BIOTECHNOLOGY
B. Sc. Semester Pattern Syllabus
B. Sc. Part I – Semester I
BIOTECHNOLOGY
(With effect from academic session 2013-14)

1) The examination shall comprise two theory papers, an Internal assessment and a practical. Each theory paper shall be of three hours duration and carry 50 marks. The practical shall be of 6 hours duration and carry 30 marks. Internal assessment carry 20 marks.

Theory Paper I	50 marks
Theory Paper II	50 marks
Practical	30 marks
Internal Assessment	20 marks

	Total - 150 marks
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2) The distribution of marks in practical shall be as follows.

[A] Experiments,	20 marks
[B] Practical record	05 marks
[C] Viva	05 marks

	Total - 30 marks
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3) The syllabus is based on six theory periods and six practical periods per week. Candidates are required to pass separately in theory, internal assessment and practical examination.
4) Students are expected to perform all the practicals mentioned in the syllabus.
5) Internal assessment: There shall be one internal assessment based on two theory papers for 10 Marks each. Total 20 Marks. The Internal assessment shall be conducted by the University approved teachers in the relevant subjects. The internal assessment shall be done by the respective college one month prior to the final exam of each semester. The Marks shall be sent to the university immediately after the internal assessment is over.
6) At the beginning of each semester, every teacher / department / college shall inform his / her students unambiguously the method teacher / department / college propose to adopt a scheme of marking for internal assessment.
7) The internal assessment marks assigned to each theory paper shall be awarded on the basis of attendance / home assignment / class test / Project assignment / seminar / any other innovative practice / activity.
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B. Sc. Part I – Semester I - PAPER I
MICROBIOLOGY

UNIT I
History, Development and Microscopy

History and development of microbiology: contributions of Louis Pasteur, Robert Koch and Edward Jenner.
Microscopy: Compound microscopy: Numerical aperture and its importance, resolving power, oil immersion objectives and their significance, principles and applications of dark field, phase contrast, fluorescent microscopy.
Electron microscopy: Principle, ray diagram and applications, TEM and SEM, comparison between optical and electron microscope, limitations of electron microscopy.
Stains and staining procedures: Acidic, basic and neutral stains, Gram staining, Acid fast staining, Flagella staining, Endospore staining.

UNIT II
Bacteria:

Bacterial morphology and subcellular structures, general morphology of bacteria, shapes and sizes, generalized diagram of typical bacterial cell.
Slime layer and capsule, difference between the structure, function and the position of the two structures.
Cell wall of gram +ve and Gram -ve cells.
General account of flagella and fimbriae.

Chromatin material, plasmids; definition and kind of plasmids (conjugative and non-conjugative) F, R, and Col plasmids.
Endospores: Detailed study of endospore structure and its formation, germination, basis of resistance.

UNIT III

A. A brief idea Bergey's manual. Morphology of archaea, archaeal cell membrane (differences between bacterial and archaeal cell membrane), other cell structures, concept of the three distinct archaea groups.
B. **Viruses**: General characteristics of viruses, difference between virus and typical microbial cell, structure, different shapes and symmetries with one example of each type, classification of viruses on the basis of nucleic acids, phage and animal cell viruses, example of each and their importance. Brief idea of lytic cycle and lysogeny.

UNIT IV

Nutrition: Basic nutritional requirements: Basic idea of such nutrients as water, carbon, nitrogen, sulfur and vitamins etc., natural and synthetic media, nutritional classification of bacteria. Selective and Differential media, Enriched media, Enrichment media.

B. Sc. Part I – Semester I - PAPER II
(MACROMOLEULES)

UNIT I

Nucleic Acids

Chemical structure and base composition of nucleic acids, Chargaff's rules, Watson Crick Model (B-DNA), deviations from Watson-Crick model, other forms of DNA (A- and Z-DNA), forces stabilizing nucleic acid structures, (hydrogen bonds and hydrophobic associations, base stacking). Maxam and Gilbert DNA sequencing, structure of t-RNA.

UNIT II

Chromosomes, Concept of Genes and Nucleosomes

Concept of prokaryotic genes and eukaryotic genes: Definition of a gene, concept of split genes, introns, exons, spacers, C-value and C-value paradox, basic idea of Cot curves.
Chromatin structure: Nucleosome structure (10 nm fibre, experiments leading to discovery of nucleosomal structure, types of histones, arrangement of histones in the octamer, H1 histone and its role, role and length of linker DNA), 30 nm fibers (arrangement of nucleosome in a helical structure), domain and loop structure (further compacting of 30 nm fibre, role of scaffolding proteins). Role of telomere and centromere, telomeric and centromeric repeat sequences.

UNIT III

Amino acids: Structure of amino acids occurring in proteins, classification of amino acids (pH based, polarity based and nutrition based), Physico-chemical properties of amino acids (solubility, boiling and melting points, reactions like Edman's, Sanger's, Dansyl chloride, ninhydrin). Titration curves of neutral, basic and acidic amino acids.
Primary structure of proteins: Determination of primary structure (end group analysis, cleavage of disulfide bonds, amino acid composition, use of endopeptidase specificity, sequence determination, assignment of disulfide position).

UNIT IV

Secondary structure of proteins: The α-helix, β-structures (parallel, antiparallel, mixed, β-turn).
Tertiary structure of proteins: Forces that stabilize the structure (electrostatic forces, hydrogen and disulfide bonds, hydrophobic associations), myoglobin as an example of tertiary structure, concept of domains, protein denaturation.
Quaternary structure of proteins: Forces stabilizing quaternary structure, advantages of oligomeric proteins.

B.Sc. I
SEMESTER I PRACTICALS
Biotechnology
Microbiology & Macromolecules

1. Formol titration of glycine.
2. Quantitative Estimation of proteins by Biuret method
3. Determination of albumin & A/G retion in serum.
4. Estimation of DNA by Diphenylamine method
5. Estimation of RNA by Orcinol method
6. Quantitative estimation of amino acids using Ninhydrin reaction.
7. Demonstration, use and care of microbiological equipments.
8. Preparation of media, sterilization and isolation of bacteria.
9. Isolation of Bacteriophage from sewage / other sources.
10. Demonstration of motility of Bacteria.
11. Simple staining of bacteria
12. Gram staining of Bacteria
13. Acid fast staining of Bacteria
14. Endospore staining.
15. Demonstration of starch hydrolysis by bacterial cultures
16. Growth of fecal coliforms on selective media.

Note: - Mandatory to perform atleast 6 practical

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BIOTECHNOLOGY
B. Sc. Semester Pattern Syllabus
B. Sc. Part I – Semester II
BIOTECHNOLOGY
(With effect from academic session 2013-14)

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Theory Paper I	50 marks
Theory Paper II	50 marks
Practical	30 marks
Internal Assessment	20 marks

	Total - 150 marks
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[A] Experiments,	20 marks
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	Total - 30 marks
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B. Sc. Part I – Semester II - PAPER I
MICROBIOLOGY & CELL BIOLOGY

UNIT I
Microbial Growth
Growth: Growth rate and generation time, details of growth curve and its various phases.
Concept of synchronous cultures, continuous and batch cultures (chemostat and turbidostat). Measurement of growth.
Physical conditions required for growth: Temperature (classification of microorganisms on the basis of temperature requirements), Ph etc. Pure cultures and cultural characteristics. Maintenance of pure culture.

UNIT II:
B. Microbial Control
Microbial Control: Terminologies - Sterilization, disinfection, antiseptic, sanitization, germicide, microbistasis, preservative and antimicrobial agents.
Mechanism of cell injury: Damage to cell wall, cell membrane, denaturation of proteins, inhibition of protein synthesis, transcription, replication, other metabolic reactions and change in supercoiling of DNA.
Physical control: Temperature (moist heat, autoclave, dry heat, hot air oven and incinerators), dessication, surface tension, osmotic pressure, radiation, UV light, electricity, ultrasonic sound waves, filtration.
Chemical control: Antiseptics and disinfectants (halogens, alcohol, gaseous sterilization.
Concept of biological control.

UNIT III
Cell Biology
Eukaryotic Cell - Structure and function of the following: nucleus, nuclear membrane, nucleoplasm, nucleolus, golgi complex, endoplasmic reticulum, lysosomes, peroxisomes, glyoxisomes and vacuoles.

UNIT IV
Plant cell wall.
Cytoskeleton (actin, microtubules) and cell locomotion.
Mitosis and meiosis. Brief idea of cell cycle.
Muscle and nerve cell structure, synaptic transmission and neuromuscular junctions.

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B. Sc. Part I – Semester II - PAPER II
(CELL CONSTITUENTS & ENZYMOLOGY)

UNIT I
Carbohydrates
Definition, classification, nomenclature of carbohydrates, structures of monosaccharides, disaccharides and polysaccharides (structures of starch and glycogen as examples of homopolysaccharides). Concept and examples of heteropolysaccharides.

UNIT II
Lipids
Types of lipids, structures of saturated and unsaturated fatty acids, triglycerides, phospholipids, plasmalogens, gangliosides and sphingolipids. Terpenoids and isoprenoids - definition and representative structures, steroids. Concept of acid value, saponification value and iodine value.

UNIT III
Enzymes
Terminology: Active site, allosteric site, Holoenzyme, apoenzyme, coenzyme, substrate, inhibitor, activator, modulator etc.

Classification and nomenclature.
Concept of isoenzymes (example Lactate Dehydrogenase) and multienzymes (example pyruvate dehydrogenase)
Substrate Specificity (bond specificity, group specificity, absolute specificity, stereo-specificity, proof-reading mechanism), lock and key and induced fit models.
Concept of allosteric enzymes (brief idea of ATCase as an example)
Mechanisms of catalysis: Acid-base, covalent and metal ion catalysis.

UNIT IV
Assay of Enzymes: Concept of activity, specific activity, turnover number, units of enzyme activity (katal, international unit), spectrophotometric methods of assay of enzymes (simple and coupled assay), very brief idea of other methods.
Enzyme kinetics: Michaelis-Menten equation, effect of substrate concentration, effect of enzyme concentration, effect of Ph and temperature, temperature quotient, single reciprocal(Eadie-Hoffstee equation) and double reciprocal plots(Lineweaver-Burke plots), enzyme inhibition kinetics (reversible inhibition types – competitive, uncompetitive and non-competitive), brief idea of irreversible inhibition.

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B.Sc. I
SEMESTER II PRACTICALS
Biotechnology
Microbiology, Cell constituents & Enzymology

1. Qualitative Analysis of sugars and proteins.
2. Quantitative estimation of sugars (Dinitrosalicylic acid method).
3. Estimation of glucose by Benedict's quantitative method
4. Quantitative estimation of proteins by Lowry's method.
5. Extraction and quantification of total lipids.
6. Determination of saponification value of Fats
7. Determination of Acid Value of Fats
8. Isolation of urease and demonstration of its activity
9. Assay of protease activity.
10. Preparation of starch from Potato and its hydrolysis by salivary amylase.
11. Assay of alkaline phosphatase
12. Immobilization of enzymes / cells by entrapment in alginate gel
13. Effect of temperature / pH on enzyme activity
14. Isolation of pure culture by pour plate method
15. Isolation of pure culture by streak plate method.
16. Anaerobic cultivation of microorganisms.
17. Cultivation of yeast and moulds.
18. Antibiotic sensitivity assay.
19. Oligodynamic action of metals.
20. To study germicidal effect of UV light on bacterial growth.
21. Stages of mitosis.
22. Stages of meiosis.

Note: - Mandatory to perform atleast 6 practical.

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B. Sc. Semester Pattern Syllabus
B. Sc. Part II – Semester III
BIOTECHNOLOGY
(With effect from academic session 2014-15)

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Theory Paper I	50 marks
Theory Paper II	50 marks
Practical	30 marks
Internal Assessment	20 marks

	Total - 150 marks
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[A] Experiments,	20 marks
[B] Practical record	05 marks
[C] Viva	05 marks

	Total - 30 marks
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B. Sc. Part II – Semester III - PAPER - I
(METABOLISM)

UNIT I

Bioenergetics: Concept of free energy, Entropy, Enthalpy & Redox Potential. Concept of high energy bonds as related to the structure of ATP, Phosphoenolpyruvate, Creatine phosphate etc.
Glycolysis (pathway, entry of other monosachharides and disaccharides, regulation, inhibitors)
Gluconeogenesis: Bypass reactions.

UNIT II

Structure of mitochondria.
TCA cycle: Detailed account, regulation, amphibolic nature and anaplerosis.
Electron Transport Chain: Components of the chain, sites of ATP synthesis, chemiosmotic theory of oxidative phosphorylation.

UNIT III

Lipid Metabolism

β-oxidation of fatty acids, role of carnitine, oxidation of unsaturated fatty acids & odd carbon fatty acids. Regulation.
Ketogenesis, Ketosis & ketoacidosis in physiology & pathology.

Biosynthesis of fatty acids, fatty acid synthase complex, regulation, Microsomal & Mitochondrial system of chain elongation & synthesis of unsaturated fatty acids.

UNIT IV

Metabolism of Nitrogenous Compounds

Transamination (mechanism). Oxidative & Non-oxidative deamination.

Urea cycle: Detailed account, linkage of urea & TCA cycle, compartmentation of urea cycle, regulation, metabolic disorders of urea cycle.

Transmethylation & Decarboxylation, physiologically important products of decarboxylation.

Biosynthesis of purines and pyrimidines: Salvage pathways.

B. Sc. Part II – Semester III - PAPER – II
(BIOPHYSICAL TECHNIQUES I)

UNIT – I:

Spectrophotometry: Concept of electromagnetic radiation, spectrum of light, absorption of electromagnetic radiations, Concept of chromophores and auxochromes, involvement of orbitals in absorption of electromagnetic radiations, Absorption spectrum and its uses, Beer's law - derivation and deviations, extinction coefficient. Difference between spectrophotometer and colorimeter. Instrumentation of UV and visible spectrophotometry

Double beam spectrometer; dual-wavelength spectrometer

UNIT II:

a) Applications of UV and visible spectrophotometry.
b) Spectrofluorometry: principle, instrumentation and applications. Absorption & emission flame photometry: principle, instrumentation and application.
c) Principles of IR and Mass spectrometry

UNIT III:

Chromatography: Partition principle, partition coefficient, nature of partition forces, brief account of paper chromatography.

Thin layer chromatography and column chromatography.

Gel filtration: Concept of distribution coefficient, types of gels and glass beads, applications.

UNIT IV

Ion-exchange chromatography: Principle, types of resins, choice of buffers, applications including amino acid analyzer.

Affinity chromatography: Principle, selection of ligand, brief idea of ligand attachment, specific and non-specific elution, applications.

Elements of high pressure liquid chromatography.

B.Sc. II
SEMESTER III PRACTICALS
Biotechnology
Metabolism & Biophysical Techniques

1. Spectrophotometric analysis of DNA denaturation.
2. Determination of absorption spectrum of oxy- and deoxyhemoglobin and methemoglobin.
3. Protein estimation by E280/E260 method.
4. Paper chromatography of amino acids/sugars.
5. TLC of sugars/amino acids.
6. Cellular fractionation and separation of cell organelles using centrifuge.
7. Isolation of mitochondria and assay of marker enzyme.
8. Estimation of Urea by diacetyle monoxime method
9. Estimation of Sugars by Folin Wu method
10. Validity of Beer’s law for colorimetric estimation of creatinine.
11. Absorption spectrum of NAD & NADH
12. Preparation of standard buffers and determination of pH of a solution
13. Titration of a mixture of strong & weak acid

Note: - Mandatory to perform atleast 6 practical

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B. Sc. Semester Pattern Syllabus
B. Sc. Part II – Semester IV
BIOTECHNOLOGY
(With effect from academic session 2014-15)

1) The examination shall comprise two theory papers, an Internal assessment and a practical. Each theory paper shall be of three hours duration and carry 50 marks. The practical shall be of 6 hours duration and carry 30 marks. Internal assessment carry 20 marks.

Theory Paper I	50 marks
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Practical	30 marks
Internal Assessment	20 marks

	Total - 150 marks
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[A] Experiments,	20 marks
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	Total - 30 marks
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B. Sc. Part II – Semester IV - PAPER - I
(IMMUNOLOGY)

UNIT I

Immune system, Organs and cells of immune system
Immunity, innate immune mechanism
Acquired immune mechanism, Antigen, Antigenecity (factors affecting antigenecity)
Humoral immunity, main pathways of complement system.

UNIT II

Antibody structure and classes.
Cell mediated immunity: TC mediated immunity, NK cell mediated immunity, ADCC, delayed type hypersensitivity, cytokines and brief idea of MHC.

UNIT III

Hypersensitivity and vaccination : General features of hypersensitivity, various types of hypersensitivity, Vaccination: Discovery, principles, significance. Concept of autoimmunity.

UNIT IV

Immunological Techniques:Antigen-antibody reactions: Precipitation, agglutination, complement fixation, immunodiffusion, ELISA.
Hybridoma technology: Monoclonal antibodies and their applications in immunodiagnosis.

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B. Sc. Part II – Semester IV - PAPER – II
(BIOSTASTICS & BIOPHYSICAL TECHNIQUES II)

UNIT – I:

a) Migration of ions in electric field, Factors affecting electrophoretic mobility.
b) Paper electrophoresis: - Electrophoretic run, Detection techniques, Cellulose acetate electrophoresis, High voltage electrophoresis.
c) Gel electrophoresis: - Types of gels, Solubilizers, Procedure, Column & slab gels, Detection, Recovery & Estimation of macromolecules.

UNIT II

a) SDS-PAGE Electrophoresis: - applications (determination of molecular weight of proteins, determination of subunit stoichiometry, molecular biology applications).
b) Isoelectric focussing, Principle, Establishing pH amd density gradients, Procedures & applications.
c) Pulsed-field gel electrophoresis.

UNIT – III:

Isotopic tracer technique: -

a) Radioactive & stable isotopes, rate of radioactive decay. Units of radioactivity.
b) Measurement of radioactivity: - Ionization chambers, proportional counters, Geiger- Muller counter, Solid and liquid scintillation counters (basic principle, instrumentation and technique), Cerenkov radiation.
c) Measurement of Stable isotopes: Falling drop method for deuterium measurement, Mass spectrometry.
d) Principles of tracer technique, advantages and limitations, applications of isotopes in biotechnology (distribution studies, metabolic studies, isotope dilution technique, metabolic studies, clinical applications, autoradiography).

UNIT IV

Centrifugation:

a) Basic principles, concept of RCF, types of centrifuges (clinical, high speed and ultracentrifuges).
b) Preparative centrifugation: Differential and density gradient centrifugation, applications (Isolation of cell components).
c) Analytical centrifugation: Sedimentation coefficient, determination of molecular weight by sedimentation velocity and sedimentation equilibrium methods.

Biostatistics

Basic concepts of mean, median, mode, Standard deviation and Standard error

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B.Sc. II
SEMESTER IV PRACTICALS
Biotechnology
Immunology & Biophysical techniques

1. Antigen – antibody reaction – determination of Blood group
2. Pregnancy test
3. Widal test
4. Ouchterloney immunodiffusion
5. Radial immunodiffusion
6. ELISA
7. Isolation of casein by isoelectric precipitation
8. Paper electrophoresis of proteins
9. Gel electrophoresis of proteins.
10. SDS-PAGE of an oligomeric protein.
11. Calculation of mean, median, and mode (manual/computer aided).
12. Calculation of standard deviation and standard error (manual/computer aided).
13. Biostatistical problem based on standard deviation.

Note: - Mandatory to perform atleast 6 practical

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B. Sc. Semester Pattern Syllabus
B. Sc. Part III – Semester V
BIOTECHNOLOGY
(With effect from academic session 2015-16)

1) The examination shall comprise two theory papers, an Internal assessment and a practical. Each theory paper shall be of three hours duration and carry 50 marks. The practical shall be of 6 hours duration and carry 30 marks. Internal assessment carry 20 marks.

Theory Paper I	50 marks
Theory Paper II	50 marks
Practical	30 marks
Internal Assessment	20 marks

	Total - 150 marks
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2) The distribution of marks in practical shall be as follows.

[A] Experiments,	20 marks
[B] Practical record	05 marks
[C] Viva	05 marks

	Total - 30 marks
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B. Sc. Part III –Semester V - PAPER – I
(MOLECULAR BIOLOGY)

UNIT I
DNA Replication

Enzymology of replication (detailed treatment of DNA polymerase I, brief treatment of pol II and III, helicases, topoisomerases, single strand binding proteins, DNA melting proteins, primase and RNA primers, distributive and processive properties of DNA polymerase I and III, importance of the β-subunit in polymerase III), proof for semiconservative replication, discontinuous replication and Okazaki fragments, Replication origins, initiation, primosome formation, elongation, and termination. Use of DNA replication mutants in the study of replication.

UNIT II
Mutations & DNA Repair

Gene mutations: Missense, nonsense and frameshift mutations.
Mutagens: Physical and chemical mutagens.
Repair: Mismatch repair, NER, BER, light induced repair, SOS repair.

UNIT III

Transcription

Enzymatic synthesis of RNA: Basic features of transcription, structure of prokaryotic RNA polymerase (core enzyme and holoenzyme, significance of σ factor), concept of promoter (Pribnow box, -10 and -35 sequences and their significance), auxiliary proteins of transcription, role of NusA.

Four steps of transcription (promoter binding and activation, RNA chain initiation and promoter escape, chain elongation, termination and release).

UNIT IV

Details of initiation, elongation, and termination (intrinsic and rho factor mediated termination).

Brief idea of reverse transcription.

Regulation of Transcription in Prokaryotes: Basic idea of lac- and trp-operons.

B. Sc. Part III – Semester V - PAPER – II
(MOLECULAR BIOLOGY & rDNA TECHNOLOGY)

UNIT I

Genetic Code

Genetic code: Argument for triplet code, experimental elucidation of codons, identification of start and stop codons, universality, degeneracy and commaless nature of codons.

The decoding system: aminoacyl synthetases, brief structure of tRNA, the adaptor hypothesis, attachment of amino acids to tRNA.

Codon-anticodon interaction - the wobble hypothesis.

Selection of initiation codon - Shine and Dalgarno sequence and the 16S rRNA.

UNIT II

Protein synthesis:

Initiation, elongation, and termination.

Regulation of translation: Autogenous control of r-proteins, phage T4 protein p32 translational regulation. Antibiotics affecting translation.

UNIT III

rDNA Technology

DNA cloning: Basics of genetic engineering, restriction endonucleases, other enzymes of DNA manipulation.

Vectors: Plasmid vectors (pBR322 and pUC 18/19)

Phage vector: Lambda replacement and insertion vectors

Cosmids, phagemids, and YAC.

Cutting and joining DNA (cohesive end ligation, methods of blunt end ligation). Transfection and transformation. Selection of transformed cells. Screening methods.

UNIT IV

Genomic DNA library and cDNA library – concept and methods of creating these libraries. Advantages and disadvantages of cDNA library over genomic DNA library.

General consideration of Polymerase chain reaction, designing of primers for PCR.

Expression of cloned genes: General features of an expression vector. Expression of a eukaryotic gene in prokaryotes – advantages and problems. Applications of recombinant DNA technology:

B.Sc. III
SEMESTER V PRACTICALS
Biotechnology
Molecular Biology & rDNA technology

1. To measure concentration of DNA & RNA by UV spectrophotometry
2. Estimation of proteins by Bradford method
3. Isolation of genomic DNA.
4. Isolation of Plasmid DNA.
5. Isolation of chloroplast DNA.
6. Restriction digestion of DNA.
7. Demonstration of Replica plating technique

8. Identification of Lac+ bacteria by blue white screening using IPTG
9. Ligation of DNA
10. Demonstration of Southern blotting
11. Demonstration of western blotting
12. Chemical mutagenesis and production of microbial mutants.

Note: - Mandatory to perform atleast 6 practical

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B. Sc. Semester Pattern Syllabus
B. Sc. Part III – Semester VI
BIOTECHNOLOGY
(With effect from academic session 2015-16)

1) The examination shall comprise two theory papers, an Internal assessment and a practical. Each theory paper shall be of three hours duration and carry 50 marks. The practical shall be of 6 hours duration and carry 30 marks. Internal assessment carry 20 marks.

Theory Paper I	50 marks
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Practical	30 marks
Internal Assessment	20 marks

	Total - 150 marks
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[A] Experiments,	20 marks
[B] Practical record	05 marks
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	Total - 30 marks
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B. Sc. Part III –Semester VI - PAPER – I
(APPLICATIONS OF BIOTECHNOLOGY)

UNIT I
Environmental Biotechnology
Water and waste water treatment process: Current community drinking water treatment process, disinfection of water (chlorination and ozonation), primary, secondary and advanced treatment of sewage (domestic waste water),
Definition and concept of: biodegradation, biodeterioration and biotransformation.

UNIT II

Xenobiotic and recalcitrant compounds. Bioaccumulation and biomagnification.

Assessment of water and wastewater quality: Concept of COD,DO and BOD. Indicators of faecal pollution and MPN and MF technique for coloforms. Significance and principal of IMViC.

UNIT III

Industrial Biotechnology

Basic Principles of Industrial Biotechnology: Important commercial products produced by microorganisms and GMOs and their applications, design of typical submerged fermentor, significance of various parts and provisions of fermentor, isolation of industrially important microorganisms – primary and secondary screening.

UNIT IV

Food Biotechnology

Food Biotechnology: Production and types of cheese, microorganisms as food – production of mushroom and spirulina, assessment of microbiological quality of various foods.

Industrial awareness: Quality control and quality assurance in food and pharamaceutical industry, concept of current good manufacturing practices in pharmaceutical industry

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B. Sc. Part III – Semester VI - PAPER – II
(PLANT & ANIMAL BIOTECHNOLOGY)

UNIT I:

a) Introduction to cell and Tissue culture. Tissue culture as a technique to produce novel plants and hybrids, Laboratory facilities
b) Tissue culture media (composition and preparation)
c) Callus and suspension cultures: initiation and maintenance of callus and suspension cultures; single cell clones.

UNIT II:

a) Tissue and micropropagation, suspension culture, callus formation, regeneration, production of haploids, protoplast culture and somatic hybridization
b) Cloning in plants - Ti plasmid.
c) Concept of transgenic plants
d) Bt cotton and other plant applications.

UNIT III:

a) Various techniques of animal cell and tissue culture, Culture media, growth factors, laboratory facilities.
b) Characteristics of cells in culture: Contact inhibition, anchorage dependence, cell-cell communication etc.; Cell senescence; cell and tissue response to trophic factors.
c) Primary culture, immortal cells, cell lines.
d) Maintenance of cell lines in the laboratory.

UNIT IV:

a) Brief idea about recombinant DNA products in medicine (insulin, somatostatin, vaccines), Concept of Gene therapy,
b) Production of recombinant vaccines – hepatitis.
c) Concept of transgenic animals
d) In vitro fertilization and embryo transfer in humans and farm animals.

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B.Sc. III
SEMESTER VI PRACTICALS
Biotechnology
Animal, Plant, Industrial & Environmental Biotechnology

1. Establishing a plant cell culture (both in solid and liquid media) – seed germination, callus culture, suspension cell culture, regeneration from callus cells.
2. Anther culture, embryo culture, suspension culture.

3. Cell count by hemocytometer.
4. Cytology of callus.
5. Establishing primary cell culture of chicken embryo fibroblasts.
6. Animal tissue culture – maintenance of established cell lines.
7. Animal tissue culture – virus cultivation.
8. Measurement of cell size.
9. Microphotography.
10. IMViC test.
11. Determination of COD
12. Testing of chlorine demand of water
13. Microbiological quality assurance of any of the commercially available foods.
14. Bioassay of penicillin/vitamin B12
15. Determination of fecal coliforms by MPN technique/MF technique
16. Isolation of azotobacter and rhizobium.
17. Sterility testing of injectibles.
18. Assay of amylase
19. Determination of seed viability.

Note: - Mandatory to perform atleast 6 practical

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