

Annexure – 19

PERIYAR UNIVERSITY
SALEM – 636 011



PERIYAR INSTITUTE OF DISTANCE EDUCATION [PRIDE]

P G DIPLOMA IN BIOTECHNOLOGY

REGULATIONS AND SYLLABUS

[Candidates admitted from 2007-2008 onwards]

PERIYAR UNIVERSITY, SALEM –636 011

PERIYAR INSTITUTE OF DISTANCE EDUCATION [PRIDE]

P G DIPLOMA IN BIOTECHNOLOGY

REGULATIONS AND SYLLABUS

1. CONDITION FOR ADMISSION

A candidate who has passed a graduate or Post graduate degree in Science with Biotechnology / Botany / Zoology / Biology / Microbiology / Microbial Gene technology / Bioinstrumentation / Bioinformatics / Biochemistry / Chemistry / Agriculture / Marine Biology / Home Science / Farm Science / Nutrition and Dietetics / Integrated Biology / Plant Science / Animal Science / Fisheries Science / Aquaculture / Mathematics with Physics, Chemistry as Ancillary / Medical Lab Technology / B. Pharm / BSMS of this University or any of the above degree of any other University accepted by syndicates as equivalent thereto, subject to such conditions as may prescribed therefore shall be permitted to appear and qualify for the P G Diploma in Biotechnology Examination of this University after a course of study of one year.

2. DURATION OF THE COURSE

The course for the PG Diploma in Biotechnology shall consist of one year.

3. COURSE OF STUDY AND SCHEME OF EXAMINATIONS

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

PAPER No:	TITLE OF THE PAPER	Duration	Marks
1	Plant and Animal Biotechnology	3	100
2	Engineering and Environmental Biotechnology	3	100
3	Industrial and Enzyme Biotechnology	3	100
4	Lab in Plants, Animals and Engineering Biotechnology	6	50
5	Lab in Industrial and Enzyme Biotechnology	6	50
6	Project / Dissertation Work	-	100
	Grand Total Marks		500

4. EXAMINATIONS

Examination shall be of three hours duration for each paper. Theory examinations and the project report will be held at the end of the year. The candidates failing in any subject(s) may be permitted to reappear in subsequent examinations

Model Question Paper Pattern: THEORY

Time: 3 Hours.

Max. Marks: 100

SECTION – A

Answer all the questions:

5 X 5 = 25 Marks

(2 questions from each unit with internal choice)

SECTION – B

Answer all the questions

5 X 15 = 75 Marks

(2 questions from each unit with internal choice)

Model Question Paper Pattern: PRACTICAL

Time: 6 Hours.

Max. Marks: 50

Major	:	15 Marks
Minor	:	10 Marks
Spotters (5x4)	:	15 Marks
Record	:	05 Marks
Viva Voce	:	05 Marks

Total

50 Marks

6. PASSING MINIMUM

The candidate shall be declared to have passed examination, if they secure not less than 50 marks in each examination.

7. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the Diploma in First Class. All other candidates shall be declared to have passed in second class.

8. COMMENCEMENT OF THE REGULATIONS

The above regulation shall take effect from the 2007 -2008 onwards

9. TRANSITORY PROVISIONS

As stipulated by the University from time to time

10. DISSERTATION:

No. of copies / distribution of dissertation:

The students should prepare three copies of dissertation and submit the same for the evaluation by Examiners. After evaluation one copy is to be retained in the college library and one copy is to be submitted to the University (Register) and the student can hold one copy.

Format to be followed:

The formats / certificate for dissertation to be submitted by the students are given below.

Format for the preparation of project work:

- (a) Title page
- (b) Bona fide certificate
- (c) Acknowledgement
- (d) Table of contents

Chapter No:	TITLE	Page no.
1	Introduction	
2	Review of Literature	
3	Materials and Methods	
4	Results	
5	Discussion	
6	Summary	
7	References / Bibliography	

Format of the Title Page:

TITLE OF THE DISSERTATION

Dissertation submitted in part fulfillment of the requirement for the
P G Diploma in Biotechnology to Periyar Institute of Distance Education (PRIDE),
Periyar University, Salem-636011.

By

Student Name

Register Number

Endroll Number

Under the guidance of

_____ with official Address



Name of the Study Centre with Code

Periyar Institute of Distance Education (PRIDE),

Periyar University, Salem-636011

Year

Format of the Certificate:

CERTIFICATE

This is to certify that the dissertation entitled
..... Submitted
in part fulfillment of the requirement of the degree of P G DIPLOMA IN
BIOTECHNOLOGY to Periyar Institute of Distance Education (PRIDE),
Periyar University, Salem is a record of bonafide research work carried out
by..... under my supervision and guidance and that no part of the
dissertation has been submitted for the award of any degree, any other diploma,
fellowship or other similar titles or prizes and that the work has not been
published in part or full in any scientific or popular journals or magazines.

Signature of the Candidate

Signature of the Guide

Study centre - Coordinator

Director

Examiner 1 :

Examiner 2 :

PAPER 1 – PLANT AND ANIMAL BIOTECHNOLOGY

UNIT – I. In-vitro Methods in plant tissue culture, Aseptic Techniques, Nutrient media, and use of growth regulators (Auxins, Cytokinins and Gibberellins). In-Vitro fertilization – Ovary and Ovule culture. Clonal Propagation of elite species (Micro Propagation). Organ Culture – Anther, Embryo and their applications. Organogenesis and Somatic Embryogenesis – Techniques and applications

UNIT – II. Protoplast Culture – Isolation, regeneration and viability test, somatic hybridization, methods of protoplast fusion –chemical and electro fusion, practical application of somatic hybridization and hybridization. Somaclonal Variation and their significance. *In-Vitro* production of secondary metabolites – Techniques and significance. role of tissue culture in agriculture, horticulture and forestry . Transgenic plants. Technique of transformation.

UNIT – III. Agrobacterium mediated and physical methods (Microporation and electroporation) Applications of transgenic plants. Edible Vaccines from plants – Banana, Watermelon. Biotechnology and Intellectual property rights. Patents, trade secrets, copyright, trademark, choice of Intellectual property (IPr) and plant genetic resource (PG r) , GAA TRIPS.

UNIT – IV . Scope of Animal Tissue Culture. Culture Media. Simulating natural conditions for growth of animal cells: 1. Natural media –Plasma Clot, biological fluids tissue extract, Importance of Serum in media. 2. Chemical defined media. a) Primary

Culture – Cell lines, and cloning disaggregation of tissue, isolation of tissue, enzyme. disaggregation, and mechanical disaggregation.

b) Secondary Culture – transformed animal cells and continuous cell lines.

UNIT - V. Production of Vaccines in animal cells. Production and applications of monoclonal antibodies. Growth factors – Prompting proliferation of animal cells EGF, FGF, PDGF, IL-1, IL-2, and NGF . Transgenic animals: mice and sheep.

SUGGESTED READINGS

1. Ravishankar G.A and Venkataraman L.V(1997) Biotechnology applications of Plant Tissue & cell culture. Oxford & IBH Publishing co., Pvt Ltd.
2. Bhan (1998) Tissue Culture, Mittal Publications, New Delhi.
3. Islan A.C (1996) Plant Tissue Culture, Oxford & IBH Publishing Co., Pvt. Ltd.
4. Lydiane Kyte & John Kleyn (1996) Plants from Test Tubes.
An introduction to Micropropagation (3rd Edition) timber Press, Partland.
5. Kumar H.D (1991) A text book on Biotechnology (2nd Edition). Affiliated East West Press Private Ltd. New Delhi.
6. Chrispeel M.J. and Sdava D.E. (1994). Plants, Genes and Agriculture,
Jones and Barlett Publishers, Boston.

7. Reinert J. and Bajaj Y.P.S (1997) Applied and fundamental Aspects of Plant Cell, Tissue, and Organ Culture, Narosa Publishing House.
8. Elements of Biotechnology – P.K. Gupta (1st Edition -2000) - Rastogi Publications.

PAPER 2 - ENGINEERING AND ENVIRONMENTAL BIOTECHNOLOGY

UNIT - I. Introduction to Genetic Engineering. Tools for genetic engineering 1. DNA manipulative enzymes – Restriction enzymes and DNA ligases. 2. Gene cloning vectors – Plasmids, Bacteriophage and cosmids In Vitro construction of recombinant DNA molecules –(pBR 332, pUC 19) Isolation of passenger & vector DNA, creation of r-DNA. Transformation of r-DNA - Electroporation and microinjection.

UNIT - II. Screening and selection of recombinant host cells – Immunological screening and colony hybridization. Gene Libraries – Genomic DNA and c DNA Cloning techniques Expression of cloned DNA in *E.coli*. Molecular biology techniques. a) Electrophoretic techniques –Proteins and nucleic acids. b) Polymerase chain reaction (PCR), c) Site directed mutagenesis (SDM), d) Nucleic acid sequencing – Sanger's method e) Blotting techniques – Southern, Western and Northern blot. Application of r-DNA technique in human health. a) Production of Insulin b) Production of recombinant vaccines – Hepatitis – B.

UNIT – III. Renewable and Non-Renewable resources of energy. Conventional fuels and their environmental impact – Firewood, Water, Coal and Gas. Modern fuels and their environmental impact – Methanogenic bacteria, Biogas, Microbial hydrogen Production, Conversion of sugar to alcohol Gasohol.

UNIT – IV. Bioremediation: Bioremediation of soil & water contaminated with oil spills, heavy metals and detergents. Degradation of lignin and cellulose using microbes. Phyto-remediation. Degradation of pesticides and other toxic chemicals by micro-organisms- Treatment of municipal waste and Industrial effluents.

UNIT – V. Biofertilizers - Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil. Algal and fungal biofertilizers (VAM). Bioleaching - Enrichment of ores by microorganisms (gold, copper, and Uranium) . Environmental significance of Genetically modified microbes, plants and animals.

SUGGESTED READINGS

1. Glick, B.R & Padernak J.J (1994) Molecular Biotechnology, Principles and Applications of Recombinant DNA, American Society for Microbiology, Washington D.C
2. Christopler H. (1995) Gene cloning and Manipulating, Cambridge University Press
3. Nicholl, D.S.T (1994) An Introduction of Genetic Engineering, Cambridge University Press.

4. Old. R.W. and Primrose, S.B. (1986) Principles of Gene manipulation, An introduction to genetic engineering (3rd Edition) Black well Scientific Publications
5. Watson J.D. Hopkins, N.H Roberts, J.W.Stectz J.A and Weiner A.M(1988).
Molecular Biology of Society for Microbiology
6. Lewin b. (1994) Genes VI, New York,Oxford University Press.
7. Microbial Biotechnology (1995) Alexander n. Glazer Hiroshi Nikaido W.H.Freeman
and Company
8. Molecular Biotechnology: Principles and Applications of Recombinant DNA –
Bernard R. Glick and Jack J. Pastemak ASM Press. Washington, D.C (1994).
9. Fungal Ecology and Biotechnology (1993) Rastogi - Publications, Meerut.

PAPER 3 - INDUSTRIAL AND ENZYME BIOTECHNOLOGY

UNIT – I. Introduction to industrial Biotechnology, basis principles of fermentation technology. Screening and Isolation of Microorganisms, maintenance of strains improvement (Mutant selection, Recombinant DNA methods). Fermentation Media Natural and synthetic Media. Sterilization techniques – Heat, Radiation and Filtration method.

UNIT – II. Fermenters - Process of Aeration, Agitation , Temperature regulation and Filtration method. Type of Fermentation . Solid State, submerged fermentation and continuous fermentation. Immobilized enzyme and cell bioreactors. Process Development – Shake flask fermentation, Down stream processing (DSP), Distinguition of cells, Separation, Extraction, Concentration and purification of products.

UNIT – III. Production of Microbial products - Brief account of the following products obtained by industrial microbiological fermentation – Alcohol -Alcoholic Beverage – Beer - Organic acid – Citric acid - Antibiotic – Penicillin Amino acids – Glutamic acid - Vitamin – B12. Brief account of Steroid biotransformation.

UNIT – IV. Enzyme Biotechnology - Characteristics of enzymes – amylases. Industrial uses of enzymes – Detergents, Leather, Beverage, food and Pharmaceutical. Bioreactors for enzyme production – Stirred tank, membrane reactors and continuous flow reactors.

UNIT – V. Fermented Foods –Buttermilk, Idli, Dosa, Cheese, Tempeh. Microbial Foods – Single cell proteins (SCP), single cell oils (SCO). Plant cell suspension culture for the production of food additives – Saffron and Capsaicin. Technique of mass culture of Algae – spirulina. Microbial polysaccharides and polyesters; production of xanthan gum and polyhydroxyalkanoates (PHA).

SUGGESTED READINGS

1. Sullia S.B& Shantharam S; (1998) General Microbiology, Oxford & IBH publication.
2. Bisen P.S (1994) Frontiers in Microbial Technology, 1st Edition, CBS Publishers.
3. Glaser A.N & Nilaido.H (1995) Microbial Biotechnology, W.H Freeman & Co.
4. Prescott & Dunn (1987) Industrial Microbiology 4th Edition, CBS Publishers & Distributors.
5. Prescott & Dunn (2002) Industrial Microbiology, Agrobios (India) Publishers.
6. Crueger W. & Crueger A. (2000) A text of Industrial Microbiology, 2nd Edition, Panima Publishing Corp.
7. Stanbury P.F, Ehitaker H, Hall S.J (1997) Principles of Fermentation Technology., Aditya Books (P) Ltd.

**PAPER – 4 : LAB IN PLANT, ANIMAL AND ENGINEERING
BIOTECHNOLOGY**

1. Preparation of plant culture media – MS (1962) and White's medium
2. Plant Protoplast Isolation
3. Micro-propagation
4. Anther Culture
5. Egg inoculation
6. Cell counting and cell viability
7. Isolation of genomic DNA from plant and animal tissue
8. Restriction & digestion of DNA
9. Separation of DNA by Gel Electrophoresis
10. SDA-PAGE

PAPER 5 – LAB IN INDUSTRIAL AND ENZYME BIOTECHNOLOGY

1. Estimation of citric acid from *Aspergillus* culture.
2. Estimation of lactic acid and lactose
3. Immobilization of Yeast cells
4. Preparation of wine
5. Estimation of Alcohol by Specific, gravity method
6. Immobilization of Enzymes – (Invertase can be obtained from yeast cells).
7. Assay of enzyme (Amylase) activity
8. Isolation of interacellular enzymes
9. Isolation of extracellular enzymes

PAPER - 6. PROJECT / DISSERTATION WORK