DEPARTMENT OF BIOTECHNOLOGY

(LESSON PLAN)

SESSION: 2017-18

Weekly Lesson Plan
B.Sc. (Medical) - I Semester (Odd)
Session- 2017-18

Subject: Biotechnology
Paper I: Introduction to Biotechnology
Paper II: Biochemistry I

Week	Dates	Paper	Topic(s)
1.	July 15, 17--22,2017	I II	Definition and scope of Biotechnology; introduction of genetic engineering; plant and animal tissue culture; Biomolecules: Introduction, important features, covalent and non-covalent interactions. Carbohydrates: Introduction and Biological Significance.
2.	July 24-29,2017	I II	Animal Biotechnology; Plant Biotechnology; fermentation technology Definition and classification: Monosaccharides; families of monosaccharides; simple aldoses and ketoses, Configuration and Conformation, Stereoisomerism/ Asymmetric centres, Fischer and Haworth projection formula, pyranose and furanose ring forms, reducing and non-reducing sugars, sugar derivatives viz. sugar alcohols, amino sugars, deoxy sugars, acidic sugars, Glycosidic bond
3.	July 31- Aug 5, 2017	I II	immobilized enzymes; monoclonal antibodies and hybridoma technology; Disaccharides and Oligosaccharides: Definition, structure and function of important di and oligosaccharides viz. lactose, sucrose, maltose, raffinose, stachyose, verbascose etc.
4.	Aug. 7- 12,2017	I II	embryo transfer technology; preservation techniques; Polysaccharides: Homo and Hetero polysaccharides, storage polysaccharides: Starch and Glycogen. Structural polysaccharides: Cellulose and Chitin. A brief account of structure and function of mucopolysaccharides/Glycosaminoglycans (Hyaluronic acid, Chondroitin sulphate), Glycoproteins and Proteoglycans.

5.	Aug. 14-19,2017	I II	introduction to gene and genomes, Amino acids, Peptides and Proteins: Classification and structure of amino acids, essential amino acids, rare and non-protein amino acids, optical and chemical properties of amino acids; acidbase behaviour/zwitterions; pKa value and titration curve.
6.	Aug. 21-26,2017	I II	Proteins and proteome, Peptide bond – nature and characteristics. Definition; structure and function of some biologically important peptides.
7.	Aug. 28- Sep. 2,2017	I II	history of genetic manipulations; Proteins: Classification based on structure and function. Structural organization of proteins: Primary structure; Secondary structure-α-Helix, β- pleats and β – turn Tertiary structure – myoglobin and lysozyme etc. Quaternary structure-hemoglobin.
8.	Sep. 4-9, 2017	I II	recombinant DNA technology Forces stabilizing different structural levels. Amino acid analysis/N-terminal amino acid analysis- Sanger's method, Edmann's degradation, dansyl chloride and dabsyl chloride
9.	Sep.11-16,2017	I II	DNA fingerprinting and forensic analysis. Lipids: Introduction and Classification – simple and complex lipids, Fatty acids – structure and nomenclature, soap value, acid value, iodine number, rancidity. Essential fatty acids.
10.	Sep.18-23,2017	I II	Application of biotechnology in agriculture; animal and veterinary sciences, A general account of structure and function of triacylglycerols, phospholipids, glycolipids, sphingolipids, steroids, bile acids, bile salts and terpenes
11.	Sep.25-30,2017	I II	Environment biotechnology; pharmaceutical industry, food industry and chemical industry. Nucleotides and Nucleic acids: Building blocks: bases, sugars and phosphates. Structure and nomenclature of nucleosides and nucleotides; polynucleotides
12.	Oct.3-7, 2017	I II	Bioremediation and waste treatment biotechnology. DNA (A,B, ZDNA) and RNA (rRNA, mRNA, tRNA).

13.	Oct. 9-14, 2017	I II	Biotechnology research in India. Biotechnology in context of developing world. Properties of DNA – absorption, denaturation, renaturation, hybridization, Tm/Cot values.
14.	Oct. 23-28,2017	I II	Brief account of safety guidelines and risk assessment in biotechnology. Biologically important nucleotides and their functions – ATP, GTP, Coenzyme A, NAD, FAD and cAMP.
15.	Oct. 30- Nov.4,2017	I II	Revision
16.	Nov. 6- 13, 2017	I II	Ethics in Biotechnology, Intellectual property rights Properties of DNA – absorption, denaturation, renaturation, hybridization, Tm/Cot values.

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Department of Biotechnology
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Weekly Lesson Plan
B.Sc. (Biotechnology) - II Semester (Even)
Session- 2017-18

Subject: Biotechnology
Paper I: General Microbiology
Paper II: Biochemistry II

Week	Dates	Paper	Topic(s)
1	Jan. 1-6,2018	**I** **II**	Introduction and Scope of Microbiology Definition and history of microbiology, contributions of Antony van Leeuwenhoek, Louis Pasteur, Robert Koch, Importance and scope of Microbiology as a modern Science Branches of microbiology. Enzymes: Introduction, active site, energy of activation, transition state hypothesis, lock and key hypothesis, induced fit hypothesis. Enzyme classification (Major classes only)
2	Jan. 8-13,2018	**I** **II**	Microscope Construction and working principles of different types of microscopes – compound, dark field, Phase contrast, Fluorescence and Electron (Scanning and transmission) Enzyme Kinetics – substrate concentration, Km, Vmax, MM equation, Lineweaver Burk plot/Double reciprocal plot.
3	Jan. 15-20, 2018	**I** **II**	Microbial techniques Sterilization: Principles and Applications of a. Physical Methods. Autoclave, Hot air oven, Laminar airflow, Seitz filter, Sintered glass filter, and membrane filter Effect of pH, temperature on enzyme activity.
4	Jan. 22-27,2018	**I** **II**	Chemical Methods: Alcohol, Aldehydes, Phenols, Halogens and Gaseous agents. Allosteric enzymes (A brief account) Enzyme Inhibition – Competitive, non-competitive and uncompetitive inhibition.
5	Jan. 29 -Feb 3,2018	**I** **II**	Radiation Methods: UV rays and Gamma stains. Stains and staining techniques: Vitamins and Hormones: Introduction. Types of vitamins – structure of water soluble vitamins and

			their coenzyme derivatives, Fat soluble vitamins Deficiency symptoms and dietary sources.
6	Feb 5-10,2018	**I** **II**	Principles of staining, types of stains – simple stains, structural stains and Differential stains. Steroid Hormones: structure and importance, Peptide Hormones: structure and function of important peptide hormones.
7	Feb.12-17,2018	**I** **II**	Microbial Taxonomy Concept of microbial species and strains, classification of bacteria based on – morphology (shape and flagella), staining reaction, nutrition and extreme environment. Metabolism: General introduction, catabolism and anabolism Carbohydrates metabolism: Glycolysis, Tricarboxylic acid cycle, Gluconeogenesis Glycogenolysis, glycogen synthesis and their regulation
8	Feb. 19-24,2018	I II	General Account of Viruses and Bacteria A. Bacteria – Ultrastructure of bacteria cell (both Gram positive and Gram negative) including endospore and capsule B. Viruses – Structure and classification Plant viruses – CaMV Animal viruses – Hepatitis B Bacterial Virus – Lamba Phage Lipid Metabolism: β-oxidation of fatty acids.
9	Feb. 26-27, 2018	**I** **II**	Pathogenic Microorganisms A. Bacterial diseases of man – tetanus, Tuberculosis, Pneumonia and Cholera 6 B. Viral diseases: AIDS (HIV) Degradation of Triacylglycerols. Synthesis of Fatty acids.
10	March 5-10,2018	**I** **II**	Microbial Growth and Metabolism Kinetics of microbial growth, growth curve, synchronous growth, factors affecting bacterial growth Amino acid Metabolism: Transamination, oxidative deamination, decarboxylation. Urea cycle
11	March, 12-17,2018	**I**	Respiration: EMP, HMP and ED Pathways, Kreb's cycle, Oxidative Phosphorylation. Different classes of oxidation and synthesis of

		II	amino acids. Glycogenic and ketogenic amino acids
I2	March 19-24,2018	**I**	Bacterial Photosynthesis: Photosynthetic apparatus in prokaryotes, Photophosphorylation & Dark reaction.
13	March 26-31, 2018	**I** **II**	Microbial Growth and Metabolism Kinetics of microbial growth, growth curve, synchronous growth, factors affecting bacterial growth Different classes of oxidation and synthesis of amino acids. Glycogenic and ketogenic amino acids
14	April 2-7, 2018	**I** **II**	Bacteria – Ultrastructure of bacteria cell (both Gram positive and Gram negative) including endospore and capsule Lipid Metabolism: β-oxidation of fatty acids
15	April 9- 13,2018	**I**	B. Viruses – Structure and classification Plant viruses – CaMV Animal viruses – Hepatitis B Bacterial Virus – Lamba Phage
16	April 16-21, 2018	**II**	Amino acid Metabolism: Transamination, oxidative deamination, decarboxylation. Urea cycle
17	April 23-28,2018		Revision

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Weekly Lesson Plan
B.Sc. (Biotechnology) - III Semester
Session- 2017-18

Subject: Biotechnology
Paper I: Molecular Biology
Paper II: Immunology

Week	Dates	Paper	Topic(s)
1	July 15, 17--22,2017	I II	Molecular Biology: Introduction to molecular aspects of life.DNA as the genetic material – experiments proving DNA and RNA as genetic material Immunology: Introduction, History and Scope. Terminology of immune system Immunity: Definition, types of Immunity- Innate, Adaptive/acquired (active, passive, natural/artificial, Humoral and Cell mediated immunity).
2.	July 24-29,2017	I II	Nucleic acids: Structure, function and properties of DNA and RNA. Watson and Crick model of DNA. DNA forms (A, B and Z), their characteristic. Different types of RNA, their structure and function. Features of Immune Response – memory, cell specificity/diversity, recognition of self and non-self. Cells of the Immune System – B and T cells (types and receptors), Null cells, Monocytes, Polymorphs.

3.	July 31- Aug 5, 2017	I II	Organization of Genomes – bacterial, viral, human, organelles. Eukaryotic genomes: Chromosomal organization and structure. Euchromatin, heterochromatin, centromere, telomere. Chromatin structure (nucleosome), histone and non-histone proteins. Organs of the Immune System: Primary and Secondary Lymphoid organs- Thymus, Spleen, Lymph nodes.
4.	Aug. 7- 12,2017	I II	Insertion elements and transposons; IS elements, transposable elements of Maize and P elements of Drosophila. Extra chromosomal DNA in prokaryotes – plasmids. Antigens: Concept, Types of Antigens, Antigenic determinants/epitopes, Hapten. Antigen and Immunogen. Antigenecity and Immunogenecity. Factors affecting antigenecity.
5.	Aug. 14-19,2017	I II	DNA Replication: Central dogma of molecular biology. Semi-conservative mode of DNA replication, experimental proof. Unidirectional and bidirectional mode of DNA replication, theta model and rolling circle model. Antibodies: Structure, Types/Classes, properties and functions of immunoglobulins. Production of antibodies. Antibody diversity (a brief account only).
6.	Aug. 21-26,2017	I II	DNA replication in prokaryotes and eukaryotes, different stages, proteins and enzymes involved. DNA damage and repair: causes of DNA damage, mutations. Repair mechanisms- photo reactivation, excision repair, mismatch repair, SOS repair. Antigen – Antibody Interactions: Binding sites, Binding forces, Affinity, Avidity, Cross reactions. Precipitation and Agglutination reactions, RIA, ELISA etc. techniques

7.	Aug. 28- Sep. 2,2017	I II	Genetic Code: concept, elucidation or cracking of genetic code, features of genetic code, Wobble hypothesis. Immune Response: Introduction, Humoral Immunity – Primary and Secondary immune response – B cells in antibody formation (differentiation, maturation and activation of B cells).
8.	Sep. 4-9, 2017	I II	Transcription in prokaryotes and eukaryotes, diff. stages, mechanism, promoters, transcription factors, RNA polymerases. Post transcriptional modifications- 5' cap formation, 3'-end processing/polyadenylation and gene splicing and generation of mature mRNA. Inhibitors of transcription. Role of MHC molecules, Antigen presenting cells. Factors influencing antibody formation. Cell mediated immunity- Cells involved in CMI, (T-cell subset and surface markers, T-dependent and T-independent antigens, recognition of antigens by T-cells.
9.	Sep.11-16,2017	I II	Translation/Protein synthesis: Mechanism of initiation, elongation and termination of protein synthesis in prokaryotes and eukaryotes. Complement system: Structure, components, properties and functions. .
10.	Sep.18-23,2017	I II	Regulation of Gene Expression in prokaryotes and eukaryotes, induction and repression, positive and negative regulation. Operon model- lac, ara, trp, catabolite repression, transcription attenuation. Major Histocompatibility Complex- Class I and Class II MHC molecules, functions of MHC.

11.	Sep.25-30,2017	I II	Molecular mechanisms of DNA recombination in eukaryotes – Site Specific and Homologous recombination. Hypersensitivity and allergic reactions. (Brief only) Autoimmunity, immunological tolerance
12.	Oct.3-7, 2017	I II	Inhibitors of translation. Post-translational modifications. Major Histocompatibility Complex- Class I and Class II MHC molecules, functions of MHC.
13.	Oct. 9-14, 2017	I II	Structure of gene- introns/exons, regulatory sequences, structure of prokaryotic gene. Role of MHC and MHC restriction), cytokines and lymphokines, functions of cell mediated immunity.
14.	Oct. 23-28,2017	I II	Recombination in prokaryotes – Transformation, transduction and conjugation Cell mediated immunity- Cells involved in CMI, (T-cell subset and surface markers, T-dependent and T-independent antigens, recognition of antigens by T-cells.
15.	Oct. 30- Nov.4,2017	I II	Revision
16.	Nov. 6- 13, 2017	I II	REVISION

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Weekly Lesson Plan
B.Sc. (Biotechnology) - IV Semester
Session- 2017-18

Subject: Biotechnology
Paper I: Recombinant DNA Technology
Paper II: Bioinformatics

Week	Dates	Paper	Topic(s)
1	Jan. 1-6,2018	**I** **II**	Recombinant DNA Technology and Genetic Engineering: Introduction, history, scope and applications. History, scope and importance of bioinformatics.
2	Jan. 8-13,2018	**I** **II**	Tools of Recombinant DNA technology: Steps in gene cloning. Gene cloning tools - Restriction enzymes- class I, II and class III restriction enzymes, their features. Ligases, polymerases, alkaline phosphatases, kinases, transferases and other DNA engineering enzymes. Introduction to Genomics – information flow in Biology
3	Jan. 15-20, 2018	**I** **II**	Gene Cloning Vectors: Introduction, nomenclature of vectors, properties of a suitable vector. Plasmid vectors, bacteriophage, cosmids and phagemids. Properties of host. M13 vectors. DNA sequence data, experimental approach to genome sequence data, genome information resources.
4	Jan. 22-27,2018	**I** **II**	Expression vectors, shuttle vectors. Vectors for cloning in eukaryotic cells, YACs and BACs. Functional Proteomics – protein sequence and structural data,
5	Jan. 29 -Feb 3,2018	**I** **II**	In vitro construction of r-DNA molecules: Isolation of gene of interest and vector DNA, cohesive and blunt ends, modification of cut ends, linkers and adaptors. Integration of DNA inserts into the vectors. protein information resources and secondary data bases.

6	Feb 5-10,2018	**I** **II**	Transformation: Techniques of introducing r-DNA into the desired host, competent cells, electroporation and microinjection. Screening and selection of transformants and their characterization, selection of clone having the specific DNA insert - immunological screening and colony hybridization Computational Genomics - Internet basics, biological data analysis and application, sequence data bases, NCBI model, File format.
7	Feb.12-17,2018	**I** **II**	Marker genes- selectable and scorable markers. Gene Libraries: Construction of Genomic and cDNA library, advantages and limitations, screening of gene libraries. Sequence alignment and data base search – protein primary sequence analysis, algorithm BLAST, multiple sequence alignment
8	Feb. 19-24,2018	**I** **II**	DNA amplification through PCR: Basic features and applications of PCR, types and modifications. Site directed mutagenesis. DATA base searching using BLAST and FASTA.
9	Feb. 26-27, 2018	**I** **II**	DNA sequencing techniques: Maxam – Gilbert's method, Sanger's dideoxy chain termination method, Automated DNA sequencing. Genome Mapping: Concept and applications. Restriction enzyme digestion and restriction mapping. Southern and Northern analysis. Predictive methods using DNA and protein sequences, Structural data bases – Small molecules data bases,
10	March 5-10,2018	**I** **II**	DNA finger printing. PAGE, Western blotting, dot blots and slot blots. RFLP, RAPD (brief only), microarrays. Protein information resources, protein data bank.
11	March, 12-17,2018	**I**	Gene expression in prokaryotes: expression cassette. Promoters- tissue specific promoters, wound inducible promoters, strong and regulated promoters
I2	March 19-24,2018	**I**	Production of recombinant proteins in E. coli, translational and transcriptional fusion- advantages and disadvantages.

13	March 26-31, 2018	**I**	Applications of Recombinant DNA technology: Production of recombinant proteins of pharmaceutical importance- insulin, human growth hormone, recombinant vaccines (hepatitis B) etc.
14	April 2-7, 2018	**I**	Transgenic plants and animals
15	April 9- 13,2018	**I**	Increasing protein yield-factors affecting level of recombinant protein production.
16	April 16-21, 2018	**I**	Applications of Recombinant DNA technology: Production of recombinant proteins of pharmaceutical importance- insulin, human growth hormone, recombinant vaccines (hepatitis B) etc.
17	April 23-28,2018	**I**	Revision

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Weekly Lesson Plan
B.Sc. (Biotechnology) - V Semester
Session- 2017-18

Subject: Biotechnology
Paper I: Animal Biotechnology
Paper II: Plant Biotechnology

Week	Dates	Paper	Topic(s)
1	July 15, 17--22,2017	I II	Animal Cell & Tissue Culture: Introduction, Principles & practice. History and Development of animal cell culture. Scope and Applications. Plant Tissue Culture: Introduction/Concept, History, Scope and Applications along with major achievements.
2.	July 24-29,2017	I II	Culture Media: Media components, Serum containing and serum free media. Plant Tissue Culture Laboratory: Layout and organization, different work areas, infrastructure/equipments and instruments and other requirements. Aseptic Techniques: General sanitation/cleanliness of PTC laboratory and precautions regarding maintenance of aseptic conditions, Washing, drying and sterilization of glassware, sterilization of media, surface sterilization, aseptic work station
3.	July 31- Aug 5, 2017	I II	Natural mediaPlasma clot, biological fluids, tissue extracts. Growth factors required for proliferation of animal cells. Chemically defined media, balanced salt solutions Culture Media: Nutritional requirements for plant tissue culture, role of different media components, plant growth regulators, different culture media viz. MS, B5 Nitsch and White's medium, Preparation of culture media.
4.	Aug. 7- 12,2017	I II	Physical requirements for growing animal cells in culture. Washing, drying, sterilization practices, various instruments and their uses in animal cell culture practices. In-vitro methods in plant tissue culture: Explants, their cellular characteristics, dedifferentiation and redifferentiation, cellular totipotency, organogenesis and somatic embryogenesis.

5.	Aug. 14-19,2017	I II	Primary Cell Culture techniques: Initiation of cell culture-substrates (glass, plastic, metals) their preparation and sterilization. Micropropagation/clonal propagation of elite species (different routes of multiplication-axillary bud proliferation, somatic embryogenesis, organogenesis
6.	Aug. 21-26,2017	I II	Isolation of tissue explants, disaggregation- enzyme disaggregation and mechanical disaggregation of the tissue. Synthetic seeds (a brief account) Callus and suspension culture techniques: Introduction, principle, methodology, applications and limitations. Somaclonal variation.
7.	Aug. 28- Sep. 2,2017	I II	Development of primary culture and cell lines. Subculture. Contamination.. Suspension culture, Organ culture: Anther & Pollen culture, ovary, ovule, embryo and endosperm culture – concept, technique, applications and limitations.
8.	Sep. 4-9, 2017	I II	Growth curve of animal cells in culture. Secondary cell culture – transformed cell and continuous cell lines. Finite and infinite cell lines Embryo rescue. Protoplast culture: Protoplast isolation, viability test, protoplast culture. Somatic hybridization – protoplast fusion techniques (chemical and electro-fusion), selection of hybrids, production of symmetric and asymmetric hybrids and cybrids.
9.	Sep.11-16,2017	I II	Cell lines: Insect and animal cells. Commonly used cell lines- their organization and characteristics. Practical applications of somatic hybridization and cybridization
10.	Sep.18-23,2017	I II	Cell repositories and their function. Karyotyping, biochemical and genetic characterization of cell lines. Production of secondary metabolites in vitro: introduction, technique and utilities. Biotransformation (a brief account only).

11.	Sep.25-30,2017	I II	Organ Culture: technique, advantages, applications and limitations. Artificial skin Plant germ plasm conservation and cryopreservation. Genetic Engineering in plants: Introduction, Plant transformation by Agrobacterium tumefaciens and A. rhizogenes. Ti plasmid. Strategies for gene transfer to plant cells. Binary and cointegrate vectors.
12.	Oct.3-7, 2017	I II	Transfection of animal cells: transfection methods. Methods for cell fusion, Selectable markers, HAT selection and Antibiotic resistance. Gene targeting in plants. Use of plant viruses as vectors (brief account only). Direct DNA transfer/Physical methods of gene transfer in plants - micro projectile bombardment, electroporation, liposome mediated, Calcium phosphate mediated etc.
13.	Oct. 9-14, 2017	I II	Cloning and expression of foreign genes in animal cells: Expression vectors. Transgenic Plants: Introduction and applications. Developing insect resistance, bacterial and fungal disease resistance, virus resistance and abiotic stress tolerance in plants.
14.	Oct. 23-28,2017	I II	Over production and preparation of the final product i.e. expressed proteins. Production of vaccines in animal cells. Hybridoma Technology: Production of monoclonal antibodies and their applications. Improving food quality – nutritional enhancement of plants (carbohydrates, seed storage proteins and vitamins).
15.	Oct. 30- Nov.4,2017	I II	Embryo transfer technology- technique, its applications. Artificial insemination. Animal clones. Transgenic Animals: transgenic sheep, cow, pig, goat etc. Plants as Bioreactors: antibodies, polymers, industrial enzymes.
16.	Nov. 6- 13, 2017	I II	Therapeutic products through genetic engineering – blood proteins, insulin, growth hormone etc. Edible vaccines

Weekly Lesson Plan
B.Sc. (Biotechnology) - VI Semester
Session- 2017-18

Subject: Biotechnology
Paper I: Microbial Biotechnology
Paper II: Research Project

Week	Dates	Paper	Topic(s)
1	Jan. 1-6,2018	**I** **II**	Microbial Biotechnology: Historical landmarks, General concept. Research Project
2	Jan. 8-13,2018	**I** **II**	Screening and Isolation of Micro organisms: Industrially important microbes, their screening and isolation, enrichment culture. Research Project
3	Jan. 15-20, 2018	**I** **II**	Strain improvement- bacterial genetics, mutant selection, recombination, recombinant DNA technology. Strain preservation and maintenance. Research Project
4	Jan. 22-27,2018	**I** **II**	Nutrition and cultivation of microorganisms: Basic nutrition and metabolism, Natural and Synthetic media, Sterilization techniques, Research Project
5	Jan. 29 -Feb 3,2018	**I** **II**	Microbial growth kinetics. Fermentation types – Continuous, Batch fed culture, Solid state and Submerged. Research Project
6	Feb 5-10,2018	**I**	Quantification of growth, thermodynamics of growth, effect of different factors on growth. Fermentation concepts and types. Microbial Fermenters/Bioreactors: Basic design of

			fermenters. Physco-chemical standards used in bioreactors (agitation, aeration, ph, temp., dissolved oxygen etc.). Types of fermenter sstirred tank, bubble column, airlift etc.
		II	Research Project
7	Feb.12-17,2018	**I**	Process Development and Downstream Processing: Shake flask fermentation, scale up of the process. Downstream processing – Separation of particles, disintegration of cells, extraction, concentration, purification and drying of the products.
		II	Research Project
8	Feb. 19-24,2018	**I**	Microbial Products: a brief discussion about production of certain industrial products such as – Alcohol, Alcoholic beverage (Beer), Organic acids (citric acid), Antibiotics (penicillin), Amino acids (glutamic acid0, Vitamin (B12), enzymes (protease, alpha-amylase) and a brief account of Steroid Biotransformation.
		II	Research Project
9	Feb. 26-27, 2018	**I**	Microbial Foods: Single Cell Proteins. Sewage waste water treatment technique and plants. Biodegradation of xenobiotic compounds. Microbial polysaccharides and polyesters; production of xanthan gum and polyhydroxyalkanoides (PHA)
		II	Research Project
10	March 5-10,2018	**I**	Bioconversions – Biomining and bioleaching. Biogas production.
		II	Research Project
11	March, 12-17,2018	**I**	Microbial technology in agriculture- Bioinsecticides, bioherbicides,

		II	Research Project
12	March 19-24,2018	**I** **II**	Biocontrol agents for disease control, advantages over chemical methods. Research Project
13	March 26-31, 2018	**I** **II**	Biofertilizers. Genetically engineered microbes: concept and technique; Research Project
14	April 2-7, 2018	**I** **II**	Use of GEM in Agriculture, Industry and Medicine. Research Project
15	April 9- 13,2018	**I** **II**	Revision Project checking
16	April 16-21, 2018	**I** **II**	Revision Project checking
17	April 23-28,2018	**I** **II**	Revision Project checking

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