

A.V.V.M. SRI PUSHPAM COLLEGE (AUTONOMOUS), POONDI

Programme: M. Sc.

Department: Biotechnology

Syllabus Revision 2017-2018

S.No.	Courses	Number of courses having changes
1.	Core Course	05
2.	Elective Course	-
	TOTAL	05

Total Number of Courses : 23

Total Number of Courses having changes : 05

Percentage of Revision : 21.7 %

Note:

The content of the syllabus which has been revised is highlighted.

M.Sc., BIOTECHNOLOGY (2017 – 2018)

S. No	SEM	Category	Paper Code	Title of the Paper	Maximum Marks			Minimum Marks for Pass			Hours Week	Credits
					CIA	E.E	Total	CIA	E.E	Total		
1.	I	Core	17P1BTC1	Biochemistry	25	75	100	10	30	50	6	5
2.		Core	17P1BTC2	Advances in Microbiology	25	75	100	10	30	50	6	5
3.		Core	17P1BTC3	Environmental Biotechnology	25	75	100	10	30	50	6	5
4.		Core	17P1BTCP1	Practical – I (Biochemistry, Microbial and Environmental Biotechnology)	40	60	100	16	24	50	6	3
5.		Major Elective-I	17P1BTEL1A 17P1BTEL1B 17P1BTEL1C	Immunology and Immuno technology/ Entrepreneur skill Development / Molecular Modeling And Drug Designing	25	75	100	10	30	50	6	4
6.	II	Core	17P2BTC4	Molecular Genetics	25	75	100	10	30	50	4	4
7.		Core	17P2BTC5	Plant and Animal Biotechnology	25	75	100	10	30	50	4	4
8.		Core	17P2BTC6	Enzyme Biotechnology	25	75	100	10	30	50	4	4
9.		Core	17P2BTC7	Nano biotechnology	25	75	100	10	30	50	4	4
10.		Core	17P2BTC8	Genomics and Proteomics	25	75	100	10	30	50	4	4
11.		Core	17P2BTCP2	Practical-II (Molecular Genetics, Plant and Animal Biotechnology, Enzyme Biotechnology and Industrial Biotechnology, Nano biotechnology, Proteomics & Genomics)	40	60	100	16	24	50	6	3
12.		Major Elective-II	17P2BTEL2A 17P2BTEL2B 17P2BTEL2C	Bio-Instrumentation and Biometry / Bio-informatics, IPR & Nanotechnology/ Bio-Informatics, Intellectual Property Rights & Nanotechnology	25	75	100	10	30	50	4	4
13.	III	Core	17P3BTC9	Bio-Process Technology	25	75	100	10	30	50	5	4
14.		Core	17P3BTC10	Clinical biochemistry	25	75	100	10	30	50	5	4
15.		Core	17P3BTC11	Recombinant DNA Technology	25	75	100	10	30	50	5	5
16.		Core	17P3BTC12	Aquatic Biotechnology	25	75	100	10	30	50	5	4
17.		Core	17P3BTCP3	Practical – III (Bioprocess Technology, Recombinant DNA Technology and Clinical Chemistry)	40	60	100	16	24	50	5	4
18.		EDC	17P3BTEDC	Fundamentals of Biotechnology	25	75	100	10	30	50	4	---
			Communicative Skill And Personality Development			-	-	-	-	-	1	-
19.	IV	Core	17P4BTC13	Research Methodology	25	75	100	10	30	50	8	5
20.		Core	17P4BTC14	Industrial Biotechnology	25	75	100	10	30	50	8	5
21.		Major Elective-III	17P4BTEL3A 17P4BTEL3B 17P4BTEL3C	Biosafety and Bioethics/ Biodiversity and Bio resources/ Enzymology	25	75	100	10	30	50	8	4
22.		CN	17P4BTCN	Comprehension	-	100	100	-	-	50	5	2
23.		Project	17P4BTPR	Project	40	60	100	16	24	50	---	4
			Communicative Skill and Personality Development								1	
			Total			2300					120	90

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
II	17P2BTC7	Core – NANOBIO TECHNOLOGY	4	4
Objectives: <ol style="list-style-type: none"> 1. To know about the Nanotechnology. 2. To learn about the nanoparticles and targeted drug delivery. 3. To learn the improved diagnostic products and techniques. 4. To study about the applications of nanomaterials. 				

UNIT – I

Principles of Nanobiotechnology; Introduction to nanotechnology - History of nanotechnology – Fundamental concept of Nanotechnology – Scope and application of Nanotechnology.

UNIT – II

Nanomaterials - classification of nanomaterials - properties of nanomaterials – Preparation of Nanomaterials – Synthesis of nanomaterials.

UNIT – III

Synthesis of nanoparticles. Using natural sources – nanotubes, carbon nanotubes, Formation of carbon nanotubes – uses of nanotubes – Biological applications of nano tubes.

UNIT – IV

Measurement techniques for nanomaterials – x-ray crystallography – Atomic force microscope – Electron microscope – SEM, TEM – Fluorescence microscope.

UNIT – V

Applications of nanomaterials – Present and future nanoparticles in medicine – Introduction of drug delivery in pharmaceuticals. Nanoparticles carrier and carrier characteristics.

Reference:

1. Claudio Nicolini, Nanobiotechnology & Nanobiosciences Pan Stanford Publishing Pte. Ltd. 2009.
2. O. Skoseyov, Ilan Levy, Nanobiotechnology – BioInspired Devices and Materials of the Future, Humana Press Inc, 2008.
3. N. Yao and Zhong Lin Wang, Handbook of Microscopy for Nanotechnology Kluwer Academic Publishers, 2005.
4. Nanotechnology – N. Arumugam – Saras Publications.
5. Introduction to Nanotechnology – Neal Lane and James R. Heath.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
II	17P2BTCP2	Core – Practical – II – MOLECULAR GENETICS, PLANT AND ANIMAL BIOTECHNOLOGY, ENZYME BIOTECHNOLOGY, NANOBIOTECHNOLOGY AND PROTEOMICS & GENOMICS	6	3

Objectives:

1. To study the Isolation of DNA, Electrophoresis and GUS Assay.
2. To study the Tissue Culture methods.

Molecular Genetics

1. Plasmid extraction : Alkaline lysis, Mini preparation.
2. Chromosomal DNA isolation (Animal tissue, plants, bacteria and fungi)
3. Quantification of DNA & RNA
4. Electrophoresis of DNA & RNA
5. Bacterial transformation
6. Isolation of drug resistant autotrophic mutants.
7. Study of mutation by Ames test.

Plant and Animal Biotechnology

1. Preparation of Tissue Culture medium for plant and animals.
2. Micro propagation of shoot tip & seed culture.
3. Preparation of single cell suspension from spleen and thymus.
4. Cell counting and cell viability
5. Macrophage monolayer from PBMC and measurement of Phagocyte activity
6. Macrophage monolayer and subculturing
7. Cryopreservation and Thawing
8. Measurement of doubling time
9. Isolation of DNA and demonstration of apoptosis of DNA laddering.
10. MTT assay for cell viability and growth
11. Cell fusion with PEG.

Enzyme Biotechnology

1. ELISA
2. Immobilization of enzymes.
3. Effect of pH & temperature on enzyme activity.

Genomics and Proteomics

1. Sequence alignment- Local and Global alignment.
2. Sequence retrieval from biological databases- NCBI, EMBL, DDBJ, SWISSPROT.
3. Protein structure visualization- Rasmol.

Nanobiotechnology

1. Synthesis of Nanoparticles.
2. Metal microbes interactions.
3. Nanoparticles for diagnosis and treatment.

Reference:

1. Genetic Transformation of plants (Molecular Methods of Plant Analysis 2003 Publisher : Springer)
2. Plant Tissue Culture by S.S. Purohit, 2004, Mrs. Saraswati Purohit for Student edition.
3. Animal Cell Culture – Practical approach, Ed. Martin Clynes, Springer.

4. Animal Cell Culture Techniques. Ed. Martin Clynes, Springer.
 5. Culture of Animal Cells, 3rd Ed, R.Ian Freshney, Wiley Liss.
 6. Animal Cell Culture – Practical Approach, Ed. John R.W. Masters, Oxford.
 7. Animal Cells : Culture and Media : Essential Data (Essential Data Series) by D.C. Darling, S.J. Morgan, 195, John Wiley and Sons Ltd.
 8. Principles of Tissue Engineering by : Robert P. Lanza, Robert Langer, Joseph P. Vacanti, 2000 Academic Press.
 9. Handbook of Industrial Cell Culture : Mammalian, Microbial, and Plant Cells 2002.
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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	17P3BTC9	Core – BIO-PROCESS TECHNOLOGY	5	5

Objectives:

1. To study the Bioprocess engineering.
2. To study the microbial strain involved in Bioprocess.
3. To study the food processing.

Unit I**Hrs15**

Introduction and scope of Bioprocess engineering. Microbial growth kinetics, Biomass production. Thermodynamics – energy balance in microbial – metabolic heat generation. Advantages of Bioprocess over chemical process.

Unit II**Hrs15**

Microbial strain improvement, increased yield. Upstream processing – Effect of pH, Temperature, Media formulation, carbon source, Nitrogen, vitamin, minerals, inducers, precursors, inhibitors and growth factors.

Unit III**Hrs15**

Downstream Processing – Biomass removal and disruption. Removal of microbial cells: and solid matter, centrifugation, sedimentation, Flocculation, microfiltration, sonication, Bead mills, Homogenizer, Chemical lysis, enzymatic lysis. Membrane based Purification – Ultrafiltration; Reverse osmosis, dialysis Pervaporation, Perstraction, absorption and chromatography. Precipitation, Biological affinity. Electrophoresis. Extraction (solvent aqueous two phase, super critical) Drying and crystallization.

Unit IV**Hrs15**

Fermentation products: Bread, Cheese, fermented milk products.
Beverages: Beer, Wine. Fermented vegetables.

Unit V**Hrs15**

Food processing technology – canning, packing, sterilization, pasteurization, food spoilage, food preservation – modern methods of preservation of Milk, Fruit, Food product, meat and other animal products.

Reference:

1. Bioprocess Technology: Fundamentals and Applications, KTH, Stockholm.
2. Jackson, A.T., Process Engineering in Biotechnology, Prentice Hall, Angelwood Cliffs.
3. Shuler, M.L. and Kargi, F., Bioprocess Engineering: Basic Concepts, Prentice Hall, Engelwood Cliffs.
4. Stanbury, P.F. and A. Whitaker, 1995, Principles of Fermentation Technology, Pergamon Press, Oxford
5. Wulf Crueger and Anneliese Crueger, 2000, A Text Book of Industrial Microbiology, Panima Publishing Corporation, New Delhi.
6. Pharmaceutical Biotechnology, Purohit, S.S. (2009).
7. Pharmaceutical Microbiology, Purohit, S.S. (2008).

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	17P3BTC12	Core – AQUATIC BIOTECHNOLOGY	4	4

Objectives

- 1.To study the scope of aquaculture.
- 2.To know about the disease management of aquatic organism.
- 3.To know about the cryopreservation techniques in aquatic organism.
4. To study about the transgenic fishes.

UNIT – I

Hrs 12

Scope of Aquaculture – Aquaculture in India – Types of aquaculture – Culture practices in India – Culturable organisms: Fin fishes, Shell fishes – water quality management & aquatic pollutions.

UNIT – II

Hrs 12

Construction of Fish pond – Fresh water aquaculture – Types of Culture – Extensive, Semi intensive, Intensive culture, Mono culture, Monosex culture, Poly culture, Cage culture, Pen culture. Integrated fish farm. Role of probionts in aquaculture.

UNIT – III

Hrs 12

Diseases of aquaculture organisms – Ectoparasites and Endoparasites – Bacterial, Viral and Fungal diseases. Preservation of fishes – PCR and applications.

UNIT – IV

Hrs 12

Cryopreservation of gametes – Implication of cryopreservation in Aquaculture – Hypophysation – Principles, Prodecures of hypophysations – mechanism of pituitary action – Ovaprim – Advantages of hypophysations. Southern blotting & DNA Finger printing.

UNIT – V

Hrs 12

Transgenic fish – Candidate genes for transfer – Making gene construction – Mechanism of gene transfer – Characterization of transgenic fish – Potential hazards and benefits.

Reference:

- 1.Hackett, P.B. 1993. The molecular biology of transgenic fish. In : Biochemistry and Molecular Biology of Fish, (Eds. Hochachka, P., Mommsen, T.) Vol.2, Elsevier Science Publishers, Amsterdam, pp.207 – 240.
- 2.Leung, L.K.P. and Jamieson, B.G.M.1991. Live preservation of fish gametes. In: Fish Evolution and Systematics: Evidence from spermatozoa (Ed.Jamieson,B.G.M) pp.245-295, Cambridge University Press.
- 3.Old, R.W. and Primrose, S.B. 1994. Principles of gene manipulation: An introduction to genetic engineering, Blackwell Scientific Publications, Oxford.
- 4.Balasubramanyam, D.et.al. 1998. Concepts in Biotechnology, University Press.
- 5.Ranga, M.M.1999. Animal Biotechnology, Agrobios, Jodhpur, New Delhi.
- 6.Karunasagar, Aquaculture and Biotechnology (for chapters 11 & 14).
- 7.Ranga and Shammi. 1999. Fish Biotechnology.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	17P3BTC3	Core – Practical – III – BIO-PROCESS TECHNOLOGY, RECOMBINANT DNA TECHNOLOGY, CLINICAL BIOCHEMISTRY & AQUATIC BIOTECHNOLOGY	6	3

Objectives:

1. To know the r-DNA Technology.
2. To know the Bioprocess Technology.
3. To know the Biodiversity.

Bio-Process Technology

1. Isolation of industrially important microorganisms (Amylase, Pectinase, Cellulase) for microbial process.
2. Study of optimal culture conditions for the production of Amylase, Pectinase and cellulose in a bioreactor.
3. Production of amylase, cellulase, pectinase, wine and beer in a bioreactor.
4. Determination of thermal death point and thermal death time of microorganisms for design of a sterilizer.
5. Microbial production of citric acid using *Aspergillus niger*.
6. Microbial production of Penicillin, (Biosynthesis of Antibiotics).
7. Production and Estimation of Alkaline Phosphatase.
8. Identification of micro organisms in preserved food product (Milk, Fruit juice, animal meat).

Recombinant DNA Technology

1. Restriction analysis of plasmid (PBR322, PUC)
2. Selection methods (Blue white screening, Insertional inactivation).
3. Primer design and PCR amplification of Beta galactosidase.
4. Cloning of PCR product into PBR.
5. Introduction of cloned genes and analysis by SDS – PAGE.
6. SOUTHERN BLOTTING of Beta galactosidase.
7. Reporter gene assay (GUS/beta galactosidase).
8. Isolation of phage DNA.
9. RFLP analysis of 18s r-DNA of genome.
10. Genetic diversity of Pseudomonas by RAPD.

Clinical Biochemistry

1. Estimation of Haemoglobin in blood samples
2. Estimation of Bile pigments
3. Estimation of Creatinine
4. Estimation of triglycerides, steroids

Aquatic Biotechnology

1. Estimation of O₂ consumption by fish.
2. Estimation of Salinity in given water samples.
3. Isolation of microbes from the digestive track of fish.
4. Cryopreservation

References

1. Short Protocols in Protein Science – A Compendium Methods from Current Protocols in Protein Science by John E. Coligan, Ben M. Dunn, 2003, John Wiley and Sons Ltd.
2. Enzymes, Biochemistry, Biotechnology, Clinical Chemistry, Trevor Palmer, Horwood Publishing, Chichester, 2001.
3. Analytical Biochemistry by David J. Holme and Hazel Peck, 3rd ed., 1998, Pearson Education Ltd., England.
4. Principles and Practice of Bioanalysis by Richard F. Venn, 2003. Taylor and Francis, London.

5. Biochemical Methods by A. Pingoud, C. Urbanke, J. Hoggett, 2002. Wiley-VCH Verlag GmbH.
 6. Molecular Cloning, A Laboratory Manual, Vol.I-III by Sambrook et al. (1989), Cold Spring Harbor Laboratory.
 7. Genetic Analysis of Bacteria by Stanley R. Maloy, Valley J. Stewart, 1996, Cold Spring Harbor Laboratory Press.
 8. PCR Protocols by John M.S. Barlett, David Stirling, 2003, Humana Press Inc.
 9. RNA Methodologies, 2nd Edn. by Robert E. Farrel Jr. 1996, Academic Press Inc.
 10. Short Protocols in Molecular Biology, Vol.I & II, 5th Edn., by Frederick M. Ausubel, Roger Breuyt, 2002, John Wiley & Sons, Inc.
 11. PCR Strategies by Mixchael, A. Immis, David, II. Gelfand, 1995, Academic Press, Inc.
 12. Bio-chemical method by A.PINGOUD, C. URBANKE, J.HOGGETT, 2002 – Wiley – VCH Verlag GmbH.
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