

Annexure – 19

PERIYAR UNIVERSITY

SALEM – 636 011



PERIYAR INSTITUTE OF DISTANCE EDUCATION

[PRIDE]

NON – SEMESTER PATTERN [PRIDE]

B.Sc. BIOTECHNOLOGY

REGULATIONS AND SYLLABUS

(Candidates admitted from 2007-2008 onwards)

PERIYAR UNIVERSITY, SALEM – 11

PERIYAR INSTITUTE OF DISTANCE EDUCATION [PRIDE]

NON – SEMESTER PATTERN

1. CONDITION FOR ADMISSION:

A candidate who has passed – Higher Secondary examination in any one of the biological sciences (Academic / Vocational Stream) under higher secondary board of Examination, Tamilnadu or as per norms set by the Government of Tamilnadu or an examination accepted as Equivalent thereto by the Syndicate subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the B.Sc. Degree in Biotechnology. Examination of this university after a course of study of three academic years.

2. DURATION OF THE COURSE:

The course for the degree of Bachelor of Science in Biotechnology shall consist of three academic years.

3. COURSE OF STUDY:

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

1st YEAR

Paper – I – Language	Tamil – 1
Paper – II – Language	English – 1
Paper – III – Major 1	Cell Biology and Genetics
Paper – IV – Major 2	Microbiology
Paper – V – Major 3	Biophysics
Paper – VI – Allied 1	Biochemistry
Paper – VII – Major Practical 1	Lab in Cell Biology, Genetics and Microbiology
Paper – VIII – Allied Practical 1	Lab in Biochemistry

2nd - Year

Paper – IX – Language	Tamil – 2
Paper – X – Language	English – 2
Paper – XI – Major 4	Molecular Biology
Paper – XII – Major 5	Developmental Biology
Paper – XIII– Allied 2	Biostatistics
Paper –XIV – Allied 3	Computer Sciences
Paper – XV – Major Practical 2	Lab in Molecular Biology
Paper – XVI – Allied Practical 2	Lab in Biostatistics and Computer Sciences

3rd - YEAR

Paper – XVII– Major 6	Environmental Biotechnology
Paper – XVIII – Major 7	Immunology and Immunotechnology
Paper – XIX – Major 8	Plant Biotechnology
Paper – XX - Major 9	Animal Biotechnology
Paper – XXI - Major 10	Bioprocess in Industrial Biotechnology
Paper – XXII – Major 11	Recombinant DNA Technology
Paper – XXIII – Major Practical 3	Lab in Immunology, Plant and Animal Biotechnology,
Paper – XXIV – Major Practical 4	Lab in Bioprocess in Industrial Biotechnology and Recombinant DNA Technology

4. EXAMINATIONS:

The theory examination shall be three hours duration to each paper at the end of year. The candidate failing in any subject(s) will be permitted to appear for each failed subjects(s) in the subsequent examination. The practical examinations for UG course should be conducted at the end of the year.

5. SCHEME OF EXAMINATIONS:

1st YEAR

S. No.	Paper/Practical- Year wise	Title of the Paper/Practical	Duration [hours]	Marks
1	Paper – I – Language	Tamil – 1	3	100
2	Paper – II – Language	English – 1	3	100
3	Paper – III – Major 1	Cell Biology and Genetics	3	100
4	Paper – IV – Major 2	Microbiology	3	100
5	Paper – V – Major 3	Biophysics	3	100
6	Paper – VI – Allied 1	Biochemistry	3	100
7	Paper – VII – Major Practical 1	Lab in Cell Biology, Genetics and Microbiology	6	100
8	Paper – VIII – Allied Practical 1	Lab in Biochemistry	6	100

2nd YEAR

S. No.	Paper/Practical- Year wise	Title of the Paper/Practical	Duration [hours]	Marks
9	Paper – IX – Language	Tamil – 2	3	100
10	Paper – X – Language	English – 2	3	100
11	Paper – XI – Major 4	Molecular Biology	3	100
12	Paper – XII – Major 5	Developmental Biology	3	100
13	Paper – XIII – Allied 2	Biostatistics	3	100
14	Paper – XIV – Allied 3	Computer Sciences	3	100
15	Paper – XV – Major Practical 2	Lab in Molecular Biology	6	100
16	Paper – XVI – Allied Practical 2	Lab Biostatistics and Computer Sciences	3	100

3rd - YEAR

S.No.	Paper/Practical- Year wise	Title of the Paper/Practical	Duration [hours]	Marks
17	Paper – XVII – Major 6	Environmental Biotechnology	3	100
18	Paper – XVIII – Major 7	Immunology and Immunotechnology	3	100
19	Paper – XIX – Major 8	Plant Biotechnology	3	100
20	Paper – XX - Major 9	Animal Biotechnology		
21	Paper – XXI - Major 10	Bioprocess in Industrial Biotechnology	3	100
22	Paper – XXII – Major 11	Recombinant DNA Technology	3	100
23	Paper – XXIII – Major Practical 3	Lab in Immunology, Plant and Animal Biotechnology,	6	100
24	Paper – XXIV – Major Practical 4	Lab in Bioprocess in Industrial Biotechnology and Recombinant DNA Technology	6	100
Grand total marks				2400

Scheme of Marks Distribution in Part – I, II and III

Part – I	Languages	Tamil	200 Marks
		English	200 Marks
Part – II	Allied	Theory	300 Marks
		Practical	200 Marks
Part – III	Major	Theory	1100 Marks
		Practical	400 Marks
Grant Total			2400 Marks

6. PATTERN OF QUESTION PAPER FOR THEORY :

Time : 3 hours

Max. Marks - 100

Section - A 10X2 = 20
(Answer all questions)
(Two questions from each unit)

Section - B 5X4 = 20
(Answer all questions)
(One question from each unit with internal choice)

Section - C 5X12 = 60
(Answer all questions)
(One question from each unit with internal choice)

7. PASSING MINIMUM:

The candidates shall be declared to have passed the examination with secure not less than 40 marks in the University examination in each theory paper and practical.

8. 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 examination in **First Class**. All other successful candidates shall be declared to have passed in the **Second Class**. Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in **First Class with Distinction** provided they pass all the examinations prescribed for the course at the first appearance.

Candidates who pass all the examinations prescribed for the course in the first instance and within a period three academic years from the year of admission to the course only are eligible for **University Ranking**.

9. MAXIMUM DURATION FOR THE COMPLETION OF THE UG PROGRAMME:

The Maximum duration for completion of the UG Programme shall not exceed six years.

10. COMMENCEMENT OF THIS REGULATION:

These regulations shall take effect from the academic year 2007 –2008, i.e., for students who are to be admitted to the year of the course during the academic year 2007 –2008 and thereafter.

11. TRANSITORY PROVISION:

Candidates who were admitted to the UG course of study before 2007 – 2008 shall be permitted to appear for the examinations under those regulations for a period of three years i.e., up to and inclusive of the examinations of April / May 2012. Thereafter, they will be permitted to appear for the examination only under the regulations.

Model Question Paper Pattern : Theory (Allied)

Time : 3 Hours

Max. Marks : 100

Section – A

Answer all the Question
(2 questions from each unit)

10 X 2 = 20 Marks

Section – B

Answer all the Question
(One question from each unit with internal choice)

5 X 4 = 20 Marks

Section – C

Answer all the Question
(One question from each unit with internal choice)

5 X 12 = 60 Marks

Model Question Paper Pattern : PRACTICAL

Time : 6 Hours

Max. Marks : 100

Major [1x40]	:	40 Marks
Minor [1x20]	:	20 Marks
Spotters (5X4)	:	20 Marks
Record	:	10 Marks
Viva voce	:	10 Marks

Note to Question paper setters:

All units in the syllabus should be given equal weight age, key & scheme of evaluation should be provided.

Question Model for Allied Practical I – Biochemistry

Time : 6 Hours

Max. Marks : 100

Two Questions: each one carries 40 marks	:	2 X 40 = 80 Marks
Record carries	:	20 Marks

Question Model for Allied Practical II – Lab in Biostatistics and Computer Sciences

Time : 3 Hours

Max. Marks : 100

Two Questions: each one carries 40 marks	:	2 X 40 = 80 Marks
Record carries	:	20 Marks

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NON – SEMESTER [PRIDE]

B.Sc. BIOTECHNOLOGY

SYLLABUS

(For the student admitted from the academic year 2007-2008 and onwards)

1st YEAR

PAPER – III – MAJOR 1 : CELL BIOLOGY AND GENETICS

CELL BIOLOGY

UNIT – I : Introduction - Definition; History and Scope of Biotechnology, Biotechnology in India, Recent trends in Biotechnology,

UNIT – II: Cell as a Basic unit, Cell theory, Classification of cell types, specialized cells such as motile, nerve and muscle cells. Ultra structure of prokaryotic and eukaryotic cells – Structure and functions of cell organelles. Comparison of microbial, plant and animal cells

UNIT – III: Cell division (Prokaryotic and Eukaryotic), Cell cycle, mitosis and meiosis, Special types of chromosomes; Salivary gland and Lampbrush chromosomes, Amoeboid, ciliary and flagellar movements.

GENETICS

UNIT – IV: Mendelism: Mendels work, laws of heredity, Test cross, Incomplete dominance and simple problems. Genome organization in bacteria, plant and animals; **DNA , RNA and replication** – chromosomal theory of inheritance.

UNIT – V : Cytoplasmic Inheritance : Plastid inheritance in *Mirabilis*, petite characters in yeast and kappa particles in paramecium. **Mutations:** Types: spontaneous;s and induced, Mutagens: Physical and chemical, Mutation at the molecular level.

SUGGESTED READINGS:

1. Animal Cytology & Evolution – MJD, White Cambridge University Publications
2. Principles of Gene Manipulations – Old & Primrose, Black Well Scientific Publications.
3. Cytology – Wilson & Marrison, Reinform Publications
4. Molecular Biology – Smith Faber & Faber Publications
5. Cell Biology & Molecular Biology – EDP Roberties & EMF Roberties, Sauder College.
6. Principles of Genetics – E.J.Gardener, M.J.Simmons and D.P.Snustad, John Wiley & Sons Publications.
7. Cell and Molecular Biology – S.C. Rastogi (2003) New Age International Publishers, New Delhi.
8. Biotechnology by U. Satyanarayana (2005), Books and allied (P) Ltd, Kolkata – 10.
9. Cell Biology, Pawar, C. P.

PAPER – IV – MAJOR 2 : MICROBIOLOGY

UNIT – I: History of microbiology, contributions of Antony van Leeuwenhoek, Louis Pasteur and Robert Hook. Scope of Microbiology – Classification of microbes; fungi, protozoa, bacteria, cyanobacteria and virus .

UNIT – III Sterilization: Principles and Applications - Physical Methods and chemical methods. **staining techniques:** Principles and types; simple, Negative and Differential staining techniques.

UNIT – III: Culture medium, growth cycle, impact of environmental factors on growth of microbes, nutritional classification of microbes. Energy production; oxidation and reduction reactions, aerobic and anaerobic processes. Microbial photosynthesis; cyclic and non-cyclic photophosphorylation and chemosynthesis.

UNIT – IV: Pathogenic Microorganisms. (A) Bacterial diseases of man – Tetanus, Tuberculosis, Pneumonia and Cholera. (B) Viral diseases: AIDS (HIV). .

UNIT – V : Microbial applications ; In medicine – antibiotics; penicillin and streptomycin. In agriculture; Bio-fertilizer (bacteria and cyanobacteria). In food and dairy industries; microbial bio-products (SCP, bio-pigments, yeast products and enzymes)

SUGGESTED READINGS:

1. Fundamentals of Microbiology- Frobisher, Sauders & toppan publications.
2. General Microbiology-C.B.Powar, H.F. Daginawala, Himalayan Publishing House
3. Microbiology an Introduction, Tortora, Funke and Case, , Addison Wesley longman Inc, 1997.
4. Principles of Microbiology, Atlas, R.M., , 2nd Ed. Wm.C. Brown Publishers,1997.
5. Text book of Microbiology – R. Anandanarayanan and C.KJ. Paniker.

PAPER – V – MAJOR – 3 : BIOPHYSICS

UNIT – I : Energetic of a living body, Laws of Thermodynamics, Nature of chemical bonds, intra and intermolecular interactions in biological systems.

UNIT – II : Absorption spectroscopy – Beer – Lambert's Law, Colorimetry, Spectrophotometry (Single and double beam spectrophotometer). Primary biophysical events in Photosynthesis, Physical methods for determining size and shape of macromolecules – Diffusion Sedimentation, Reverse Osmosis.

UNIT – III : Spectroscopy - UV, visible, Fluorescence, atomic absorption, IR to Raman Spectra, MASS spectroscopy and LASER.

UNIT – IV : Physical methods of imaging intact biological structures (X-ray, CAT-Scan, ECG, EEG, NMR)

UNIT – V : Structure of proteins, X-ray crystallography, Centrifugation, GM-Counter, Autoradiography.

SUGGESTED READINGS

1. Physical Biochemistry, Applications to Biochemistry and Molecular Biology D, Freifelder.
2. General Biophysics, Vol. I & II – H.V. Volkones.
3. Molecular Biophysics – B. Pullman & M. Voino.
4. Biophysical chemistry – Upadhyay.
5. Protein structure and molecular properties – W.H. Freeman & Company.
6. Physical chemistry of Macromolecules, Tanford, C. John Wiley and Som.
7. Biotechnology – 3 – S. Mahesh (2003), New Age International (P), Ltd, New Delhi

PAPER –VI – ALLIED 1 : BIOCHEMISTRY

UNIT – I : Carbohydrates : - Monosaccharides and Disaccharides – Definition, classification, structure, properties and biological significance, Polysaccharides – Types and biological importance.

UNIT – II : Amino acids – classification, essential and Non-essential amino acid, structure and properties. Proteins – Definition, classification and function. Structure levels of organization. Denaturation and Renaturation.

UNIT – III : Enzymes : Definitions, classification with example, Active site, Lock and key model, Induced fit hypothesis. Enzyme units. Kinetics factors affecting enzyme activity, M.M. equation, LB. Plot, Enzyme inhibition.

UNIT – IV : Lipids : Classification of lipids, physical and chemical properties, saturated, unsaturated fatty acids and steroids. Structure of cell membrane and Transport. **Vitamins** : Classification, occurrence, deficiency symptoms, biochemical functions of fat soluble and water soluble vitamins.

UNIT – V : Buffers – Definition, important buffers in blood (Bicarbonate, phosphate and hemoglobin buffer systems), Bioenergetics : Laws of thermodynamics, Hormones : - Definition, classification of hormones, Biological functions and disorders of pancreatic hormone (Insulin), thyroid hormone (thyroxin),

SUGGESTED READINGS :

1. Fundamentals of Biochemistry. J.L. Jain – S. Chand publication 2004-
2. Biochemistry by Agarwal – Gobl Publications – Year 1999, Rs.300.00
3. General Biochemistry – 6th Edition – J.H. Weil –New Age international Publishers – Rs. 235.00
4. Biochemistry IInd edition – Keshar Trehan – New age International Publishers – Rs. 200.00
5. Text book of Biochemistry – IV Edition, Edward Stauton West, Wilbert .Todd, Howard S. Manson, John, Bruggen –Oxford. IBH Publishing – Co. Pvt Ltd. Year – 1996. Rs. 615.00
6. Haper's Biochemistry. 24th edition Robert. K. Murray, Daryl K. Granner, Peter A, Mayes, Victor W. Rudwell, Prentice – Hall international – Unc.

**PAPER – VII – MAJOR PRACTICAL 1 : LAB IN CELL BIOLOGY,
GENETICS AND MICROBIOLOGY**

Cell Biology and Genetics

1. Cell staining – Staining of Plant cell (onion epidermal cell), Animal cell (Squamous epithelial cell), Blood cell, Microbial cells (Bacteria & Yeast).
2. Cell division : Mitotic and meiotic studies in grasshopper testes, onion root tips and flower buds
3. Sex chromatin (Buccal smear)
4. Estimation of chlorophyll content by Spectrophotometry.

Microbiology

1. Staining Techniques: Simple, Negative staining, Grams staining, Endospore staining and fungal staining.
2. Media preparation : Nutrient agar and Nutrient broth.
3. Isolation and enumeration of bacteria from soil, air, and water – dilution and pour plate and spread plate methods, Isolation of fungi from soil.
4. Antibiotic sensitivity test.
5. Biochemical tests – starch hydrolysis, catalase & gelatin liquefaction.
6. Study of Rhizobium from root nodules of legumes.

PAPER – VIII – ALLIED PRACTICAL 1 : LAB IN BIOCHEMISTRY

I. Qualitative Analysis

1. Analysis of carbohydrates – Glucose, fructose,
2. Analysis of Amino acids – Tyrosine, Tryptophan, Arginine, methionine, and cysteine

.

II. Preparation

1. Starch from potato
2. Casein from milk

III Estimation

1. Estimation of Glycine by formal titration method
2. Estimation of Ascorbic acid by 2,6, Dichlorophenol indophenol dye.
3. Estimation of urea by DAM colorimetric method
4. Estimation of Glucose by ortho-Toludine method

IV Techniques

1. Separation of aminoacids and sugar by ascending paper chromatography.
2. Separation of lipid by TLC

SUGGESTED READING :

1. Laboratory manual in biochemistry by Pattarbiraman and Acharya.
2. Practical biochemistry by J. Jayaraman.

Note : The Allied Biochemistry paper should be handled and evaluated by Biochemistry staff only.

2nd YEAR

PAPER – XI – Major 4 : MOLECULAR BIOLOGY

UNIT – I : Nucleic Acids Structure and functions (DNA and RNA). Watson and Crick model of DNA and other forms of DNA (A and Z). Functions of DNA and RNA including ribosomes. DNA Replication Prokaryotic and Eukaryotic.

UNIT – II: DNA Repair Causes and mechanism-photo-reactivation, excision repair, mismatch repair, SOS repair. Recombination in prokaryotes Transformation, Conjugation and Transduction.

UNIT – III : Transcription in Prokaryotes and Eukaryotes. Mechanism of Promoters and RNA polymerase and transcription factors,

UNIT – IV: Translation. Mechanism of translation in Prokaryotes and Eukaryotes, Post translational modifications of proteins. Regulation of Gene expression in Prokaryotes(Operon concept (*Lac* and *Tryp*)) and in Eukaryotes (galactose metabolism in yeast).

UNIT – V : Gene organization and expression in Mitochondria and Chloroplasts. Transposable elements in maize and drosophila.

SUGGESTED READINGS:

1. Gene VI Lewin, B., New York, Oxford University Press.
2. Genetic Engineering, Rigby, P.W.J. (1987) Academic Press Inc. Florida, USA.
3. Genetics – T.A. Brown
4. Molecular biology – David Freifelder.
5. Cell and Molecular Biology – S.C. Rastogi (2003), New Age International Publishers, New Delhi.

PAPER – XII – Major 5 : DEVELOPMENTAL BIOLOGY

UNIT – I : Reproductive cycle in mammals, their hormonal control, gametogenesis – spermatogenesis and oogenesis. Fertilization, Artificial insemination and invitro fertilization, Embryo Trasfer.

UNIT – II: Types of eggs and patterns of cleavage, Blastulation, Gastrulation, Fate of germ layers, metamorphosis – retrogressive and progressive changes in insects and amphibians.

UNIT – III : Microsporogenesis, megasporogenesis, Pollen development, Gametophytic amphimixis; Polyploidy; methods and application; Seeds – types, germination, Organogenesis.

UNIT – IV: Plant embryogenesis – techniques to study embryology, Embryo sacs in Anther Leptomenia, Calotis; Hyacinthus, Unusual embryological features – Loranthaceae, Endosperimal embryos; Gynospermic characters in angiosperms, Types of embryos.

UNIT – V : Genetic control of development – Early experiments, Pattern determination, Bithorax Complex, Genes Controlling – Flower development and development of Drosophila.

SUGGESTED READINGS :

1. An introduction to Embryology – Balansky (1981)
2. Developmental Biology : Patterns, Principals, Problems – Saunders. .W.
3. The embryology of Angiosperms. Vilas publication – Bojani and Bhatnager (1978)
4. The embryology of Angiosperms Springer Verlec – Jhori B.M. (1982)
5. Introduction to the embryology of Angiosperms McGraw Hill – Maheswari. P (1981)

PAPER – XIII– Allied 2 : BIOSTATISTICS

UNIT – I : Bio Statistics – definition – types of data – Quantitative, Qualitative data – Sources of data in Life Science – Limitation and uses of Statistics.

UNIT – II : Collection of data – Primary data designing Questionnaire and Schedule – Secondary data – Methods of Collection data – Methods of collection of data – Classification of data – Tabulation and presentation of data.

UNIT – III : Measures of Central Tendency – Mean, Median, Mode, Geometric Mean – Merits and Demerits. Measures of dispersion – Range, Standard Deviation, Mean deviation, Quartile deviation, Merits and demerits, Coefficients of variation.

UNIT – IV : Correlation – Types and Methods of correlation, Rank – Correlation, Regression, Simple regression equation, fitting, Prediction,

UNIT – V : Sampling Methods – Population, Sample. Simple Random Sample – Concept of Sampling distributions – Standard error – Test of Significance – Hypothesis – Simple Test of Significance – Hypothesis – Simple hypothesis – Tests based on Large Samples and Smalls – Chi – Square test.

SUGGESTED READINGS :

1. Bio Statistics. Daniel. W.W 1987 – New york, Johh Wiley and Sons.
2. An introduction of Bio Statistics. Third edition, Sundar Rao. P.S.S and Richand. J. Christian Medical College, Vellore.
3. Introduction to Bio-Statistics. Sokal – Rohlf – 1973. W.H. Freeman and Company San – Francisco.

Note : This paper has to be taught and exam paper valued by a teacher in Statistics . This paper has to be referred to Statistics Board for valuation.

PAPER – XIV– Allied 3: COMPUTER SCIENCES

UNIT – I : Introduction to Computers: Introduction - Types of computers – Characteristics of Computers. Rice Generations of Modern Computers: First Generation – Second Generation, Third Generation, Fourth Generation and Fifth Generation computers. Classification of Digital Computers – Workstations Portable Computers – Minicomputers – Mainframes – Super computers – Net Computers. Programming Languages: Introduction - Machine Language – Assembly Language – High level languages. Input Devices: Introduction – Keyboard – Mouse – Types of mice – Connections - Mouse Pad – Trackball – Joystick – Digitizing tablet – Scanners – Digital camera. Magnetic Ink Character Recognition (MICR) – Optical Character Recognition (OMR) - Bar Code Reader – Speech Input Devices – Touch Screen – Touch Pad – Light Pen. Out put Devices: Introduction – Monitor Classification of Monitors – Based on Color – Characteristics of a Monitor – Printer Daisy Wheel Printer – Dot Matrix Printer – Inkjet – Laser printer – LCD & LED Printer – Line Printer – Thermal Printer – Plotter – Sound Cards & Speakers Auxiliary Storage Devices: Magnetic Tape – Hard Disk – Floppy Disk – CD - Rom.

UNIT – II : Flow Charts: Symbols – A Simplified Model of a Computers More flow Charting examples. Fortran programming preliminaries: Higher – level languages for Computers – The FORTRAN Language – Characters used in FORTRAM. FORTRAN CONSTANTS and Variables: FORTRAN Constants – FORTRAN Variable name – Type declaration for integers and reals. Arithmetic Expressions: Arithmetic Operators and modes for expressions- Integer expressions – Real expressions – Hierarchy of operations in expressions – examples of arithmetic expressions – Arithmetic Statement – Defining variables – Some problems due to rounding of Examples of use of functions – Programme preparation preliminaries. Input – Output Statements : list directed input statements. Control Statements: Relational Operators – Logical IF Statement – Statements Labels - GO TO Statement – Nested logical IF statement – The arithmetic IF statement. The DO statement: The Do statement – Rules to followed in utilizing DO loops – The REPEAT WHILE structure. Subscripted Variable: Use of Multiple Subscript – Subscript Expression – DIMENSION Statement – DO type notation for input / output statements – summary of Subscript rules.

UNIT – III : FUNCTIONS AND SUBROUTINERS: Introduction – Statement functions Function Subprograms – Syntax rules for function subprograms – Subroutines – The COMMON declaration – Labelled COMMON – Placement of array – Use of procedure names as arguments. Processing Files in FORTRAN: Creating a sequential file - Searching a sequential file – Updating a sequential file – Merging two sequential files – Direct access files.

UNIT – IV : FoxPro overview and sample session – ACCEPT. INPUT – ACTIV
ATE / DEFINE MENU. DEFINE PAD – ACTIVATE/ DEFINE POPUP, DEFINE
BAR, BAR O – ACTIVATE / DEFINE WINDOW, ACTIVATE SCREEN – APPEND
CALCULATE – CALL, LOAD, RELEASE MODULE – DATEO, TIME O, SET
CLOCK – DELETE, RECALL. PACK – DIMESION – DIR – DISPLAY, LIST,
CLEAR – DO – DO CASE, OTHERWISE, ENDCASE – DO WHILE, EXIT, LOOP,
ENDNO, EOF O.

UNIT – V : edit – find – seek – seek o for, endfor – go – go to – go bottom – go top – skip – if – else – end if – index – reindex insert – join – locate, continue – modify command – modiy memo, close memo, memlines o, mline o – modify structure replace – run – say, say get, say picture – clear gets, read – scan, endscan – scroll – set Commands – sort – store. release. save, restore – sum – suspend, resume – text, endtext – total – udata – use – wait.

SUGGESTED READINGS :

1. Fundamentals of computers science and Communication Engineering, Alexis Leon & Mathews Leon, Vikas Publishing House Pvt. Ltd., New Delhi (**unit I**)
2. Fourth Edition Computer Programming in FORTRAN 77. V. Raja Raman, PHI Pvt. New Delhi (**Unit II & III**)
3. Illustrated FOXPRO 2.0, Robert Granillo BPB Publications, New Delhi – 110001. (**Unit IV & V**)
4. Introduction to Bioinformatics by V. Kothekar, 2004 Dhruv publications, Delhi -95

Note : This paper has to be taught and exam. papers to be valued by only **Computer Science Board.**

PAPER – XV- MAJOR PRACTICAL 2 : LAB IN MOLECULAR BIOLOGY

1. Isolation of DNA from plant, animal and bacteria.
2. Separation of DNA by agarose gel electrophoresis.
3. Conjugation interrupted and uninterrupted.
4. Estimation of DNA by DPA method.
5. Estimation of RNA by Orcinal method.
6. Extraction and estimation of protein from animal and plant sources.
7. Protein separation by SDS–PAGE.

PAPER – XVI – ALLIED PRACTICAL – 2 - LAB IN BIOSTATISTICS AND COMPUTER SCIENCES (FORTRAN AND FOXPRO)

1. Finding Mean, Standard deviation and Mean deviation for a given problems
2. Calculating the Correlation coefficients.
3. Finding Regression coefficients and Regression lines.
4. Calculating Student 't' – test for a given problem.
5. Calculating Chi – square test for a given problem.
6. Sorting.
7. Indexing.
8. Multiple database.
9. Reports generation.

3rd YEAR

PAPER – XVII – MAJOR 6: ENVIRONMENTAL BIOTECHNOLOGY

UNIT – I : Environmental pollution and its control measures. Renewable and Non-Renewable resources of energy . Conventional and Modern fuels. Microbial hydrogen Production.

UNIT – II : Bioremediation of soil & water contaminated with oil spills, heavy metals and detergents. Degradation of lignin and cellulose using microbes. Degradation of pesticides and other toxic chemicals by micro-organisms. Degradation aromatic and chlorinated hydrocarbons and petroleum products.

UNIT – III: Treatment of municipal waste and Industrial effluents. Bio-fertilizers Role of symbiotic and asymbiotic nitrogen fixing bacteria. Algal and fungal bio-fertilizers (VAM).

UNIT – IV : Bioleaching Enrichment of ores by microorganisms (gold, copper, and Uranium). Environmental significance of genetically modified microbes, plants and animals.

UNIT – V : Restoration of degraded land – reforestation through micro propagation. Development of stress tolerant plants – use of mycorrhiza in reforestation. Use of microbes in soil fertility (N₂ fixing bacteria and Actinomycetes).

SUGGESTED READINGS:

1. Microbial Biotechnology (1995) Alexander n. Glazer Hiroshi Nikaido
W.H.Freeman and Company
2. Molecular biotechnology: Principles and Applications of Recombinant DNA –
Bernad R. Glick and Jack J. Pasternak ASM Press. Washington, D.C (1994).
3. Fungal Ecology and Biotechnology (1993) Rastogi Publicaions, Meerut.

PAPER – XVIII – Major 7: IMMUNOLOGY AND IMMUNOTECHNOLOGY

UNIT – I : Historical perspectives and overview of immune system, innate and acquired immunity. Immune system structure and organisation.

UNIT – II : Antigen and antigenicity, Immunoglobulins – Structure and function. Complements, Antigen – Antibody interaction, Monoclonal antibodies.

UNIT – III : Organisation and expressions of immunoglobulin genes, Histocompatibility complex.

UNIT – IV : Cytokines: Types and function. Cytokine receptors Biological functions of cytokines. Cell mediated immunity– receptors and T cell activation. Humoral response– B cell activation and proliferation. Hypersensitive reactions.

UNIT – V : Immune regulation, autoimmunity, Vaccines and immune response to infectious diseases, Immune deficiency diseases (AIDS), Immune suppression & transplantation.

SUGGESTED READINGS:

1. Immunology by L.M. Roitt, J. Brestoff and D.K. Male (1996)
2. Immunology by J.Kubey (1993) Freeman and company
3. Immuno-biology by Janeway CA and Paul Travers 1994.
4. Immunological techniques by D.M. Weir (1992)
5. Immunology by I. Roitt (1960)
6. Current Protocols in Immunology 3 Volumes, Wiley Publications 1994.
7. Monoclonal Antibodies: Principles and Practice by J. W. Goding (1983) Academic Press
8. Hybridoma Technology in the Biosciences and medicine by T.A. Springer (1985) Plenum Press NY.
9. Vaccines, New Approaches to immunisation by F.Brown, R.M.Chanock, KA Lerner (1986) cold spring Harborolab.
10. Topley and Wilson principles of bacteriology, Virology and immunology by G. Wilson, A.Miles, M.T.Paker (1984) Arnold, Heineman. Basic and Clinical Immunology by D.P. Stities, J.D. Stobo

PAPER – XIX – Major 8: PLANT BIOTECHNOLOGY

UNIT – I : In-vitro Methods in plant tissue culture, 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).

UNIT – II : Organ Culture – Anther, Embryo and Endosperm culture and their applications, Organogenesis and Somatic Embryogenesis – Techniques and applications. Protoplast Culture – Isolation, regeneration and viability test, somatic hybridization,

UNIT – III : Somaclonal Variation and their significance. *In-Vitro* production of secondary metabolites – Techniques and significance . Role of tissue culture in agriculture, horticulture and forestry.

UNIT – IV : Transgenic plants: Technique of transformation – Agrobacterium mediated and physical methods (Microprojectile and electroporation) Applications of transgenic plants.

UNIT – V : Plant tissue culture in plant breeding. Biodiversity and germplasm, Synthetic seeds, Terminator seed technology. Applications of various techniques of plant breeding.

SUGGESTED READINGS:

1. Biotechnology applications of Plant Tissue & cell culture. Ravishankar G.A and Venkataraman L.V(1997) Oxford & IBH Publishing co., Pvt Ltd.
2. Tissue Culture, Bhan (1998) Mittal Publications, New Delhi.
3. Plants from test tubes. An introduction to Micropropagation (3rd Edition) Lydiane Kyte & John Kleyn (1996) Timber Press, Portland.
4. A text book on Biotechnology (2nd Edition). Kumar H.D (1991) Affiliated East West Press Private Ltd. New Delhi.
5. Applied and fundamental Aspects of Plant Cell, Tissue, and Organ Culture, Reinert J. and Bajaj y.P.S (1997) Narosa Publishing House.
6. Plant – Tissue culture basic and applied by Timer Baran Jha & Biswajit Ghosh, University Press (India) Pvt Ltd, Hyderabad.

PAPER – XX – Major 9: ANIMAL BIOTECHNOLOGY

UNIT – I : Structure and organization of Animal cell. Conventional techniques in animal improvement. Animal breeding for traits; Aquaculture.

UNIT – II : Animal Cell: Production and culture of animal cells, Producing native and recombinant proteins – Animal viral vectors.

UNIT – III : Sericulture: Silk Worm life cycle, Use of silk worm in commercial production of silk, Improving qualities of silk, Producing non-silk in baculoviruses – Pest management.

UNIT – IV : Embryo technology and animal breeding: Micromanipulation and embryo splitting, *In vitro* fertilization – chromosome engineering, Crypreservation.

UNIT – V : Transgenic animals: Improving important genes, Gene targeting, Producing vaccine, DNA Vaccine etc., in animal cells, Sheep Cloning, Transgenic fish, Transgenic cattle.

SUGGESTED READINGS:

1. Gene transfer and expression protocols methods in Molecular Biology, Vol. 7 by (Ed.) E.T. Murray (1991) Humana Press.
2. Recombinant DNA 2nd by (Ed.) J.D. Watson, Gilman, J. Witkowski and M.Zoiler (92) Scientific American Books. NY.
3. Genetic Engineering of Animals by (Ed.) A. Puhler (1993) VCH Publishers, Weinheim, FRG.
4. Pest Management by Robert Pedigo.
5. Animal Biotechnology by Dr. Ramadoss.
6. Animal Biotechnology by Ranga.
7. Molecular Biotechnology : Principles and Applications of Recombinant DNA. Bernad R. Glick and Jack J. Pasternak. ASM Press, Washington, D.C.(1994)

PAPER – XXI – MAJOR 10 : BIOPROCESS IN INDUSTRIAL BIOTECHNOLOGY

UNIT – I : Introduction to bioprocesses : An overview of traditional and modern applications of biotechnological processes, integrated bioprocess and the various (upstream and downstream) unit operations involved in bioprocesses.

UNIT – II : Fermentation processes : General requirements of fermentation processes, main parameters to be monitored and controlled in fermentation processes, aerobic and anaerobic fermentation processes and their application in the biotechnology industry.

UNIT – III : Enzymatic bioconversion processes : Kinetics and thermo dynamics of enzyme-catalyzed reactions, immobilized enzyme bioreactors and their applications in enzyme technology, Media for fermentation processes:

UNIT – IV : Bioprocess control and monitoring of variable such as temperature, agitation, pressure, pH. On line measurement. On / Off control. PID, Control. Elementary idea of Canning & Packing Sterilization & Pasteurization and preservation of food products.

Unit – V : Kinetics of microbial growth and product formation: Phases of cell growth in batch cultures, simple unstructured kinetic models for microbial growth- Growth associated (primary) and non-growth associated (secondary) product formation kinetics – leudeking – Piret models.

SUGGESTED READINGS :

1. Bioprocess engineering – Shuler, M.L. and Kargi, F.2002. Basic concepts. Prentice Hall of India.
2. Bioprocess engineering, Shuler and Kargi, 1992, prentice Hall.
3. Biochemical engineering Fundamental, Bailey and Ollis.1986. McGraw Hill (2nd Ed).

PAPER – XXII– Major 11- RECOMBINANT DNA TECHNOLOGY

UNIT – I : Recombinant DNA: Historical perspective and early experiment, in vivo gene construction like P1, transduction, cloning vectors, cloning hosts; bacteria fungi animal and plant cells- Gene transfer in nature; interspecies gene transfer.

UNIT – II : Restriction enzymes and their use – DNA modifying enzyme like DNA polymerases, ligases, poly nucleotide kinase etc., Restriction and ligation of DNA, Cloning vector for cloning large pieces of DNA like yeast artificial chromosomes.

UNIT – III : Types of Plasmids: Conjugative and non conjugative, Incompatibility group, Transfer of plasmids, Properties of plasmids like F, Ti drug resistance plasmids, carcinogenic plasmid, Ti Plasmids and their structure.

UNIT – IV : Phage biology lytic and lysogenic cycle phage vector: Early, middle & late order of genes, Phage as a cloning vector, replacement and integrated vector – commit and their construction, plant and animal viruses and their use as vectors.

UNIT – V : Gene transfer in bacteria, plant and animal cell, electroporation and particle bombardment. Analysis of cloned foreign genes; hybridization in liquid and on solid support, DNA and RNA probes. Transgenic and their generation, uses of transgenic,

SUGGESTED READINGS:

1. Gene Cloning an introduction – T.A. Brown
2. Recombinant DNA – Watson
3. Gene Cloning – The mechanism of DNA manipulation – D.M. Glover.
4. Genetic Engineering – An introduction – D.S.T. Nicholl.
5. Principles of Gene Manipulation by Old and Primrose.

PAPER-XXIII - MAJOR PRACTICAL 3 : LAB IN IMMUNOLOGY, PLANT AND ANIMAL BIOTECHNOLOGY.

1. Haem agglutination – ABO blood grouping – Slide Method.
2. Bacterial agglutination – WIDAL – Slide and tube method
3. Latex agglutination – ASO and pregnancy test – Slide method
4. Plant Tissue Culture Media Preparation –
 - (i) M.S. Media,
 - (ii) White's media
5. Callus induction
6. Micropropagation
7. Protoplast isolation
8. Green House.
9. Preparation of Animal cell culture media
10. Culture of chick embryo fibroblast.
11. Chick embryo – Demonstration.

PAPER – XXIV - MAJOR PRACTICAL 4 : LAB IN BIOPROCESS IN INDUSTRIAL BIOTECHNOLOGY AND RECOMBINANT DNA TECHNOLOGY.

1. Isolation of industrially important enzymes (Amylase & Antibiotic) from soil microbes.
2. Estimation of Biomass – Dry weight & wet weight method
3. Production of Wine
4. Estimation of alcohol by colorimetry.
5. Immobilization of Yeast cells and Immobilized beads used for alcohol production.
Preparation of SCP
6. Isolation and visualization of plasmid DNA
7. Isolation of antibiotic resistant mutants
8. Process Control of Fermentor – Demonstration. (pH, Temp, Foam and Dissolved O₂).