Rayat Shikshan Sanstha's

Annasaheb Awate Arts, Commerce And Hutatma Babu Genu Science College, Manchar

DEPARTMENT OF BIOTECHNOLOGY

Courses offered-

- **B. Sc Biotechnology**

Sr. No.	Code	Course	Course Outcomes
1.	BBt - 101 & BBt - 201	Fundamentals of Chemistry I & II	CO-1: To know in detail about Kinetic Theory of Gases; Liquids and Chemical kinetics CO-2: To learn the basic concept, terms and equations of Atomic Structure; Chemical Periodicity and Acids and Bases CO-3: To learn about the Fundamentals of Organic Chemistry; Stereochemistry; Types, Mechanism and Examples of Nucleophilic Substitution Reaction and Elimination Reaction CO-4: To understand detail about Chemical thermodynamics, Chemical equilibrium, Solutions, Phase Equilibrium and Solids.
2.	BBt - 102	Fundamentals of Physics	CO-1: To understand the basic laws and explore the fundamental concepts of physics □ CO-2: To understand the concepts and significance of the various physical phenomena. □

			CO-3: To carry out experiments to understand the laws and concepts of Physics. □ CO-4: To apply the theories learnt and the skills acquired to solve real time problems.
3.	BBt - 103 & BBt - 201	Biochemistry I & II	CO-1: Understand biochemistry at the atomic level, draw molecules and reaction mechanisms perfectly. CO-2: Understand in detail about amino acid structures, types of amino acids, classifications, structure of proteins and types of proteins. CO-3: Learn the molecular structures of 20 amino acids, differentiating essential and non-essential amino acids, biologically important modified amino acids and their functions. CO-4: Recognize thes tructural levels of organization of proteins,3D structure of proteins, its functions, denaturation (hemoglobin, myoglobin etc.). CO-5: Learn how amino acids and proteins are metabolized, emphasizing the role of few intermediates of their metabolism, monitoring the deficiency and abundance disorders of amino acid metabolisms and the role of enzymes in the regulation of the pathways CO-6: Describe what happens: - when lipids are metabolized, cholesterol, prostaglandins etc. are synthesized, emphasizing the genetic defects of lipid metabolism
4.	BBt - 104	Biophysics	CO-1: Students can clear the concept of Membrane Structure & dynamics, □ Membrane potential, □ Osmosis,

			Surface tension, Active & Passive transport Membrane energetics etc. CO-2: Students will understand The principle, methodology Applications of various analytical techniques like Chromatography, Electrophoresis Spectroscopy.
5.	BBt - 105 & BBt - 204	Animal Sciences I & II	CO-1: Students will able to apply concepts of breeding, physiology, nutrition, herd-health, economics and management into practical and profitable animal production programs. CO-2: Students will understand the role of nutrition in animal production. CO-3: Students will be able to explain the mechanisms and role of reproductive physiology in livestock production
6.	BBt - 106 & BBt - 205	Plant Sciences I & II	CO-1:After completion of the course the students are familiar with various physiological aspects involved in the plant development. CO-2: Also the role of enzymes in it and mechanism of photosynthesis, respiration, nitrogen and lipid metabolism. CO-3: The students are able to isolate starch, pectine and various nutritive products from the plants.
7.	BBt - 107 & BBt - 206	Microbiology I & II	CO-1: After successful completion of this course students are expected to be able to Demonstrate theory and practical skills in microscopy and their handling techniques and staining procedures, Understand the basic microbial structure and function and study the comparative characteristics of prokaryotes and eukaryotes and also Understand the

			structural similarities and differences among various physiological groups of bacteria/archaea CO-2: Know various Culture media and their applications and also understand various physical and chemical means of sterilization CO-3: Know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and algae CO-4: Master aseptic techniques and be able to perform routine culture handling tasks safely and effectively Comprehend the various methods for identification of unknown microorganisms
8.	BBt - 108 & BBt - 207	Biomathematics And Biostatistics I & II	CO-1: The student learn to calculate Mean Median Mode. CO-2: The student learn to calculate measures of dispersion and their applications in data analysis. CO-3: Familiarising with data interpretation in statistics; ANOVA, Correlation and Regression analysis.
9.	BBt - 208	Computers In Biology	CO-1: Comprehensive study of various topics including Data representation methods, measures of central tendency, variance CO-2: Practical knowledge of application of correlation and regression analysis, test of significance: F and t tests, Chi square test etc. CO-3: Study on sigma plotter, null hypothesis, Bioinformatic methods, Basic idea of computer languages CO-4: Familiarization with biological databases, sequence, structure and strain

			database, Secondary and sequence analysis of DNA, RNA and proteins
10.	BBt - 301 & BBt - 401	Cell biology	CO-1: Study of cell theory, Cell organelles, Ultrastructure, Roles of cell organelles. Exhaustive study of Cell Signaling pathways, secondary messengers etc CO-2:Understanding of Developmental biology: Stem cell and cancer, Differentiation in plant tissue CO-3: Familiarization with methods of cell-study, various forms of Microscopy, staining for microscopy etc.
11.	BBt - 302 & BBt - 402	Molecular Biology	CO-1: Understanding of Genome organization, Development of basic concepts in DNA/RNA structure , Replication, Repair & Recombination. CO-2: Knowledge of transcription and translation in prokaryotic and eukaryotic system. CO-3: Development of concepts of Oncogenesis, oncogenes and tumor suppressor genes. CO-4: Hands on training on DNA & RNA isolation by different techniques; plasmid isolation, transformation, Electrophoresis, quality check of Nucleic acids, restriction digestion, PCR, RFLP etc
12.	BBt - 303	Genetics	CO-1: Upon successful completion of this course student should be able to study History and scope of Genetics Understanding the pre mendelian genetic

			concepts CO-2: To study the laws and concepts of Mendelian inheritance. Principles of deviation from Mendelian inheritance with examples. Concepts of multiple alleles with examples. CO-3: Understanding the mechanism of sex determination in different organisms.
	BBt - 304	Metabolism	CO-1: The student in the course learn the biochemical aspects of metabolic pathways . CO-2: They also learn the application of microbial cells in bioremediation and mineral recovery CO-3: At the end of the course, the students will be able to appreciate the aspects of microbial metabolism and their application in industries
	BBt - 305	Enviornmental Biotechnology	CO-1: Theoretical knowledge of Environment; Basic concepts; Resources; Eco system: plants, animals, microbes; Ecosystem management; Pollution, Renewable resources; Sustainability; Microbiology of degradation and decay. CO-1: Study of role of biotechnological techniques in environment protection. Waste water collection; control and management; Waste water treatment; Sewage treatment through chemical, microbial and biotech techniques CO-2: Concept building in alternate energy sources: Biomass as source of energy; Bioreactors; Rural biotechnology; Biocomposting; Biofertilizers; Vermiculture; Organic farming; Bio-mineralization; Biofuel etc

13.	BBt - 306	Bio Analyticsl Techniques	CO-1: Concept building in various topics including: Spectroscopy, chromatography, electrophoresis, centrifugation and their different variants CO-2: Practical knowledge of Chromatographic techniques, Spectroscopy techniques, protein isolation/purificationusing different techniques ,quantitative and qualitative estimations of biomolecules CO-3: Development of understanding on Radioactivity, Radioisotopes and their uses in biology, measurement of radioactivity etc. CO-4: Theoretical basic concept building in Protein crystallization; Enzyme and cell immobilization techniques
	BBt - 403	Immunology	CO-1: Students will be abla to explain the immunological terms CO-2: Students will be able to explain the immune system. CO-3: Students Will be able to discuss immune response mechanisms.
14.	BBt - 404	Animal Development	CO-1: The student will gain knowledge onbasic concepts in development. CO-2: The student will explain the process of gametogenesis, fertilization and embryonic development. CO-3: Students able to explain the developmental process that leads to the development and differentiation of the body.

			CO-4: Explain different developmental stages in vertebrates
15.	BBt - 405	Plant Development	CO-1: Student will develop the understanding of growth, development and reproduction in plants as well as understand the physiological and metabolic changes happening along with the environmental impact.
16.	BBt - 406	Microbial biotechnology	CO-1: Identification of different types of food, Dairy product spoilages & causative Agents CO-2: Familiarization with the concept of Waste Water Tretment Plant CO-3: Basic concept building related to Scope and importance of microbiology as applied to environment and industry, Petroleum and mining microbiology, Biopesticides and Microbiology of paints, films, pharmaceuticals etc CO-4: Familiarization with the concept of Environmental quality; Biodegradation of waste and pollutants; (i) solid waste disposal, sanitary, landfills and composting (ii) Treatment of liquid waste, sewage treatment, (iii) treatment and safety of water supply etc.
17.	BBt -501	Industrial Microbiology	CO-1: Theoretical knowledge of microbial diversity & systematics, Microbial growth and physiology; Study of size, shape and growth pattern, nutrition type of microbes. CO-2: Experimental knowledge of Sterilization, disinfection, safety in microbiological laboratory. CO-3: Preparation of media, Isolation

			and maintenance of organisms by plating, Streaking and Serial dilution methods, Storage of microorganisms, Gram Staining and enumeration of microorganisms. CO-4: Familiarization of assays related to antibiotics production and demonstration of antibiotic resistance CO-5: Understanding fermentation process & production of industrially important products
18.	BBt -502	R DNA Technology	CO-1: Major events in the development of rDNA technology. Introduction of rDNA into bacterial cells. Selection of transformants and recombinants – lac selection. CO-2: Learning tools and techniques in rDNA technology- DNA manipulative enzymes. CO-3: Acquire skills on techniques of construction of recombinant DNA - Cloning vectors and isolation of gene of interest. CO-4: Construction of genomic DNA library and cDNA library
19.	BBt -503 & BBt -504	Plant Tissue Culture Animal Tissue Culture	CO-1: **L**earning important milestones in the plant tissue culture And Animal Tissue Culture CO-2: Understanding the concepts and principles of Plant tissue culture. CO-3: Learning the techniques of sterilization and monitoring method of sterilization. CO-4: Learning different pathways of plant regeneration under in vitro

			conditions - organogenesis and somatic embryogenesis.
20.	BBt -505 BBt -603	Applied Biotechnology	CO-1: This is an interdisciplinary and emerging area The students are taught the basics of nanotechnology and their applications . CO-2: The course introduces the students to the new and novel applications to solve biomedical problems through nanotechnology
21.	BBt -506	Biodiversity And Systematics	CO-1: Know the role of conservation, diversity of species, genetics, community, and landscape in marine, freshwater, andterrestrial habitats.
22.	BBt -601	Enzyme And Enzyme Technology	CO-1: Upon successful completion of this course, the student will be able to Understand on the kingdoms of biomolecules,Bioenergetics principals that are the prerequisites and consequences of physiological phenomenon for further manipulations. CO-2: The student will be able to Distinguish the fundamentals of enzyme properties, nomenclatures, characteristics and mechanisms CO-3: The student will be able to Apply biochemical calculation for enzyme kinetics The student will be able to Compare methods for production, purification, characterization and immobilization of enzymes

23.	BBt -602	Agricultural Biotechnology	CO-1: This course teaches the students approaches to manipulate and improve plant yield, throws light on transgenic plants □ CO-2: They are introduced to the concept of utilizing plants for production of vaccines and production of biofertilizers CO-3: This students will be able to understand the relationship between science and society and will be able to give justification for biotechnological manipulation of plants for human use
	BBt -604	Food And Farmaceutical Biotechnology	CO-1: The learner will gain basic knowledge of food and its microbiological aspects in term of quality and spoilage activity along with structural composition, nutrient value and biological value and their mechanisms CO-2: Learners would have acquired basic knowledge of food properties like intrinsic and extrinsic parameter and its significance of spoilage mechanism in food. CO-3: To understand the methods of preservation by food additives
24.	BBt -605	Bioinformatics	CO-1: Students will developed firm base for hardwares, softwares, networking, processing of computers. CO-2: They are able to understand the designing and function of nvarious databases and bioinformatic resourses. CO-3: They are able to select specific

			softwares and tolls to solve certain biological problems with respect to Nucleotides and Proteins.
25.	BBt -606	Biosaftey and IPR	CO-1: Students Able to understand the methods of biosafety CO-2: Students Able to understand the concepts of Patent, Copyright, Tredmarks, Trade secret, Geographical Indication etc.
26.	BBt -607 & BBt -608	Project Formulation	CO-1: Research on various topics as per the expertise and facilities available in the department (and with collaborators), including hands on training on various advanced molecular and analytical techniques An overall study on the concerned plant/animal/microbial system addressing any of relevant and pursuable scientific problems. CO-2: Familiarization with good laboratory practices, data presentation, thesis writing etc. CO-3: Prepare professional work reports and presentations.
27.	BBt -507	Industrial Intrenship	CO-1: Participate in the projects in industries during his or her industrial training. CO-2: Describe use of advanced tools and techniques encountered during industrial training and visit. CO-3: Interact with industrial personnel and follow Biotechnology practices and discipline prescribed in industry. CO-3: Develop awareness about general workplace behavior and build

			interpersonal and team skills. CO-4: Prepare professional work reports and presentations.