

DEPARTMENT OF BIOTECHNOLOGY
 B.Sc. SYLLOBUS
 BANGALORE UNIVERSITY
 Three Year B.Sc course Semester Schemes
 Biotechnology.

Sem ester	Title of the paper	Lecture hours per week	Practical hours per week	Theory		Practical		Internal Assessment	Total marks
				Duration of exam in hours	Maximum Marks	Duration of exam in hours	Maximum Marks	Marks	
I	BTP 101- Cell Biology and Genetics	4		3	60			10	100
	BTP 102-		3			2	30		
II	BTP 201- Microbiology and Biostatistics	4		3	60			10	100
	BTP 202		3			2	30		
III	BTP 301- Biochemistry and Biophysics	4		3	60			10	100
	BTP 302-		3			2	30		
IV	BPT 401- Molecular Biology	4		3	60			10	100
	BTP 402		3			2	30		
V	BTP 501- Genetic Engineering and Environmental Biotechnology	3		3	60			10	100
	BTP 502-		3			2	30		
	BTP 503- Immunology and Animal Biotechnology	3		3	60				100
	BTP 504-		3						
VI	BTP 601-Plant Biotechnology	3		3	60			10	100

	BTP 602-		3		60	2	30			
	BTP 603- Industrial Biotechnology	3		3					10	100
	BTP 604-		3			2	30			

BANGALORE UNIVERSITY, BANAGLORE
Syllabus for B.Sc. Biotechnology mester Scheme)

Semester –I BTP 101- Cell Biology and Genetics

membrane
and cell
wall of
eukaryotes

4 hrs.

Total Hours allotted 60

Unit 3

**Cellular
Organelle**

Total Hours:33

Part A: Cell Biology

Unit 1 :Cell as a Basic unit o

s
Structure
and
functions
of cell
organelles-
Endoplasm
ic
reticulum,
Golgi
complex,
Mateo
conidia,
Chloroplas
ts,
Ribosome'
s,
Liposome'
s,
Peroxisom
es,
Nucleus
(Nuclear
envelope
with
nuclear
pore
complex,
nucleolus,
and
chromatic)

f Living Systems

Discovery of cell,

The Cell theory.

Ultra structure of an eukaryotic cell-(both plant and animal cells)

, Vacuole,
Cytosol
and
Cytoskelet
on 3 hours

Unit 2: Surface Architecture

Structural organization and functions of plasma

structures
(Microtub
ules,

Microfilaments and Intermediate filaments).

Unit 4. Chromosomes

Discovery, morphology and structural organization- Centromere, secondary constriction, telomere, chromomeres, euchromatin and heterochromatin, chemical composition and karyotype.

Ultra structure: Single-stranded and multi-stranded hypotheses, folded fiber and nucleosome models. Special types of chromosome: Salivary gland and Lamp brush chromosomes 6 hrs

Unit 5. Cell division

, mitosis
and
meiosis
4hrs

Unit
2hrs

6.

Cell

Amoeboid, ciliary and flagella movements

Unit 7. Cell Senescence and Programmed Cell Death

PART-B GENETICS

Unit 1. Structure of DNA and RNA-a brief account

2hrs

Unit 2. Mendelism

- Mendel's work, Laws of heredity, Test cross, Incomplete dominance and simple problem

Genes

Unit 3. Interaction of

Motility

Supplementary factors:
Comb pattern in fowls
Complementary genes:
Flower colour in sweet peas
Multiple factors-
skin colour in human beings
Epistasis:
Plumage colour in poultry

3hr	
Multiple alleles: Blood groups in human beings.	4
hrs.	
Unit 4: Sex Determination in Plants and animals	
Concept of allosomes and autosomes. XX-XY-XX-XO-ZW-ZZ ZO-ZZ types	2
hrs	
Unit 5: Linkage and Crossing Over	
Coupling and repulsion hypothesis Linkage in maize and Drosophila, Mechanism of crossing over importance, Chromosome mapping-linkage map in maize.	
Unit 6: Chromosomal Variations	
A general account of structural and numerical aberrations, chromosomal evolution of wheat and cotton.	4
hrs	
Unit 7: Cytoplasmic Inheritance	
Plastid inheritance in Mirabilis, Petite characters in yeast and Kappa particles in Paramecium	
Unit 8: Mutation	
Types: spontaneous and induced, Mutagens: Physical and chemical, Mutation at the molecular level Mutations in plants, animals, and microbes for economic benefit of man.	
4 hrs	
Unit 9: Human Genetics	
Karyotype in man, Inherited disorders-Down (Klinefelter syndrome and Turner's syndrome) Autosomal (Down syndrome and Cri-Du-Chat syndrome).	
2 hrs	

Semester I	BTP 102- Cell Biology and Genetics	Total Units
1. Use of Micrometer and calibration, measurement of onion epidermal cells and yeast.		2
2. Cell division Mitotic and meiotic studies in grasshopper testes. Onion root tips and flower		1
3. Chromosomes: Mounting of polytene chromosomes		11
4. Buccal smear-Barr bodies		11
5. Karyotype analysis-Man and onion		
Man-Normal and Abnormal-Down and Turner's syndromes (with the help of slides)		21
6. Simple genetic problems (problems on Interaction of genes)		
7. Isolation of chloroplasts and mitochondria		
8. Vital staining of mitochondria		

9. Blood smear-differential staining

**EACH STUDENT IS REQUIRED TO SUBMIT 5 PERMANENT SLIDES
(MITOSIS & MEIOSIS – at least two from each)**

References:

Cell Biology

1. Molecular Biology of Cell-Bruce Albert's et.al, Garland publications
2. Animal Cytology & Evolution-MJD. White Cambridge University Publications
3. Molecular Cell Biology Daniel. Scientific American Books
4. Cell Biology-Jack D. Bruke, The William Twikins Company
5. Principles of Gene Manipulations-Old & Princes Black Well Scientific Publications
6. Cell Biology-Ambrose & Dorothy M Eastry, ELBS Publications
7. Fundamental of cytology sharp, Mc Graw Hill Company
8. Cytology- Willson & Morrison, Rein form Publications
9. Molecular Biology-smith Faber & Faber Publications
10. Cell Biology &Molecular Biology EDP Robberies & EMF Robberies, Saunder College
11. Cell Biology C.B. Powar, Himalaya Publications

GENETIC

1. Basic Genetics – Daniel L. Hartl Jones & Barlett Publishers USA
2. Human Genetics and Medicine – New Studies in Biology by Cynl A Clark Edward Arnold Publishers London.
3. Genetics –Monroe W Struck burger, Macmillan Publishers, New York
4. Genes V – Benjamin Lewin Oxford University Press.
5. Genes I-Benjamin lewin, Wiley & Sons Publications
6. Genes II- Benjamin Lewin, Wiley & Sons Publications
7. Genes III- Benjamin Lewin, Wiley & Sons Publications
8. Principles of Genetics – Winchester Sinnot & Dorn
9. Genetics –Blue Print of life by Sandhya Mitra, Tata & McGraw Hill Publications
10. Genetics-Edgar Altenburg oxford & IBH Publications
11. Principles of Genetics –E.J. Gardener, M.J. Simmons and D.P. Snustad, John Wiley & Sons Publications

Semester II BTP 201- Microbiology and Biostatistics

Part A: Microbiology

Total hours allotted-45

Unit 1. Introduction and Scope of Microbiology

Definition and history of microbiology, contributions of Antony van Leeuwenhoek, Louis Pasteur, Koch Joseph Lister, and Alexander Fleming . Importance and scope of Microbiology as a modern science Branches of Microbiology.

5 hrs

Unit 2. Microscopy

Structure and working principles of different types of microscopes-Compound, Dark field contrast. Fluorescence and Electron (Scanning and Transmission)

5hrs

Unit 3. Microbial Techniques

A). STERILIZATION: Principles and applications of

a. Physical Methods: Autoclave, Hot air oven, Laminar airflow, Seitz filter, Sintered glass filter, membrane filter.

b. Chemical Methods: Alcohol, Aldehydes, Phenols, Halogens and Gaseous agents.

c. Radiation Methods: UV rays and Gamma rays.

5Hrs

B) STAINS AND STAINING TECHNIQUES: Principles of staining, Types of stains-simple structural stains and Differential stains.

2 Hrs.

Unit 4. Microbial Taxonomy

Concept of microbial species and strains, classification of bacteria based on-morphology (shape flagella), staining reaction, mutation and extreme environment. 4hrs

Unit 5. General Account of Viruses and Bacteria

A. VIRUSES- Structure and Classification

Plant viruses-CAMV

Animal viruses-Hepatitis B

Bacterial viruses- lambda phage

B. BACTERIA-Ultra structure of a bacterial cell (both Gram positive and Gram negative) includes endospore and capsule. 8hrs

Unit 6. Eukaryotic microorganisms

Salient features, classification and reproduction of fungi, mycoplasma and algae. 4hrs

Unit 7. Pathogenic Microorganisms

A. Bacterial diseases of man-Tetanus, Tuberculosis, pneumonia and Cholera

B. Viral disease; AIDS (HIV) 6hrs

Unit 8. Microbial Metabolism

A) Respiration: EMP, HMI and ED Pathways, Krebs's cycle, Oxidative Phosphorylation.

B) Bacterial Photosynthesis Photosynthetic apparatus in Prokaryotes, Photophosphorylation & I reaction.

PART-B BIOSTATISTICS

Unit 1. Importance and applications

Tabulation and Classification of data, Frequency distribution and Graphical distribution of data

2hr

s

Unit 2 Measure of Central tendencies

Mean, Median, mode and their properties

hrs

3

Unit 3. Measures and Dispersion

Mean deviation, Variance, Standard deviation and Coefficient of Variation.

Hrs

3

Unit 4. Hypothesis Testing

Student T and Chi-square test

Hrs

2

Unit 5. Probability and Distribution

Concepts and problems on probability, Binomial, Poisson, Normal Distribution and their applications

Hrs

3

Unit 6. Different Models of data presentation with special reference to biological samples

Semester II	BIP 202 Microbiology	Total Units allotted : 15
1. Safety measures in microbiology laboratory		1 Unit
2. Cleaning and sterilization of glass ware		
3. Study of instruments: Compound microscope, Auto cleave, Hot air oven, pH meter, Laminar airflow and centrifuge.		
2 Units		
4. Staining Techniques Simples, Negative staining, Gram Staining, Endoscope staining and tug staining.		4 Units
5. Medical preparation : Nutrient agar, MRBA and Nutrient broth.		2Units
6. Isolation of bacteria and fungi from soil, air, and water-diction and pour plate methods.		2 Units
7. Estimation of micro organisms-Total Count (harem hyetometer)		1 Units
8. Antibiotic sensitivity test-paper disc method		1 Units
9. Biochemical tests-starch hydrolysis, catalane & gelatin liquefaction.		1 Units
10. Study of Rhizaobium from root nodules of legumes.		1 Units

Reference: MICROBIOLOGY

1. Microbiology-Pelzer, Chan, Krieg Tata McGraw Hill Publications
2. Microbiology- Concepts and applications by Paul A. Ketchum Wiley Publications
3. Fundamentals of Microbiology –Furbisher, Saunders & Toppan Publications
4. Microbiology –Ronald M. Atns
5. Introductory Biotechnology-R.B Singh C.B.D India (1990)
6. Industrial Microbiology-Casual Wiley Eastern Ltd
7. Fundamentals of Bacteriology sale
8. Fontiers in Microbial technology-P.S. Bison, CBS Publishers.
9. Biotechnology, International Trends of perspectives A. T. Bull, G. Holl M.D.Lilly Oxford & T Publishers.
10. General Microbiology –C.B. Powar, H.F. Daginawala, Himalayan Publishing House

BIOSTATISTICS

1. Bliss, C.J.K. (1967) Statistics in Biology, Vol. I Mc Graw hill. New York.
2. Campbell R.C. (1974) Statistics for Biologists, Cambridge Univ, Press, Cambridge
3. Daniel (1999) Biostatistics (3rd edition) Panima Publishing, Compotation
4. Sward law, A. C. (1985) Practical Statistics for Exponents Biologists, John Wiley and Sons, In
5. Khan (1999) Fundamentals of Biostatistics Publishing corporation

SEMESTER III

BTP 301- Biochemistry and Biophysics

PART-A: BIOCHEMISTRY

Total Hours allotted 38

Hours

MOLECULES

* Amino acids

function and properties

4

hrs

* Proteins

fication based on structure and functions, structural organization of proteins (primary, secondary, y and quaternary structure)	10
hrs	
Enzymes	
fuction, classification, enzyme kinetics, factors influencing enzyme activity, co-enzymes and co	
*Carbohydrates	
ture, properties and classification, Carbohydrates as a source of energy	5
hrs	
5. Lipids	
ture, properties, classification and functions.	4
hrs	
6. Vitamins	
Soluble and fat-soluble vitamins Dietary source.	4
hrs	
7. Hormones	
old hormones-structure and importance in brief	3
hrs	

PART-B: BIOPHYSICS

Total hours allotted 22

Hours

1. Scope and development of Biophysics.	1
hrs	
2. pH and buffer concepts.	2
hrs	
3. Chemical bonding – Ionic bond, covalent bond, hydrous bond and peptide bond vainer walls Principles of thermodynamics.	
4 hrs	
4. Analytical techniques	
Ciples and applications of	
Chromatography (Paper, thin – layer, column and GLC)	
Centrifugation (RPM and G, Ultra centrifugation)	7
hrs	
5. Spectroscopic techniques	
Visible spectroscopic, X-ray crystallography, NMR, IR, fluorescence & atomic absorption	
4hrs	
6. Isotopes	
Their importance in biological studies, measure of radioactivity, GM counters & Scintillation	

SEMESTER IV BTP 401 MOLECULAR BIOLOGY Total Hours Allotted 60

Hours

Unit 1. Molecular of Life – an introduction experimental proof of DNA and RNA as genetic material.	3
hrs	
Unit 2. Nucleic Acids	
Structure and function of DNA and RNA	
Watson and Crick model of DNA and other forms of DNA (A and Z)	

Functions of DNA and RNA including ribosome's hrs	7
Unit 3. DNA Replication Prokaryotic and Eukaryotic-Enzymes and proteins involved in replication, Theta model and Rolling circle model. hrs	6
Unit 4, DNA Repair Causes and mechanism –photo reactivation, excision repair, mismatch repair, SOS repair. 4hrs	
Unit 5 Recombination in prokaryotes Transformations, Conjugation and Transduction. hrs	5
Unit 6, Structure to Prokaryotic and Eukaryotic gene-genetic code, Properties and Wobble hypothesis. hrs	5
Unit 7 Transcription in Prokaryotes and Eukaryotes Mechanism, promoters and RNA polymerase, transcription factors, post transcriptional modifications a eukaryotic mRNA. hrs	7
Unit 8 Translation Mechanism of translation in Prokaryotes and Eukaryotes, Post translational modifications of proteins hrs	8
Unit 9 Regulation of Gene expression Regulation of Gene expression in Prokaryotes-Person concept (Lac and Trip) Regulation of Gene expression in Eukaryotes –transcriptional activation, glactose metabolism in yeast hrs	8
Unit 10. Gene organization and expression in Mitochondria and chloroplasts. hrs	3
Unit 1. Inspectional elements and transposes. Transposable elements in Maize and Drosophila. hrs	4

BTP 302- Biochemistry**Total Units allotted:15h**

1. Preparation of Buffers-Crave and phosphate.
1unit
2. Estimation of reducing suggest Glucose Maltose and lactose by DNA, H.J and Somoji's methods. 4 unit
3. Estimation of Protein by Binretmetka and Lowry's method 3 unit
4. Assay of enzyme activity-anylese.
5. Separation of Sugars by TLC 2unit
6. Estimation of Amino acids 2 unit
7. Estimation of inorganic phosphate by subbed row method 1 unit

Reference: BIOCHEMISTRY

1. Principles of Biochemistry- Albert L. Lehninger CBS Publishers & Distributors.
2. biochemistry-Labret Stryer _____ International Edition.
3. Biochemistry-Keshav Trehan Wiley Eastern Publications
4. Fundamentals of Biochemistry J.L. Jain S.Chand and company
5. Biochemistry, Prasaranga, Bangalore University
6. Fundamental of Biochemistry-Dr. A..C. Deb
7. Textbook of Organic Chemistry (A Modern approach) P.L. Soni, Sultan Chand and Sons, Publishers.
8. The Biochemistry of Nucleic acid-tenth Edition-Roger L.P. Adams, John T. Knowler and David P. Leader, Chapman and Hall Publications.

BIOPHYSICS

1. Narayanan, P (2000) Essentials of Biophysics, New Age Int. Pub. New Delhi.
2. Bliss, C.J.K. (1967) Statistics in Biology, Vol. I Mc Graw hill. New York.
3. Campbell R.C. (1974) Statistics for Biologists, Cambridge Univ, Press, Cambridge
4. Daniel (1999) Biostatistics (3rd edition) Panima Publishing, Computation
5. Sward law, A. C. (1985) Practical Statistics for Exponents Biologists, John Wiley and Sons, In
6. Khan (1999) Fundamentals of Biostatistics Publishing corporation
7. Roy R.N. (1999) A Text Book of Biophysics New Central Book Agency.

BTP 402 –Molecular Biology

Total Units Allotted 15

1. Preparation of DNA model.	1 units
2. Estimation of DNA by DPA method.	1 units
3. Estimation of RNA by Ordinal method.	1 units
4. Detergent lyses of RBC	1 units
5. Osmotic lyses of RBC	1 units
6. Extraction and estimation of protein from animal goat liver/muscle soured by salt precipitation & Organic solvent method.	3 units
7. Extraction and estimation of protein from animal or plant source (Green gram/Pea) by salt precipitation & Organic solvent method.	
8. Protein separation by Polycrylamide Gel Electrophoresis (PAGE)	3 units
9. Charts on Conjugation, Transformations and Transduction.	1 units

Reference: MOLECULAR BIOLOGY

1. Glick, B.R. and Pasternak J.J (196) Molecular biotechnology, Principles and application of recombinant DNA, Washington D.C. ASM press.
2. Howe C (195) Gene cloning and manipulation, Cambridge University Press, USA
3. Lewin, B. Gene VI New York, Oxford University Press
4. Rigby P.W.J (1987) Genetic Engineering Academic Press Inc. Florida, USA
5. Sam brook al (2000) Molecular cloning Volumes I, II, & III, Cold spring Harbor Laboratory Press, New York USA
6. Walker J.M and Giggled, E.B (1983) Molecular Biology & Biotechnology (Indian Edition) Royal Society of Chemistry U.K.
7. Karp. G (2002) Cell & molecular Biology , 3rd Edition John Wiley & Sons; INC

Semester V : BIT 501
Genetic Engineering and Environmental Biotechnology
Total Hours Allotted : 45Hour

PART A: Genetic Engineering	Total Hours Allotted 25 Hours
1. Introduction to Genetic Engineering	1 hrs
2. Tools for genetic engineering	
NA manipulative enzymes-Restriction enzymes and DNA ligases	1hrs
Gene cloning vectors-Plasmids, Bacteriophage and Cosmids.	3 hrs
3. In vitro construction of recombinant DNA molecules-(pBR 332, pUC 19) Isolation of passenger vector DNA, creation of r-DNA	3 hrs
4. Transformation of r-DNA Transformation of r-DNA molecules into target host organisms cloned mediated, Electroporation and microinjection.	2 hrs
5. Screening and selection of recombinant host cells-Immunological screening and Colony iodization.	2 hrs
6. Gene Libraries-Genomic DNA and DNA cloning techniques.	2 hrs
7. Expression of cloned DNA in E coli	1 hrs
8. Molecular biology techniques	6 hrs
Electrophoretic techniques –Proteins and nucleic acids	
Polymerase chain reaction (PCR)	
Site directed mutagenesis (SDM)	
Nucleic acid sequencing – Sanger’s method	
Blotting techniques-Southern, Western and Northern blot.	
9. Application of r-DNA technique in human health.	4 hrs
Production of Insulin	
Production of recombinant vaccines-Hepatitis –B	
Production of human growth hormone	

PART-B : ENVIRONMENTAL BIOTECHNOLOGY

Total Hours Allotted: 30 hrs

1. Renewable and Non-Renewable resources of energy	1
hrs	
2. Conventional fuels and their environmental impact-Firewood, Plant, animal, Water, Coal and	
	2 hrs
3. Modern fuels and their environmental impact-Methanogenic bacteria, Biogas, Microbial hydrogen Production, conversion of sugar to alcohol & Gasohol.	3
hrs	
4. Bioremediation	
Remediation of soil & water contaminated with oil spills, heavy metals and detergents. Degradation and cellulose using microbes, Phytoremediation. Degradation of pesticides and other toxic. Chemicals by Micro-organisms-Degradation of Aromatic and chlorinated hydrocarbons and petroleum products.	06
Hrs	
Unit 5. Treatment of Municipal waste and Industrial effluents	2
Hrs	
Unit 6. Biofertilizers	

Role of symbiotic and symbiotic nitrogen fixing bacteria in the enrichment of soil. Algal and Fungal bio fertilizers (VAM) 3 hrs

Unit 8 Bioleaching

Enrichment of ores by microorganisms (Gold, Copper and Uranium) 2 hrs

Unit 9. Environmental Significance of Genetically modified microbes, plants and animals 1hrs

BTP 502- Genetic Engineering and Environmental Biotechnology

Total Units Allotted :15

- | | |
|---|--------|
| 1. Isolation of genomic DNA from bacteria, plant and animal tissue. | 3units |
| 2. Isolation of plasmid DNA (E. coli) | 1 unit |
| 3. Restriction Digestion of DNA | 2 unit |
| 4. Separation of DNA by Gel Electrophoresis | 2 unit |
| 5. SDS-PAGE | 2 unit |
| 6. Bacterial Examination of water by MPN Method | 2 unit |
| 7. Estimation of BOD (2 samples) | 2 unit |
| 8. VAM staining | 1 unit |

Reference: GENETIC ENGINEERING

- Glick, B.R. and Pasternak J.J (196) Molecular biotechnology, Principles and application of recombinant DNA, American Society for Microbiology, Washington D.C..
- Christopher H (1995) Gene cloning and Manipulation, Cambridge University Pres..
- Nicholls, D.S.T (1994) An Introduction of Genetic Engineering Cambridge University Press.
- Old, R.W. and Primrose, S.B. (1986) Principles of gene manipulation, An introduction to genetic engineering (3 rd Edition) Blackwell, Scientific Publications.
- Watson, J.D. Hopkins, N.H. Roberts, J.W. Sretetz, J.A. and Weiner, A.M. (1988) Molecular Biology the gene the Benjamin/Cummings Publishing Company, Inc.
- Kucherlpati.R and Smith G.R. Editors (1983) Genetic recombination. Washington D.C. America Society for Microbiology.
- Lewin, B. Gene VI New York, Oxford University Press

ENVIRONMENTAL BIOTECHNOLOGY

- Microbial Biotechnology (1995) Alexander N. Glazer Hiroshi Nikaido W.H. Freeman and Company
- Molecular biotechnology Principles and Applications of Recombinant DNA Bernal R. Glick and Jack J. pasternak ASM Press. Wastington D.C. (1994)
- Fungal _____ and Biotechnology (1993) Rastogi Publications Meenit

Semester VI

BTP 601- Plant Biotechnology

Total Hours Allotted: 45 hrs

Unit 1. in-vitro methods in plant tissue culture, Aseptic Techniques, Nutrient media, and use of growth regulators (auxins, Cytokines and Gibberellins).

Unit 2. In-vitro fertilization-Ovary and Ovule culture. 2hrs

Unit 3. Clonal propagation of elite species (Micro propagation) 4 hrs

Unit 4.	
Organ Culture- Anther, Embryo and Endosperm culture and their applications	
Organogenesis and Somatic Embryogenesis-Technique and applications	10
hrs	
Unit 5.	
Protoplast Culture-Isolation, regeneration and viability test, somatic hybridization, methods of protoplast fusion-Chemical and electro fusion, practical application of somatic hybridization and hybridization.	
10 hrs	
Unit 6. Seasonal variation and their significance	3
hrs	
Unit 7. In-vitro production of secondary metabolites-Techniques and significance	5
hrs	
Unit 8. Role of tissue culture in agriculture, horticulture and forestry	4
hrs	
Unit 9. Transgenic Plants	
Technique of transformation-Agrobacterium mediated and physical methods (Micro projectile and electro oration) Application of transgenic plants.	8
hrs	
Unit 10. Edible Vaccines from Plants – Banana, Watermelon	4
hrs	
Unit 11. Biotechnology and Intellectual property rights.	
Patents, trade secrets, copyright, trademark, Choice of Intellectual property (IPR) and Plant genetic resomes (PGR), GAA and TRIPS	4
hrs	

SEMESTER V

BTP 503- Immunology and Animal Biotechnology

Total Hours Allotted:45 hrs

PART A: Immunology

Total Hours Allotted:25 hrs

Unit 1. History and scope of Immunology.	1
hrs	
Unit 2. Types of Immunity	
Passive, Active and Acquired immunity, Hum oral, Cell Mediated Immunity	2
hrs	
Unit 3. Cell and organs of immune responses and their functions	2
hrs	
Unit 4. Antigens	
Types, hastens, epitomes and Factors influencing antigen city.	
2hrs	
Unit 5, Antibodies	
Structure, types, properties and functions of immunoglobulin, Production of antibodies.	3
hrs	

Unit 6. Complement system. Structure, Components, Properties and Functions hrs	2
Unit 7. Antigen-Antibody reaction Investor tests-Precipitation, Immunolectro -phoresis, Haemagglutination, Labeled antibody (RIA, ELISA and Immuno-fluro scent techniques) hrs	5
Unit 8 Hypersensitivity and Allergic reactions hrs	2
Unit 9. Blood cell components, ABO blood grouping Rh typing hrs	2
Unit 10. Vaccines and Immunization Passive and Active Immunization Types of Vaccines – Inactivate Attenuated and Recombinant Vaccines-Peptide and DNA Vaccines. hrs	3

PART-B: ANIMAL BIOTECHNOLOGY

Total Hours Allotted: 20 Hours

Unit 1. Scope of Animal Tissue Culture. hrs	1
Unit 2. Culture Media Simulating natural conditions for growth of animal cells:	
1. Natural media-Plasma Clot, biological fluids tissue extract, embryo extract, Importance of Serum in media.	
2. Chemical defined media. hrs	3
Unit 3.	
a) Primary Culture:- Cell lines, and cloning desegregation of tissue, isolation of tissue, enzyme desegregation, and mechanical desegregation.	
b) Secondary Culture:- Transformed animal cells and continuous cell lines. hrs	3
Unit 4. Transfect ion of animal cell lines, HAT selection Selectable Markers and Transplantations of Cultural Cells. hrs	3
Unit 5. Expression of cloned proteins in animal cell-Expression vector, over production and down stream processing of the expressed proteins. hrs	2
Unit 6. Production of vaccines in animal cells. hrs	1
Unit 7. Production and applications of monoclonal antibodies hrs	1
Unit 8, Growth factors-promoting proliferation of animal cells EGF, FGF, PDGF, IL-I, II-2, NGE and Erythropoietin. hrs	3
Unit 9. Transgenic Animals	

Techniques and Applications and Transgenic mice and sheep.

3hrs

BTP 504- Immunology and Animal Biotechnology

Total Units Allotted:15

1. Blood grouping	1 unit
2. Differential Count of WBC	2 unit
3. Widal Test and VDRL Test	2 unit
4. Dot Elisa	1 unit
5. ELISA-Demonstration	1unit
6. Ocuteriony Double diffusion (ODLO	1 unit
7. Isolation of liver parenchyma cells	3 units
8. Rocket Electrophoresis	2 units
9. Separation of Serum from blood & precipitation of immunoglobulin.	2 units

Reference: IMMUNOLOGY

1. William, E. Paul, (1989) Fundamental immunology, 2nd Edition Raven Press, New York.
2. William, R. Clark (191) The Experimental Foundations of Modern Immunology (4th Edition) John Wiley, and Sons, New York.
3. Ivan, M. Roitt (194) Blackwell Scientific Publications, London.

ANIMAL CELL BIOTECHNOLGY

1. Ian Freshncy (4th Edition)
2. Buttler.
3. Elements of Biotechnology –P.K. Gupta (1st Edition-200) Rastogi Publications.

BTP 602-Palnt Biotechnology

Total Units Allotted

1. Preparation of plant culture media-MS (1962) NItsch (1969) and White's medium	4 Unit
2. Production of Gallus and Suspension culture	2 Unit
3. Plant protoplast Isolation	2 Unit
4. Plant propagation through Tissue culture (shoot tip and Nodal culture)	4 Unit
5. Preparation of Synthetic Seeds.	1Unit
6. Anther Culture	2 Unit

Reference: PLANT BIOTECHNOLOGY

1. Ravishankar G.A. and Venkataraman L.V. (197) Biotechnolgy Applications of plant Tissue & 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 Kelyn (1996) Plants from test tubes. An introduction to Micropropogation Edition) Timber Press, Partland.
5. Kumar H.D. (1991) A text book on Biotechnology (2nd Edition) Affiliated East West Press Priva Ltd. New Delhi.
6. Chrispcel M.J. and Sdava D.E. (1994) Plants, Genes and Agriculture. Jones and Barlett Publisher Boton.
7. Reinert J. and Bajaj Y.P.S. (197) Applied and Fundamental Aspects of Plant Cell, Tissue, and Orga Culture, Narosa Publishing House.

SEMESTER VI
BTP 603- Industrial Biotechnology

Total Hours Allotted: 45 Hrs

Unit 1. Introduction to industrial Biotechnology, basic principles of fermentation technology
1hr

Unit 2. Screening and Isolation of Microorganisms, maintenance of strains, strain improvement (Mutant Selection, Recombinant DNA methods). 2 hrs

Unit 3. Fermentation Media
Natural and Synthetic Media
Sterilization techniques-Heat, Radiation and Filtration methods. 2hrs

Unit 4. Fermenters
Process of Aeration, Agitation, Temperature regulation and Foam control.
Types of Fermenters- Typical, Air-lift, Tower and Bubble-up Fermenters. 5 Hrs

Unit 5. Type of Fermenters
Solid State, Submerged fermentation and continuous fermentation
Immobilized enzyme and cell bioreactors. 3hrs

Unit 6. 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. 11 hrs

Unit 7. Enzyme biotechnology
Characteristics of enzymes
Industrially produced enzymes-analysis.
Industrial uses of enzymes-Detergents, Leather, Beverage, food and pharmaceutical
Bioreactors for enzyme production-stirred tank, membrane reactors and continuous flow reactors 6 hrs

Unit 8. Fermented Foods.
Fermented Foods: Yogurt, Buttermilk, Idli, Dosa, Cheese, Tempeh.
Microbial Foods: Single cell proteins (SCP), Single cell oils (SCO) 5hrs

Unit 9. Plant cell suspension culture for the production of food additives-Saffron and Capsaicin 2hrs

Unit 10. Technique: of mass culture of Algae-Spiraling 1hrs

Unit 11. Microbial polysaccharides and polyesters; production of xanthenes gum and polyhydroxyalkon des (PHA)
hrs

3

BTP 604- Industrial Biotechnology

Total Hours Allotted:

- | | |
|---|--------|
| 1. Algal and fungal culture-Spiraling, Agarics, Yeast and Aspergillums. | 4 Unit |
| 2. Estimation of citric acid from Aspergillums Culture. | 2 Unit |
| 3. Estimation of lactic acid and lactose. | 3 Unit |
| 4. Immobilization of Yeast cells. | 1 Unit |
| 5. Preparation of wine. | 2 Unit |
| 6. Estimation of Alcohol by Specific gravity method. | 1 Unit |
| 7. Immobilization of enzymes-(Inverses can be obtained from yeast cells and observed for production). | |
| 8. | |

Reference: I N D U S T R I A L B I O T E C H N O L O G Y

1. Sullia S. B & Shantharam S. (198) General Microbiology Oxford, & IBH Publishing Co Pvt
2. Bisen P.S (1994) Frontiers in Microbial Technolgoy, 1st Edition, CBS Publshers.
3. Glazer A.N. & NIKaido. H (1995) Microbial Bitechnology, W.H. Freeman & Co.
4. Prescott & Dum (1987) Industrial Microbiology 4th Edition, CBS Publishers & Distrbutiors,
5. Prescott & Dum (2002) Industrial Micrbiology, Agrabios (India) Publishers
6. Creueger W. & Crueger A. (2000) A Text of Industrial Microbiology, 2nd Edition, Panima Publishers corp.
7. Stanbury P.F, Whitaker H. Hall S.J. (19978) Principle of Fermentation Technology Aditya Book Ltd.

I Semester Department of Biotechnology Examination, Nov/Dec. 2007
(Semester Scheme)
BIOTECHNOLOGY (Paper – I)
Cell Biology and Genetics

Time: 3 Hours

Max. Marks: 60

Instruction : Draw neat and labeled diagrams **wherever** necessary.

SECTION – A

I. Answer the following:

(5X2=10)

1. What are microtubules?
2. What is heterochromatin?
3. Define cell cycle.
4. What is Chargaff's equivalence rule?
5. Define point mutation.

SECTION – B

II. Answer **any four** of the following:

(4X5=20)

6. Describe the structure of Lamp brush chromosome.

Turner's syndrome.

7. Distinguish between spontaneous mutations and induced mutations. Give two examples.
8. Explain the Fluid Mosaic model of plasma membrane with labeled diagram.
9. Explain coupling and repulsion hypothesis.
- 10.

SECTION – C

III. Answer **any three** of the following:

(3X10=30)

11. Give an account of structure, chemical composition and functions of nucleus.
12. Explain Watson and Crick's double helix model of DNA with the help of neat labeled diagram.
13. What is multiple allelism? Explain with reference to blood groups in human beings. A man with blood group 'A' marries a woman with blood group 'B'. What will be the blood groups of their children if both the parents are heterozygous.
14. Give a detailed account of meiotic prophase.
15. What are chromosomal aberrations? Explain in detail about structural aberrations.

II SEMESTER B.Sc. Examination, June 2008

(Semester Scheme)

BIOTECHNOLOGY – II

Microbiology and Biostatistics

Time: 3 Hours

Max Marks: 60

Instruction : Part – I and Part – II must answered in **separate** answer booklets.

PART – I

(Microbiology)

SECTION – A

I. Answer the following: **(4X2=8)**

- 1) Endospore staining
- 2) Structure of TMV
- 3) Distinguish between pathogen and parasite
- 4) UV-rays.

SECTION – B

II. Answer **any two** of the following: **(2X6=12)**

- 5) Asexual reproduction in algae
- 6) Bacterial photosynthesis
- 7) Prevention of Tuberculosis.

SECTION – C

III. Answer **any two** of the following: **(2X10=20)**

- 8) What are the symptoms of pneumonia? Explain the nature of causative agent.
- 9) Explain glucolysis with different enzymes involved in the pathway. Mention total number of ATP produced at the end of glycolysis.
- 10) Explain the structure and composition of bacterial cell wall.
- 11) Write short notes on
 - a) Capsule
 - b) Phenols
 - c) TEM

d) Branches of microbiology

PART – II
Biostatistics

Instruction : All questions carry equal marks.

Answer any four questions.

(4X5=20)

1. Lives or two models of refrigerators in a survey are as follows. Suggest which model to be purchased?

Life Time (In years)	MODEL-A	MODEL-B
0-2	05	02
2-4	16	07
4-6	13	12
6-8	07	19
8-10	05	09
10-12	04	01

2. In a sample of 1,000 cases, the mean marks scored in a certain test is 14 with standard deviation of 2.5. Assume the distribution to be normal find

i) How many students scored between 12 and 15?

ii) How many students scored exactly 16?

iii) How many students scored between 10 and 14?

3. The following data gives number of deaths took place due to road accident during last month in a city. Represent the data by histogram and hence find mode.

No. of deaths	0-3	3-6	6-9	9-12	12-15	15-18
No. of days	02	05	08	07	06	03

4. The result of an investigation to measure the effect of vaccination of laboratory animal against a particular disease is given below. Test the hypothesis that vaccination is not effective.

	GOT DISEASE	DID NOT GET DISEASE
VACCINATED	45	70
NOT VACCINATED	65	20

5. Find mean, median and standard deviation from the following data:

CI	0-4	4-8	8-12	12-16	16-20	20-24	24-28	28-32
Frequency	08	09	12	07	05	04	03	02

6. Explain the following:

i) Type I and Type II error.

ii) Null and alternate hypothesis.

III Semester B.Sc. Examination, November/December 2008
(Semester Scheme)
BIOTECHNOLOGY – II
Biochemistry and Biophysics

Time: 3 Hours

Max. Marks: 60

Instructions: i) Part **I** and Part **II** must be answered in **separate** booklets.

ii) Draw the structures and labeled diagrams **wherever** necessary.

PART – I

(Biochemistry)

SECTION – A

I. Answer **any four** of the following: **(4X2=8)**

1. Primary structure of proteins.
2. Active centre of enzyme.
3. Sanger's reagent.
4. Structure of tristearin.
5. Steroid hormones.

SECTION – B

II. Answer **any two** of the following: **(2X6=12)**

- 6) Explain quaternary structure of proteins with an example.
- 7) What are sugar phosphates? Write the structure of any two.
- 8) Explain the properties of amino acids.

SECTION – C

III. Answer **any two** of the following: **(2X10=20)**

- 9) How are enzymes classified? Explain with examples.
- 10) Explain the importance of vitamins. Add a note on their dietary source.
- 11) Explain the properties of lipids and add a note on saponification and rancidity.
- 12) Write the structure of starch. Explain carbohydrates as energy source.

PART – II

(Biophysics)

SECTION – A

I. Answer **any two** of the following: **(2X5=10)**

- 1) List out the differences between ionic and covalent bonds.
- 2) Explain the importance of pH and buffers.
- 3) Write the principle and applications of GLC.

SECTION – B

II. Answer **any one** of the following: **(1X10=10)**

- 4) Explain X-ray crystallography and NMR.
- 5) Describe the methods of measuring radio activity.

IV Semester B.Sc. Examination, June 2008
(Semester Scheme)
BIOTECHNOLOGY – IV
Molecular Biology

Time : 3 Hours

Max. Marks : 60

Instruction: Draw neat and labeled diagrams **wherever** necessary.

SECTION – A

I. Answer the following:

(5X2=10)

- 1) Function of RNA
- 2) 'A' form the DNA
- 3) Genetic code
- 4) -10 box

5) SD sequence.

SECTION – B

II. Answer **any four** of the following: (4X5=20)

- 6) Explain the activation of amino acid by amino acyl t-RNA synthetase enzyme.
- 7) What are transposable elements? Explain recombination in maize by transposons.
- 8) Explain excision and mismatch repair mechanism.
- 9) Differentiate the eukaryotic RNA from prokaryotic RNA.
- 10) Explain Griffith's experiment on transformation.

SECTION – C

III. Answer **any three** of the following: (3X10=30)

- 11) Write briefly about the replication of DNA.
- 12) Explain the mechanism of translation in prokaryotes.
- 13) What is cytoplasmic DNA? Explain in detail about cytoplasmic and mitochondrial genome.
- 14) With the help of neat and labelled diagram explain the structure and function of all types of RNA.

V Semester B.Sc. Examination, Nov./Dec. 2007

(Semester Scheme)

BIOTECHNOLOGY – V

Genetic Engineering and Environmental Biotechnology

Time: 3 Hours

Max. Marks: 60

Instructions: Draw neat and labelled diagrams **wherever** necessary.

SECTION – A

I. Answer the following: (5X2=10)

- 1) Bioleaching
- 2) PCR
- 3) Reverse transcriptase
- 4) VAM
- 5) Conventional fuel.

SECTION – B

II. Answer **any four** of the following: (4X5=20)

- 6) What are plasmid vectors? Explain with examples.
- 7) Explain the role of gene libraries in genetic engineering.
- 8) Explain different hybridization techniques.
- 9) Write short note on biopesticides and their mode of action.
- 10) Explain biomining with suitable examples.

SECTION – C

III. Answer **any three** of the following:

- 11) Explain the procedure of screening and detection of recombinant cells.
- 12) Discuss in detail about various gene transfer techniques.
- 13) Explain the application of r-DNA techniques in human health.
- 14) What are Xenobiotic compounds? Explain the degradation of pesticides.
- 15) Write a detailed account on primary, secondary and tertiary treatment of effluents.

V Semester B.Sc. Examination, Nov./Dec. 2007

(Semester Scheme)
BIOTECHNOLOGY – VI
Immunology and Animal Biotechnology

Time: 3 Hours

Max. Marks: 60

Instruction: Draw **neat** and labeled diagram **wherever** necessary.

SECTION – A

I. Answer the following: **(5X2=10)**

- 1) Humoral immunity
- 2) Epitopes
- 3) DNA vaccine
- 4) PDGF
- 5) Transformed cells.

SECTION – B

II. Answer any **four** of the following: **(4X5=20)**

- 6) What are T-cells? Explain types of T-cells.
- 7) Give an account on antigens and antibodies present in ABO blood groups. Add a note on Rh factor.
- 8) What is hypersensitivity? Explain Type-I hypersensitivity in detail.
- 9) What is erythropoietin? Explain its role as a growth factor.
- 10) Recombinant vaccines.

SECTION – C

III. Answer **any three** of the following: **(3X10=30)**

- 11) Name the invitro tests for antigen and antibody reaction, and explain any three tests in detail.
- 12) Describe the structure of antibody molecule. Explain in detail about IgM.
- 13) What are lymphoid organs? Give an elaborate account of primary and secondary lymphoid organs.
- 14) What are genetically modified animals? Explain the techniques involved in generating a transgenic mice and add a note on its significance.
- 15) Describe the physicochemical properties of media used in animal tissue culture.

VI Semester B.Sc. Examination, June 2008

(Semester Scheme)
BIOTECHNOLOGY – VIII
Industrial Biotechnology

Time : 3 Hours

Max. Marks: 60

Instruction : Draw neat labeled diagram **wherever** necessary.

SECTION – A

I. Answer the following: **(5X2=10)**

- 1) Lyophilization.
- 2) Baffles.
- 3) Batch sterilization.
- 4) Continuous Fermenters.
- 5) Maintenance of strain.

SECTION – B

- II. Answer **any four** of the following: (4X5=20)
- 6) Explain the production of Saffron.
 - 7) Explain the steps involved in the production of citric acid.
 - 8) Give an account on Air Lift Fermenters.
 - 9) Briefly explain different types of sparger.
 - 10) Write a note on rotary vacuum filter.

SECTION – C

- III. Answer **any three** of the following. (3X10=30)
- 11) Draw a neat diagram of fermenter, describe its parts and its body construction.
 - 12) Describe the different methods of isolating a micro-organism and screening of microbes.
 - 13) Explain the steps involved in the production of Alcohol.
 - 14) Write short notes on:
 - a) Enzymes used in Pharmaceutical Industry.
 - b) Drying.
 - 15) Give an account on:
 - a) Industrially produced enzymes.
 - b) Single cell protein.

VI Semester B.Sc. Examination, June 2008
(Semester Scheme)
BIOTECHNOLOGY – VII
Plant Biotechnology

Time : 3 Hours

Max. Marks : 60

Instruction : Draw **neat** and labeled diagrams **wherever** necessary.

SECTION – A

- I. Answer the following: (5X2=10)
- 1) Secondary metabolite.
 - 2) Anther culture.
 - 3) Embryogenesis.
 - 4) Patent.
 - 5) Gibberellins.

SECTION – B

- II. Answer **any four** of the following: (4X5=20)
- 6) Discuss the applications of somaclonal variations.
 - 7) Write a brief note on techniques and applications of endosperm culture.
 - 8) Give an account of techniques used for the sterilization of explants under in vitro conditions.
 - 9) Discuss the process of plant genetic transformation by Ti-plasmid.
 - 10) Discuss the role of tissue culture in horticulture.

SECTION – C

- III. Answer **any three** of the following: (3X10=30)
- 11) Discuss the method of isolation, fusion and regeneration of protoplasts.
 - 12) Elucidate the techniques and applications of somatic embryogenesis. Write a brief note on synthetic seeds.

- 13) What are Secondary Metabolites? Discuss the techniques used for the production of secondary metabolites under in vitro conditions.
- 14) What is Plant Tissue Culture? Highlight the applications of Plant Tissue Culture.