Research-Basic and Applied Research – Essential Steps in Research-Literature collection- Literature citation – Different systems of citing References – Citation Index and Impact Factor-Journal Abbreviations-Research Report – Introduction- Components of Research Report – Abstract- Introduction- Materials and Methods- Results- Discussion- Summary- Appendix- References and Plagiarism- Experimental Designs – Basic Principles- Experimental Error- Replication- Controls and Randoization.

UNIT II **(18 hrs)**

Plant Cell- Tissue and Organ Culture and its Applications- Totipotency-Dedifferentiation and Re differentiation- Types of Cultures – Callus, Cell Suspension- Protoplast- Anther Microspore etc- Somatic Embryogenesis and Organogenesis- Culture Media – Types- Role of Hormones- Somaclonal Variation and its Application.

UNIT III **(18 hrs)**

Agarose - Polyacrylamide- 2D Gel Electrophoresis and Pulsed Field Electrophoresis – Iso Electric Focusing-Blotting Techniques –Southern- Northern and Western- MALDI-ToF-MS and ESI-MS-Principles and Applications of HPLC and GLC-Affinity Chromatography- RFLP-RAPD analysis- AFLP- MAS- PCR- DNA Fingerprinting- Nucleic acid labeling techniques-DNA sequencing methods- ELISA and Microarray.

UNIT IV **(18 hrs)**

Statistics–collection-Classification-Tabulation of Statistical Data–Diagrammatic Representation of Data- Measures of Central Tendency – Measures of Dispersion–Correlation and Regression- Student's t Test- ANOVA and Chi-square test.

UNIT V **(18 hrs)**

Input and Output Devices- Classification of Computers- CPU- Software and Application-Machine and Assembly languages- Compiler Assembler and Interpreter- Flow Charts- General Knowledge of Software Packages Used in Statistics and Graphics.

Text Books:

1. Anderson, J Durston, D Poole, M "Thesis and Assignment writing", New Age International Pvt.Ltd, New Delhi, 1991.
2. Conference of Biological, "Style manual for Biological Journals, American Institute of Biological Science", Washington, D.C, 2000.

Unit	Text Book No	Chapter	Section	Page No.
I	2	1	1.1-1.9	283-330
		12	12.1-12.6	330-333
II	2	1	7.2-7.9,	31 to 382
		2	2.1-2.9,	41-49
III	2	4	4.9-4.11,	189-191
		6	6.1-6.9	281-298
		7	7.2-7.9	426,381-467
		9	9.1-9.30	443-450
		10	10.2-10.4	941-949
IV	1	6	6.1-6.4	42 to 60
V	1	7	7.1-7.5	341 to 349

Reference Books:

1. N. Gurumani, “Research Methodology for Biological Sciences”, MJP publisher, 2007.
2. Gurdeep R Chatwal , Sham K Anand, “Instrumental methods of chemical analysis”, Himalaya Publishing House, Second Edition, 2007.
3. Wilson.k; Walker.J, “Principles and techniques of practical- Biochemistry”, Cambridge University Press, Fifth Edition,1999.
4. David W. Mount, “Bioinformatics sequence and genome analysis” 2nd, CSHL press, Second Edition, 2004.
5. David Freifelder, W.H.Freeman, “Physical Biochemistry Applications to Biochemistry and Molecular Biology” Second Edition , 1982.
6. Jerrold H. Zar, “Biostatistical Analysis” Prentice Hall publishers, Fourth edition, 1998.
7. Veer Bala Rastogi, “Fundamentals of Biostatistics”, Ane Books India, New Delhi. 2006.
8. Bioinstrumentation, Veerakumar, L., MJP Publishers, Chennai. 2006.
9. Fritsch and Maniatis, Sambrook, “Molecular Cloning”, A laboratory manual, 2002.
10. Prakash, M, C.K. Arora, ”Laboratory instrumentation”, Anmol Publications Pvt ltd,1999.
11. Gelvin, “Plant Molecular Biology” , A laboratory manual, Kluwer academic press,1996.
12. Zar, J.H,”Biostatistical methods”, Prentice Hall International, 1984.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
Research Programme - M. Phil
Semester I
(2018 – 2019)
Core Course–II: Advanced Biotechnology (18HBTC12)
(For those who join from June 2018 and afterwards)

Credits	**: 5**	**Int. Marks**	**: 40**
Hours/Week	**: 6**	**Ext. Marks**	**: 60**
Duration	**: 90 hrs**	**Max. Marks**	**: 100**

Course Objectives:

- This paper provides the student a thorough knowledge in principles and methods in genetic engineering, vectors in gene cloning.
- To expose students to application of rDNA technology in various fields of biotechnology, medicine and research areas.
- This paper will help the student get a grasp of the latest advances in recombinant DNA technology, which is a powerful tool in modern Biotechnology.

Course Outcomes:

1. Understand the recent advances in biotechnology.
2. Understand the gene expression process in prokaryotes and Eukaryotes.
3. Ability to use bioinformatics tools and softwares.
4. Ability to understand the strageties of cloning.

UNIT I **(18 hrs)**

Organization of Prokaryotic and Eukaryotic Genomes- Gene Expression in Prokaryotes and Eukaryotes- Transposable Elements- Organization and Functions in *E.col*- Extra Chromosomal Inheritance in Plants and Animals.

UNIT II **(18 hrs)**

Plasmids- Cosmids- Phagmids,-λ Based Cloning Vectors- BAC, YAC- Cloning vectors of *Bacillu*- *Streptomyces*- *Pseudomonas*- Construction and Expression System of Insect and Mammalian Vectors- SV40- Baculo Virus- CaMV and Artificial Chromosomes.

UNIT III **(18 hrs)**

Shot Gun Cloning- Genomic Library- Cloning Large Sized DNA Molecules- cDNA library- Physical and Genetic Mapping- Functional Genomic Strategies – T-DNA Tagging.

UNIT IV **(18 hrs)**

Production and Applications of Monoclonal Antibodies- Concept of Stem Cell Research- Stem Cell Growth- Maintenance and Applications of Embryonic and Adult Stem Cells.

UNIT V **(18 hrs)**

Principles of Bioinformatics- Gene Annotations- Gene Analysis- Data Mining- Multiple Sequence Alignment- various bioinformatics software and their applications-Molecular modeling and drug design- Protein engineering- Protein Folding and Structural Bioinformatics.

Text Books:

1. Slater,A. Scot,N. and Fowler,M, "Plant Biotechnology",the genetic manipulation of plants, Oxford press, 2007.
2. Watson,J.D, Gilman,M, Witkowshi,J and M.Zoller, "Recombinant DNA", Scientific American Books, W.H. Freeman and Co; New york, USA, Second Edition,1992.

Unit	Text Book No	Chapter	Section	Page No.
I	1	1	1.1-1.9	283-330
		12	12.1-12.6	330-333
II	2	1	7.2-7.9,	31 to 382
		2	2.1-2.9,	41-49
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		7	7.2-7.9	426,381-467
		9	9.1-9.30	443-450
		10	10.2-10.4	941-949
IV	2	6	6.1-6.4	42 to 60
V	2	7	7.1-7.5	341 to 399

Reference Books:

3. Glick, B.R and J.J. Pasternak, "Molecular Biotechnology Principles and application of recombinant DNA", ASM press, Third Edition, Washington, USA,1992.
4. Environmental Biotechnology, principles and applications, Bruce Rittman, Perry Mccarty, McGraw- Hill, Second edition, 2000.
5. Buchanan, B.B., W. Gruissen and R.L. Jones, "Biochemistry and Molecular Biology of Plants", by American Society of Plant Biology, Rockilled, Md, USA, 2000.
6. Richard A. Golsby, Thomas J. Knidt, Barbara A. Osborne, Janis " Kuby Immunology," W.H. freeman and Company, New York, Fifth Edition, 2003.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
Research Programme - M. Phil
Semester I
(2018– 2019)
Core Course- III: Applied Biotechnology (18HBTC13)
(For those who join from June 2018 and afterwards)

Credits	**: 5**	**Int. Marks**	**: 40**
Hours/Week	**: 6**	**Ext. Marks**	**: 60**
Duration	**: 90 hrs**	**Max. Marks**	**: 100**

Course Objectives:

- To make the students to understand the genetic engineering and gene manipulation techniques
- To impart the knowledge on fermentation technology
- To make the students familiar with immunology and immune technology

Course Outcomes:

1. Understand the application of biotechnology in various fields
2. Ability to use IPR and its methods.
3. Understand the core features of nanotechnology.
4. Understand the future prospective of biotechnology.

UNIT I **(18 hrs)**

Introduction and applications- Selectable markers- reporter genes and promoters used in plant vectors- Methods of transformation- chloroplast transformation-Genetic engineering of plants for herbicide- virus and fungus resistence- delay of fruit ripening- Molecular biology of plant stress response- engineering plants against abiotic stress.

UNIT II **(18 hrs)**

Animal Cells- Cloning Vectors and Expression Vectors for Animal Gene Introduction- Cloning and Expression of Foreign Genes in Transgenic Animals- Gene Therapy- IPR- Biosafety and Bioethics.

UNIT III **(18 hrs)**

Fermentors- Fermentation- scale up of genetically engineered microbes- Types of recombinant products – their clinical uses- Biological insect control – Biodegradation and bioremediation- bioleaching and mining- Production of ethanol- vitamins- organic acid- amino acid- vaccines and enzymes.

UNIT IV **(18 hrs)**

Immuno detection in infectious disease- Nucleic acid biochemistry in immunology- Immuno proteomics- Vaccines development and delivery- Methods for analyzing B cell response and T cell response- Immuno-diagnosis.

UNIT V **(18 hrs)**

Genomics of secondary metabolite production- antibiotic resistance-Metagenomics-construction- vector design and screening of metagenomics libraries- ecological perspectives of metagenomics- industrial application of metagenomics- Proteomics – principles, methods and applications- Nanotechnology and its applications.

Text Books:

1. Slater,A. Scot,N. and Fowler,M, "Plant Biotechnology-the genetic manipulation of plants", Oxford press,2007.
2. Watson,J.D,Gilman,M; Witkowshi,J and M.Zoller, "Recombinant DNA, Scientific American Books, W.H. Freeman and Co, New York, USA, Second Edision,1992.

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		6	6.1-6.9	281-298
		7	7.2-7.9	426,381-467
		9	9.1-9.30	443-450
		10		415-419
IV	2	4		42 to 60
V	2	3		341 to 349

Reference Books:

1. Glick, B.R and J.J. Pasternak. "Molecular Biotechnology "Principles and application of recombinant DNA", ASM press,Washington, USA, Third edition,2002.

2.Environmental Biotechnology, principles and applications, Bruce Rittman, Perry Mccarty, McGraw- Hill, Second Edition, 2000.

Sri Kaliswari College (Autonomous), Sivakasi
Department of Biotechnology
Research Programme – M.Phil
Semester II
(2018 - 2019)
Project (18HBTJ21)
(For those who join from June 2018 and afterwards)

Credits : 5

Course Objectives:

- To enable students understand the purpose and importance of research in Biotechnology.
- To plan and carry out research work by collecting review, collecting materials, and find the results by various biotechniques.

Course Outcomes:

1. Inculcate Research interest among students
2. Get familiarized with basic concepts of research.
3. Identify and state the research topic.
4. Design and conduct research study accordance with the identified research need.
5. Develop skill to search online and offline sources to carryout research.
6. Assess ways to collect, compile and conduct a data analysis.
7. Apply academic skills to present the research study findings in a formal academic oral presentations and a written research paper.

Project work:

Each learner can select for his/her research project in the thrust areas of Biotechnology in consultation with his/her guide and the Head of the Department.

The learner can undergo his/her project work in the reputed Biotechnology laboratories or in the Biotechnology laboratory itself. The learner should attend the Review meetings without fail.

The project dissertation should be submitted to the Principal through the Head of the Department of Biotechnology one week prior to the commencement of the summative examination. If a candidate fails to submit his/her project report on the date presented above, he/she may be permitted to submit the same 4 days prior to the date of viva-voce examination with a fine as prescribed by the college.

Each learner shall submit 2 copies of his/her project dissertation for valuation.

The project dissertation shall contain at least 50 pages excluding bibliography and appendices.

The project dissertation shall be valued for a total of 150 marks out of which 75 is internal mark and 75 is external mark and sum of the two is taken for 150.

The viva-voce carries 50 marks and it will be conducted jointly by the guide and the external examiner.

For a pass in this course as a whole, a learner should secure at least 50% marks in project dissertation and viva-voce put together.