



BON SECOURS COLLEGE FOR WOMEN

Nationally Accredited with 'A' Grade by NAAC

UGC Recognized 2(f) and 12(B) Institution

VILAR BYPASS, THANJAVUR - 613 006

PG & RESEARCH DEPARTMENT OF BIOTECHNOLOGY

B. SC., BIOTECHNOLOGY

Programme Specific Outcomes:

PSO1: Comprehend the concepts of the core courses at the levels of fundamental, technology and application.

PSO2: Acquire knowledge on instruments and performing skills to satisfy the need of the industries and research laboratories.

PSO3: Familiarize with the biotechnological and professional ethics for the betterment of the environment, society and nation.

PSO4: Ability to find innovative solutions and contribute for the different areas of agriculture, food security, climate change and medicine.

PSO5: Be proficient in the fundamental knowledge and recent trends/updates of different disciplines in biotechnology.

PSO6: Attain competence and develop leadership attitude to work in the industries, companies and R&D labs

Course Outcomes:

COURSE	COURSE CODE	CO. NO	OUTCOME	LEVEL
Cell Biology	16SCCBT1	CO1	Discover the structure of cells and cellular organelles	L1
		CO2	Recognize the role of various cellular organelles in biological processes	L1
		CO3	Sensitize with scale of magnitude from cells to organelles and to molecules	L1
		CO4	Acquire knowledge on cellular energy metabolism	L1
Cell Biology (P)	16SCCBT1P	CO1	Examine the different types of cell structures	L4
		CO2	Develop skills in use of instruments and slide preparation	L4
		CO3	Analyse the shape and magnitude of	L4

			different microbial cells	
		CO4	Identify the cellular and sub cellular components	L1
		CO5	Get acquainted with stages of cell division	L1
Basic Microbiology	16SACMB1	CO1	Infer the history and development of microbiology	L2
		CO2	Discover the microbial world and classify the microorganisms based on structure and characteristics	L2
		CO3	Explore the biodiversity of microorganisms, their nutrition and their molecular systematic analysis	L2
		CO4	Acquainted with cellular organization, reproduction & life cycle of Algae and Fungi	L1
		CO5	Familiarize with the structural characteristics of protozoa, viruses, viroids & prions	L2
Microbiology (p)	16SACMB1P	CO1	Demonstrate the methods in sterilization and other pre preparatory procedures to be followed in the laboratory.	L2
		CO2	Perform the isolation of microbes from various samples	L3
		CO3	Analyze the influence of environmental factors in microbial growth	L4
		CO4	Identification of microorganism by staining and confirm the biochemical characteristics	L1
		CO5	Acquainted with culture techniques, maintenance and storage of microbial strains	L1
Value Education	RUGVED	CO1	Comprehend the philosophy of life and social values	L2
		CO2	Infer human rights and role of associated organizations	L2
		CO3	Extend social values and responsibilities	L2
		CO4	Perform yoga practices and improve health	L3
		CO5	Demonstrate the role of state public service commission in job placement	L2
Molecular Biology	16SCCBT2	CO1	Summaries the history of nucleic acids and elucidate the structure, types and its functions	L2
		CO2	Elucidate organization of chromosomes and get familiar to classical genetics	L2

		CO3	Discuss the central dogma ,process of transcription and translation	L2
		CO4	Discuss the types and mode of replication, its repairing mechanism	L2
		CO5	Comprehend regulation of genes in prokaryotes	L2
Molecular Biology (P)	16SCCBT2P	CO1	Prepare solution and buffers and estimate the quantity of different biomolecules	L4
		CO2	Experience the isolation and identification of Macromolecular components	L1
		CO3	Isolate , quantify nuclear materials and perform genetic manipulation of DNA	L4
		CO4	Perform molecular techniques for induced transformation of microorganisms invitro	L3
		CO5	Acquire hands-on experience in operating instruments and equipments	L2
Applied Microbiology	16SACMB2	CO1	Illustrate the role of microorganisms in fermented foods and in food processing. Microbiology of different types of fermented food products	L2
		CO2	List out the microbial energetic of various metabolic reactions through which energy production and energy transformation takes place	L1
		CO3	Interpret the significance and activities of microorganisms in food and role of intrinsic and extrinsic factors on growth and survival of microorganisms in foods	L2
		CO4	Discuss the diagnosis, prevention, treatment and epidemiology of infectious diseases including the impact of bacterial, Viral, fungal and parasitic infectious agents on human	L2
		CO5	Explain the role and application of microorganisms in waste management and sustainable agriculture	L2
Environmental Studies	16UGCES	CO1	Create awareness on the importance and multidisciplinary nature of Environmental studies	L2
		CO2	Discuss the use and exploitation of natural resources and its associated problems	L2
		CO3	Define the structure and functions of	L1

			ecosystem and explain the benefits of biodiversity conservation	
		CO4	Summaries the sources, effects and control measures of various types of Pollutants	L2
		CO5	Visit local area to document environmental assets	L1
rDNA Technology	16SCCBT3	CO1	Acquire basic knowledge on various steps involved in recombinant technology	L1
		CO2	Familiarize with different types of vectors concerned in genetic engineering	L2
		CO3	Acquaint with different cloning vectors and cloning strategies to be followed during genetic manipulation	L1
		CO4	Describe the recombinants through selection and screening process and gene expression	L2
		CO5	Acquaint with the applications of rDNA technology in plants, animals and gene therapy of humans	L1
rDNA Technology (P)	16SCCBT3P	CO1	Perform basic procedures to isolate genetic materials from different sources	L3
		CO2	Gain knowledge on restriction digestion and ligation for genetic manipulation	L1
		CO3	Perform molecular techniques for induced transformation of microorganisms invitro	L3
		CO4	Acquire hands-on experience in operating instruments and equipments	L1
		CO5	Get familiarized in screening with molecular markers	L1
Biomolecules	16SACBT1	CO1	Elucidate the structure, classification and properties of Carbohydrates	L2
		CO2	Explicate the structure and Classify amino acids and proteins based on their physical and chemical properties	L2
		CO3	Explain the biochemical properties, structure and metabolism of lipids and fatty acids	L2
		CO4	Familiarize with the types and structural configuration of Nucleic acids	L2
		CO5	Summaries the significance of vitamins and minerals in daily requirement and deficiency manifestation	L2

Biochemistry (P)	16SACBT1P	CO1	Impart knowledge on all basic instruments	L2
		CO2	Isolate and prepare cellular and sub cellular fractions	L3
		CO3	Separate the biomolecules based on colour using biochemical techniques	L3
		CO4	Demonstrate the techniques for separation of macromolecules	L2
		CO5	Analyze and interpret the biochemistry of biological samples	L3
NME I	16SNMEMB 1	CO1	Recognize the types of edible and non edible mushroom	L1
		CO2	Perform techniques for preparation of mother spawn culture	L3
		CO3	Experience mushroom bed reparation and cultivation techniques	L4
		CO4	Comprehend storage methods and nutritional values of mushroom	L2
		CO5	Realize the significance of R&D centers and marketing process	L2
Immunology	16SCCBT4	CO1	Define the basic biology cells of the immune system and their specific functions	L1
		CO2	Outline the interaction of cells ensuing the immune response and Immunity	L2
		CO3	Interpret molecular basis of the recognition and specific response of immune cells to pathogens	L2
		CO4	Perceive immunization process, types of vaccines and describe antibody engineering.	L1
		CO5	Explain immune disorders, tumor immunology and immuno deficiencies	L2
Immunology (P)	16SCCBT4P	CO1	Gain basic hands on skills in immunological techniques	L1
		CO2	Obtain practical skill on blood sample collection, separation and agglutination	L1
		CO3	Demonstrate the principles of labeled assays	L2
		CO4	Acquainted with maintenance, bleeding and immunological techniques in laboratory animals	L1
Applied Biochemistry	16SACBT2	CO1	Acquainted with basic sedimentation principles of molecules by centrifugation process	L1

		CO ₂	Describe the principles and different types of chromatographic separation	L ₂
		CO ₃	Analyze and separate genetic and molecular materials based on their size	L ₃
		CO ₄	Explain the interaction of electromagnetic radiation and matter through spectroscopy	L ₂
		CO ₅	Know about basic concepts of crystal structures, symmetries, lattice through crystallography	L ₁
NME II	16SNMEMB 2	CO ₁	Acquire knowledge on types and importance and applications of biofertilizer	L ₁
		CO ₂	Describe the characterization & cultivation of Rhizobium, Frankia and Cyanobacteria	L ₂
		CO ₃	Describe the characterization & cultivation of Azospirillum & Azotobacter	L ₂
		CO ₄	Familiarize with the mass production of Phosphate solubilizing bacteria	L ₂
		CO ₅	Acquaint with cultivation and field application of Mycorrhizae	L ₁
SBE I	16RSBE18:1 A	CO ₁	Acquire knowledge on history and scope of Bee keeping	L ₂
		CO ₂	Familiarize with characteristics of bee colony and honey bee behavior	L ₂
		CO ₃	Familiarize in hive maintenance and Apiary management	L ₂
		CO ₄	Skilled in honey extraction and marketing	L ₃
		CO ₅	Develop Entrepreneurial skills for sustainable economy	L ₃
Plant Biotechnology	16SCCBT5	CO ₁	Provide basic knowledge on Plant tissue culture techniques	L ₃
		CO ₂	Get acquainted with genetic manipulation of plants	L ₂
		CO ₃	Familiarize with the applications of plant genetic engineering for crop improvement	L ₂
		CO ₄	Recognize the transgenic plants , GMOs, their applications and future perspectives	L ₂
		CO ₅	Disseminate types, production, identification and importance of organic foods	L ₃

Animal Biotechnology	16SCCBT6	CO1	Impart knowledge on basics of Embryology	L2
		CO2	Provide animal tissue culture techniques for establishing cell lines	L3
		CO3	Interpret genetic manipulation for production of GMOs, product development	L3
		CO4	Express the future application of biotechnology in gene therapy and know patenting procedures	L3
		CO5	Attain development and use of transgenic animals and GMOs through genetic engineering	L3
Biostatistics and Biosafety	16SCCBT7	CO1	Define variability and uncertainty in sampling and data collection	L3
		CO2	Categorize the type of variables, summarize the data and construct graphical and diagrammatic representation of data	L4
		CO3	Apply probability principles for setting significance levels and testing hypothesis using statistical tests	L3
		CO4	Interpret on biosafety levels and biosafety issues in biotechnology	L3
		CO5	Illustrate national and international biosafety guidelines and role of biosafety committees in risk management	L2
Plant & Animal Biotechnology (P)	16SCCBT5P	CO1	Attain knowledge on basic laboratory safety measures	L1
		CO2	Experience hands on skills in plant tissue culture practices	L3
		CO3	Standardize the media composition for tissue culture techniques	L4
		CO4	Analyze the response of plant cells to external factors	L4
		CO5	Isolate and analyse the genetic material from Plant and animal tissues	L4
Bioinstruments	16SMBEBT1	CO1	Demonstrate the principles and operation of basic instruments used in laboratory	L34
		CO2	investigate the morphology of microbes by different types of microscopes, and know its working principle, applications	L2
		CO3	Demonstrate the instruments used for analysis of compound by the interaction of electromagnetic radiation and matter	L2

		CO ₄	Acquainted with separation of molecules by chromatography and centrifugation process	L ₃
		CO ₅	Comprehend the separation of molecular compounds with respect to weight and size.	L ₄
SBE II	16RSBE18:2 A	CO ₁	Appraise prospects and employment potential of sericulture in India	L ₄
		CO ₂	Categories the types, races and life cycle of Silk worms	L ₃
		CO ₃	Acquaint knowledge on silk worm rearing and appliances	L ₃
		CO ₄	Know the pests and diseases and preventive measures while silk rearing	L ₂
		CO ₅	Appraise with Commercialization and marketing of silk and its by products	L ₄
SBE III	16RSBE18:3 A	CO ₁	Summaries on diversity and distribution of earthworms in India	L ₂
		CO ₂	Familiarize with anatomy and physiology of earthworm	L ₂
		CO ₃	Familiarize the use of earthworms in sustainable agriculture	L ₂
		CO ₄	Experience the methods of vermicomposting and its benefits to environment	L ₃
		CO ₅	Skilled with Small and large scale production of Vermicompost as a self employment venture.	L ₃
Soft Skill Development	RUGSDC	CO ₁	Attain soft skills and evaluate SELF	L ₂
		CO ₂	Develop interpersonal relations and improve leadership quality	L ₃
		CO ₃	Define communicative skills and develop it by practice	L ₃
		CO ₄	Build up corporate skills through time and stress management	L ₃
		CO ₅	Equip to face the competitive world with confidence	L ₃
Microbial Biotechnology	16SCCBT8	CO ₁	Categories industrial importance of microbes, their growth and strain improvement	L ₄
		CO ₂	Classify basic modes of bioreactors and fermentation process	L ₄
		CO ₃	Demonstrate the steps during upstream process of fermentation	L ₃

		CO4	Illustrate the types and importance of down stream process in Bioseparation	L2
		CO5	Disseminate applications of microbes on food processing and production	L4
IPR & Bioethics	16SCCBT9	CO1	Categories Intellectual property rights	L3
		CO2	Explain the procedures of patent filing, financial assistance and about patent infringement.	L3
		CO3	Summaries principles of patent laws and its protection through treaties	L3
		CO4	Relate the framework , purpose and principles of bioethics	L3
		CO5	Criticize on benefits and risks of genetic engineering and ethical aspects of genetic testing	L4
Microbial biotechnology (P)	16SCCBT6P	CO1	Perform screening , strain improvement and study growth characteristics of industrially important microorganisms	L3
		CO2	Experiment the protocols for production of microbial byproducts	L4
		CO3	Analyse the sensitivity pattern of microbes to different antibiotics	L4
		CO4	Examine the microbiology of foods and its shelf life	L4
		CO5	Experience live visit to production units and research laboratories	L4
Food Technology	16SMBEBT2	CO1	Explore the basics of food constituents and food chemistry	L2
		CO2	Demonstrate the association of microbes to food and discuss the causes for infectious diseases and food spoilage	L3
		CO3	Analyze the procedures involved in food processing and physical conversion of raw materials	L4
		CO4	Rate and know food preservation by exposure to high and low temperature	L5
		CO5	Illustrate the manufacturing of food products from various raw materials	L2
Immuno Technology	16SMBEBT3	CO1	Acquaint knowledge on principles and methods of immunization techniques	L2
		CO2	Categorize the role and response of immune cells to pathogens	L4
		CO3	Explain antigen and antibody reaction and analysis through biosensor assays	L2
		CO4	Describe the new generation antibodies	L2

			and immuno regulators as therapeutic products	
		CO5	Justify the need for recombinant vaccine designing and development	L5
Gender Studies	UGGS	CO1	Know about concepts of gender and gender equity	L2
		CO2	Acquaint with the UGC 's guidelines and plans on women studies and gender issues	L2
		CO3	Disseminate knowledge on areas of gender discrimination	L2
		CO4	Familiarize with the initiatives and policies of women development and gender empowerment	L2
		CO5	Dissemination of acts and amendments on Women's movements and safe guarding mechanism	L2

M. Sc., Biotechnology

Programme Specific Outcomes:

PSO1: Comprehend the concepts of the core courses at the levels of fundamental, technology and application.

PSO2: Acquire knowledge on instruments and performing skills to satisfy the need of the industries and research laboratories.

PSO3: Familiarize with the biotechnological and professional ethics for the betterment of the environment, society and nation.

PSO4: Ability to find innovative solutions and contribute for the different areas of agriculture, food security, climate change and medicine.

PSO5: Enhance their skills in designing projects and receive funds from the government agencies and enable technology transfer to the society.

PSO6: Attain competence and develop leadership attitude to work in the industries, companies and R&D labs

Course Outcomes:

COURSE	COURSE	CO. NO	OUTCOME	LEVEL
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	CODE			
Cell Biology	P16BT11	CO1	Identify and differentiate the cells based on their structure and composition	L1
		CO2	Comprehend the structure and functions of cellular organelles	L2
		CO3	Understand the organization and functions of cytoskeleton and nuclear materials	L2
		CO4	Analyze with the organization of chromosomes, cell division and cell cycle	L2
		CO5	Describe the structural organization of Prokaryotic and Eukaryotic cells	L2
Microbiology	P16BT12	CO1	Classify the microorganisms based on structure and characteristics.	L2
		CO2	Explore the evolution of microorganisms, biodiversity, their nutrition and their molecular systematic analysis	L2
		CO3	Analyze the influence of environmental factors in microbial growth and reproduction.	L4
		CO4	Demonstrate the methods in sterilization, isolation and identification of microbes.	L2
		CO5	Acquire knowledge on genomics and metagenomics of microbes.	L2
Biochemistry	P16BT13	CO1	Elaborate the chemical and physical properties of biomolecules and their significance in biological system	L2
		CO2	Explain the structure and classification of amino acids, carbohydrates, proteins, lipids and enzymes	L2
		CO3	Emphasize on the role of metabolic pathways	L2
		CO4	Elucidate the structure , function and classify nucleic acids and vitamins.	L2
		CO5	Illustrate the principles of bioenergetics and the metabolic regulations	L2
Molecular biology	P16BT14	CO1	Summarize nucleic acids and elucidate the structure, types and its functions	L2
		CO2	Discuss the mechanism of replication, transcription, translation and post translational modification.	L2
		CO3	Elucidate types and causes of mutation and acquainted with gene regulations	L2
		CO4	Illustrate the role of vectors and transposable elements in genetic analysis	L2

		CO5	Interpret on genetic analysis of microbes and vaccine designing	L3
Cell Biology, Microbiology, Biochemistry & Molecular biology practical	P16BT15 P	CO1	Perform basic laboratory techniques for identification of cell structure and examine stages of cell division	L3
		CO2	Identify and characterize the microorganisms in the environment and measure their growth	L1
		CO3	prepare solution and buffers and estimate the quantity of different biomolecules	L4
		CO4	Isolate , quantify nuclear materials and perform genetic manipulation of DNA	L4
rDNA Technology	P16BT21	CO1	Explain the basic concepts of DNA structure and properties	L2
		CO2	Comprehend the significance of cloning vectors in genetic engineering	L2
		CO3	Illustrate the cloning methodologies for gene expression and construction of gene libraries	L2
		CO4	List the applications of molecular markers for diagnosis and mutation detection	L1
		CO5	Infer methods of gene sequencing and gene expression	L2
Immunology	P16BT22	CO1	Define the basic biology cells of the immune system and their specific functions	L1
		CO2	Outline the interaction of cells ensuing the immune response	L2
		CO3	Interpret molecular basis of the recognition and response of immune cells to pathogens	L3
		CO4	Perceive immunization process, types of vaccines and describe antibody engineering.	L1
		CO5	Depict immune disorders, tumor immunology and immuno deficiencies	L2
rDNA technology practical	P16BT23 P	CO1	Familiarize with basic techniques of molecular biology	L2
		CO2	Perform recombinant DNA techniques for gene manipulation	L3
		CO3	Analyze the recombinant with molecular assays	L4
		CO4	Get trained with basic immunological techniques and perform analysis of clinical samples	L4

		CO5	Acquaint animal tissue culture and assay techniques	L2
Bioinstrumentation	P16BTE1	CO1	Demonstrate the principles and operation of basic instruments used in laboratory	L2
		CO2	Explore the types of microscopes, working principle and its applications	L2
		CO3	Demonstrate the instruments used for analysis of compound by spectra.	L2
		CO4	Acquaint the methods of bioseparation of compounds with respect to colour	L1
		CO5	Comprehend the separation of molecular compounds with respect to weight and size.	L2
Bioinformatics	P16BTE2	CO1	Acquaint knowledge on tools and databases available in website for analysis	L1
		CO2	Discuss the benefits and implications of knowing the DNA sequences of organisms.	L2
		CO3	Familiarize the identity, similarity and homology of sequences with matrices	L2
		CO4	Explain and perform with various file formats, bioinformatics tools and repositories for storing sequences.	L2
		CO5	Exercise the neighborhood relationship of organisms by phylogenetic analysis	L3
Plant Biotechnology	P16BT31	CO1	Acquire knowledge on the basic techniques of plant tissue culture	L2
		CO2	Outline the process of genetic manipulation of plants for crop improvement	L2
		CO3	Describe the methods of gene delivery to produce transgenic plants	L2
		CO4	list the applications of transgenic plants as bioreactors for quality enhancement	L3
		CO5	Comprehend knowledge on plant molecular biology techniques for crop improvement	L3
Animal biotechnology	P16BT32	CO1	Define and familiarize animal tissue culture techniques for establishing cell lines	L2
		CO2	Attain development and use of transgenic animals	L2
		CO3	Improve pest management through hormones and animal breeding strategies	L2

		CO4	Categorize molecular markers for genetic engineering and clinical analysis	L3
		CO5	Appraise the future application of biotechnology in gene therapy and know patenting procedures	L4
Plant and Animal biotechnology practical	P16BT33 P	CO1	Acquire knowledge on basic laboratory s safety measures	L2
		CO2	Experience hands on skills in plant tissue culture practices	L3
		CO3	Analyse the response of plant cells to external factors	L4
		CO4	Isolate and quantify the genetic material from animal tissues	L4
		CO5	Analyze the genetic materials by molecular assays	L4
Biostatistics, Bioethics and IPR	P16BTE3	CO1	Differentiate variables and interpret the results of biological experiments based on statistical analyses	L4
		CO2	Summarize principles of bioethics and know the emerging issues in implications of genetic engineering	L3
		CO3	Acquaint principles of patent laws and its protection through treaties	L2
		CO4	Explain the procedures of patent filing, financial assistance and about patent infringement.	L3
		CO5	Gain knowledge on biosafety levels and role of biosafety committees in risk management	L2
Biotechnology for Entrepreneurs	P16BTE4	CO1	Develop and promote bioentrepreneurs to plug the need of biotech companies	L3
		CO2	Identify, design and formulate projects and project management	L2
		CO3	Gain knowledge on project financial analysis and marketing methods	L2
		CO4	Summarize the support mechanism of funding agencies to promote bioentrepreneurs	L3
		CO5	Attain small and large scale industries exploring export possibilities	L2
Bioprocess Technology	P16BT41	CO1	Infer the basic principles of screening , strain improvement growth and preservation of industrially important microorganisms	L2

		CO ₂	Summarize and pertain the different methods of fermentation and various designs of fermenters	L ₃
		CO ₃	Elaborate the concept of downstream processes involved in fermentation	L ₃
		CO ₄	Illustrate the applications of enzymes in food processing	L ₂
		CO ₅	Illustrate the importance and role of microbes in food processing and food production	L ₂
Food Technology	P16BT42	CO ₁	Explore the basics of food technology and food chemistry	L ₂
		CO ₂	Demonstrate the association of microbes to food and discuss the rationale for the use of standard methods and procedures for the microbiological analysis of food	L ₃
		CO ₃	Analyse the procedures involved in food processing	L ₄
		CO ₄	Rate and know food preservation by exposure to high and low temperature	L ₅
		CO ₅	Illustrate the manufacturing of food products from various raw materials	L ₂
Bioprocess and food technology practical	P16BT43 P	CO ₁	Isolate and enumerate industrially important microorganisms	L ₃
		CO ₂	Setup knowledge on bioprocessing and enzyme production in small scale	L ₂
		CO ₃	Perform procedures for the microbiological analysis of food and discuss the rationale for the use of standard methods	L ₃
		CO ₄	Accomplish bioassay techniques for different antibiotics	L ₃
		CO ₅	Acquaint real time revelation of industrial experience	L ₂
Environment Biotechnology and Nanotechnology	P16BTE5	CO ₁	Explain pollution as global environment problem and control measures	L ₂
		CO ₂	Explore the causes of water pollution, biomonitoring and biological treatment process.	L ₂
		CO ₃	Illustrate solid waste management and understand the values of biodiversity and conservation	L ₂
		CO ₄	Explain the synthesis of nano materials and their characterization by	L ₂

			spectroscopy	
		CO5	Know the importance and applications of nanotechnology in medicine and bioremediation.	L2
Project	P16BTPW	CO1	Collect and analyze the scientific literature from web resources	L4
		CO2	Develop practical skills in the use of tools, technologies and methods common to biotechnology	L6
		CO3	Apply the scientific method and hypothesis testing in the design and execution of experiments.	L4
		CO4	Construct a summative project or articles that draws on current research, and/or Techniques in life sciences.	L6