

DEPARTMENT OF BIOTECHNOLOGY

PSO/CO



**PROGRAMME SPECIFIC OUTCOMES AND
COURSE OUTCOMES OF
BIOTECHNOLOGY (UG & PG)**

KALYAN P.G. COLLEGE, SECTOR-7, BHILAI

VISION

Our vision is to reach milestones in Biotechnology research and transform biotechnology into a leading precision tool for future development.

MISSION

The Department of Biotechnology was established in the year 2006 as one of the Departments under the Faculty of Science to impart quality education in the field of Biotechnology and to create trained Biotechnologists.

- Department of Biotechnology focuses on understanding humans as a biological and a cultural being, through cross-cultural perspective.
- The department of biotechnology has been teaching undergraduate, postgraduate, and research works that encompass various basic and applied aspects of modern biotechnology.
- The course contents of our department highly specialized and require very clear and fundamental inputs from basic and advanced biology, applied biology, and technology.
- The Department of Biotechnology has well developed facilities for Microbiology, Biochemistry, Molecular Biology, Plant Tissue culture and Bioinformatics. The Instruments available include PCR Thermal Cyclers, ELISA Reader, Electrophoresis, UV Spectrophotometer, BOD Incubator and Microscope etc.
- The faculty of the department publishes research papers in national and international journals on regular basis.
- The main objective of the department is to provide academic training and research in the interdisciplinary areas of biotechnology with a particular emphasis on extending the knowledge generated from these studies towards the development of technologies.

GRADUATION - BIOTECHNOLOGY**PROGRAMME SPECIFIC OBJECTIVES (PSO)**

- ✓ **PSO1-** The Students will gain and apply knowledge of Biotechnology and Science concepts to solve problems related to field of Biotechnology.
- ✓ **PSO2-** The Students will be able to identify, analyze and understand problems related to biotechnology and finding valid conclusions with basic knowledge in biotechnology.
- ✓ **PSO3-** The Students Graduates will be able to design and develop solution to Biotechnology problems by applying appropriate tools while keeping in mind safety factor for environmental & society.
- ✓ **PSO4-** The Students will be able design, perform experiments, analyze and interpret data for investigating complex problems in biotechnology and related fields.
- ✓ **PSO5-** The Students will be able to decide and apply appropriate tools and techniques in Biotechnology.
- ✓ **PSO6-** The Students will be able to undertake any responsibility as an individual and as a team in a multidisciplinary environment.

PROGRAMME OUTCOME

- ✓ **PO1-** To create in-depth knowledge and ability to undertake further study and research in biotechnology
- ✓ **PO2-** To provide broad based training in technical skills in methods of biotechnology.
- ✓ **PO3-** To demonstrate knowledge and techniques fundamental to the practice of biotechnology.
- ✓ **PO4-** To make a knowledge and understanding of a range of concepts and issue in biotechnology.
- ✓ **PO5-** To understand basic biochemistry, immunology, cell and molecular biology and genetics and their associated laboratory techniques.
- ✓ **PO6-** To understand the theoretical nature of the science involved in medically related biotechnology research and practice.

U.G. SYLLABUS**B.Sc. PART I, II, III**

YEAR	PAPER	MAXIMUM MARKS	MINIMUM MARKS
THEORY			
B.Sc.I	BIOCHEMISTRY, BIOSTATS & COMPUTERS	50	17
	CELL BIOLOGY, GENETICS AND MICROBIOLOGY	50	17
B.Sc.II	MOLECULAR BIOLOGY AND BIOPHYSICS	50	17
	RECOMBINANT DNA TECHNOLOGY AND GENOMIC	50	17
B.Sc.III	PLANT, ENVIRONMENT AND INDUSTRIAL BIOTECHNOLOGY	50	17
	IMMUNOLOGY, ANIMAL AND MEDICAL BIOTECHNOLOGY	50	17
	TOTAL	100	
PRACTICAL FOR B.Sc. PART I, II, III			
1.	PRACTICAL (BASED ON PAPER I & II)	50	17
	TOTAL	50	

ADDITION OF THE MARKS OF INTERNAL EVALUATION IN THE ANNUAL EXAM RESULT AT U.G. LEVEL:-

As per decision of university co-ordination committee (25th meeting, proposal number 11) and the notification issued by Durg University, Durg on 25.10.2017, it is resolved that the marks obtained in the half-yearly examination will be added in the result of annual examination in such a way that the percentage of marks of internal evaluation will be 10% and the marks of the annual exam will be 90%. This decision will be effective for the B.Sc. annual examination in the forth coming sessions.

COURSE OUTCOMES

PAPER	PAPER NAME (PAPER CODE)	OUTCOMES
<u>B.Sc. I</u>		
PAPER I	BIOCHEMISTRY, BIOSTAT & COMPUTERS	CO –1 To get the knowledge of the structure of Carbohydrate, protein and Amino acid
		CO – 2. To get the knowledge of the Biochemistry , scope and development
		CO – 3To get the knowledge of the Lipids, Enzyme and Hormones
		CO-4 To understand the concept of biostatistics their mean, median and mode
		C0-5 To knowledge the salient features of computer
PAPER II	CELL BIOLOGY, GENETICS AND MICROBIOLOGY	CO – 1. To get the knowledge of the basic concepts cell structure , organelles and functions
		CO – 2. Know the mendel law of inheritance
		CO – 3. To get the knowledge of the mutations and structural changes in chromosome
		CO – 4. Understand the properties of viruses, bacteria and mycoplasma
		CO – 5. Know the concept of food microbiology and disease
LAB COURSE	MICROBIOLOGY AND BIOCHEMICAL TECHNIQUES	CO – 1. To get knowledge of the laboratory rules, tools, equipment in microbiological laboratory.
		CO – 2. Understand the preparation of media for culture
		CO – 3. Get the knowledge of methods of obtaining pure cultures
		CO – 4 To know the biostatistics: By Manual and by computer.

B.Sc. II

PAPER I	MOLECULAR BIOLOGY & BIOPHYSICS	<p>CO – 1. To get the knowledge of DNA, RNA and structure of gene.</p> <p>CO – 2. To get the knowledge of genetic code and protein synthesis</p> <p>CO – 3. Understand the Law of Thermodynamics and Beer Lambert's law</p> <p>CO – 4. To know and concept of the gene therapy</p> <p>CO – 5. Understand the principal of Biophysics</p>
PAPER II	RECOMBINANT DNA TECHNOLOGY AND GENOMICS	<p>CO – 1. To get the knowledge of the Recombinant DNA Technology</p> <p>CO – 2. Understand the properties of Vectors</p> <p>CO – 3. To Know the techniques of PCR</p> <p>CO – 4. To get the knowledge of Bioinformatics</p> <p>CO-5 To understand the concept of Targeted Gene Transfer and DNA fingerprinting</p>
LAB COURSE	Molecular biology & biophysics Practical	<p>CO – 1. Understand the Laminar Air Flow, Autoclave, Hot Air Oven, Incubator, Water Bath, Quebec colony counter, Centrifuge, Spectrophotometer, Electrophoresis, Camera Lucida.</p> <p>CO – 2. Determine the strength of Estimation of DNA from Plant Cells</p> <p>CO – 3. To get the knowledge of isolation of DNA and RNA</p>

B.Sc. III

PAPER I	PLANT, ENVIRONMENT AND INDUSTRIAL BIOTECHNOLOGY	<p>CO – 1. Know the Plant cell and tissue culture : General introduction history, scope and application .</p> <p>CO – 2. To get the knowledge of Germplasm storage and Cryopreservation.</p> <p>CO – 3. To Know the scope of environmental biotechnology</p> <p>CO – 4. Understand the Bioreactors and its type. Fermentation</p> <p>CO – 5. To get the knowledge of concept of food technology</p>
PAPER II	IMMUNOLOGY, ANIMAL AND MEDICAL BIOTECHNOLOGY	<p>CO – 1. Understand the Immune system concept</p> <p>CO – 2. To get the knowledge of antigen-antibody interactions</p> <p>CO- 3 To get the knowledge of understand the Animal tissue culture</p> <p>CO – 4 Understand the knowledge of invitro fertilization</p> <p>CO – 5. Understand the concept of transplantation</p>
LAB COURSE	PLANT, ENVIRONMENT, INDUSTRIAL AND MEDICAL BIOTECHNOLOGY PRACTICAL	<p>CO – 1. Plant tissue culture</p> <p>CO – 2. Analysis of antigen- antibody interaction</p> <p>CO – 3. Determine the strength of DO, BOD and COD</p>

POST GRADUATION BIOTECHNOLOGY**PROGRAMME SPECIFIC OBJECTIVES (PSO)**

- ✓ **PSO1.** The student will be able to pursue higher education in India/abroad in Biotechnology and its related fields by taking up competitive exams like GATE, CSIR- NET , UGC –NET, DBT , ICMR, DST etc.
- ✓ **PSO2.** The student will be able to come up with solutions for any scientific or technical problems related to Biotechnological industries/institutes.
- ✓ **PSO3.** The student will be able to plan and conduct experiments in modern biotechnology and allied field laboratories including interpreting the significance of resulting data, reporting results and writing technical reports.
- ✓ **PSO4.** The student will be able to get familiarized with professional and economical issues in biotechnology and foster important job related skills such as communications and experience in working as a team that will help them to become good Entrepreneurs.
- ✓ **PSO5.** Exhibit skills of handling microbial processes, biochemical analysis by making use of state of the art instruments.
- ✓ **PSO6.** Exhibit strong, independent learning, analytical and problem solving skills with special emphasis on design, communication, and an ability to work in teams.
- ✓ **PSO7.** To have successful career as a researcher through lifelong learning in the field of biotechnology.

LEARNING OUTCOME

- ✓ **PO1-** To produce responsible biotechnologists that can work with in the interdisciplinary frame work of biotechnology and related fields.
- ✓ **PO2-** Developing concepts and technical skills in methods of biotechnology.
- ✓ **PO3-** To empower students to think critically and solve problems in the field of biotechnology by applying research strategies .
- ✓ **PO4-** Student will be able to demonstrate the ability to communicate effectively with appropriate audiences with regards to field of biotechnology.
- ✓ **PO5-** To provide education that leads to comprehensive understanding of the principles and practices of biotechnology.
- ✓ **PO6-** To ability to develop, constructs and manage a research project in biotechnology.
- ✓ **PO7-** To analyze experimental results, differentiating between expected and unexpected results, trouble shooting, interpreting results and making conclusions.
- ✓ **PO8-** To make our students competent in the field of biotechnology and its allied areas.

SEMESTER ONE**SCHEME OF SEMESTER I EXAMINATION**

Semester	Paper code	Title of Theory/Practical papers	Marks Theory	Internal Assessment & Sessional
O N E	I	Cell and Development Biology	80	20
	II	Genetics	80	20
	III	Microbial Physiology	80	20
		Biomolecules	80	20
	IV	Based on theory paper I and II	80	20
		Based on theory paper III and IV	80	
	Lab -One		80	
	Lab – Two		80	
Seminar		Paper I and II Paper III and IV	20 20	

TOTAL MARKS – 600

COURSE OUTCOME

At the end of this course, a student will have developed ability to:

PAPER NAME	COURSE	OUTCOMES
PAPER I	CELL AND DEVELOPMENT BIOLOGY	CO-1. Get the knowledge of cell structure and organelles
		CO-2. To understand the cell cycle and apoptosis
		CO-3. Study the biology of cancer.
		CO-4. Understand the structure and properties of development of germ lines
PAPER II	GENETICS	CO-1. To understand the nature of prokaryotic and eukaryotic gene
		CO-2. Understand the regulation of gene expression in prokaryotic and eukaryotic
		CO-3. Study the mutation and change in chromosome number and structure.
		CO-4. Get the knowledge of genetic disorder
PAPER III	MICROBIAL PHYSIOLOGY	CO-1. Understand the basic knowledge of microbial growth
		CO-2. Understand the basic concepts of metabolic diversity
		CO-3. Study the basics of bacteria, virus
		CO-4. Understand the microbial, food and water borne disease.
PAPER IV	BIOMOLECULES	CO-1. To gain insight into the basic principle of thermodynamics
		CO-2. To know about amino acid, protein, lipids and nucleic acid
		CO-3 To get the knowledge of carbohydrate metabolism
		CO-4. To understand the theories/principles of secondary metabolites
LAB COURSE I	BASED ON PAPER I AND II	To get the knowledge of cell biology, mitotic and meiosis division and Mendel law experiments
LAB COURSE II	BASED ON PAPER III AND IV	To get the knowledge of Principles and Techniques of Biomolecules and microbial activities

SYLLABUS
M.Sc.-2nd Semester

SEMESTER TWO

SCHEME OF SEMESTER II EXAMINATION

Semester		Paper code	Title of Theory/Practical papers	Marks Theory	Internal assessment and Sessional
T W O	I		Biostatistics and Computer Application in Biotechnology	80	20
	II		Molecular Biology	80	20
	III		Plant Biotechnology	80	20
	IV		Macromolecules and Enzymology	80	20
	Lab -One		Based on theory paper I and II	80	
	Lab – Two		Based on theory paper III and IV	80	
	Seminar			20	
			Paper I and II Paper III and IV	20	

TOTAL MARKS – 600

COURSE OUTCOME

At the end of this course, a student will have developed ability to:

PAPER	PAPER NAME	COURSE OUTCOME
PAPER I	BIostatISTICS AND COMPUTER APPLICATION IN BIOTECHNOLOGY	CO-1. To understand the Measure of central tendency
		CO-2. To understand how to interpret probability
		CO-3. To understand knowledge of computer applications
		CO-4. To study the data structures and database concepts
PAPER II	MOLECULAR BIOLOGY	CO-1. To have a thorough idea about the basic concepts DNA replication, damage and repair.
		CO-2. To get an idea about the mechanism of transcription and translation
		CO-3. To understand the mechanism of protein localization
		CO-4. To acquire the knowledge of oncogene and tumor suppressor gene.
PAPER III	PLANT BIOTECHNOLOGY	CO-1. To have basic knowledge of plant tissue culture, embro culture, anther, pollen and ovary.
		CO-2. To illustrate the concepts in germplasm conservation and cryopreservation
		CO-3. To explain and derive metabolic engineering and industrial products.
PAPER IV	MACROMOLECULES AND ENZYMOLOGY	CO-1 To get the knowledge of supermoleculer assembly.
		CO-2. To gain detailed insight into protein-protein interactions
		CO-3. To acquaint with the principle and kinetics of enzyme
		CO-4. To get to know in detail about the ribozyme and nucleic acid hybridation.
LAB COURSE III	BASED ON PAPER I AND II	Understand the computer programmes, linear regression, MS office, Excel and biostatics analyses as well as extraction and estimation of DNA
LAB COURSE IV	BASED ON PAPER III AND IV	Understand the plant tissue culture techniques and determination of alkaline protease , catalase and urease activity

SEMESTER THREE**SCHEME OF SEMESTER III EXAMINATION**

Semester	Paper code	Title of Theory/Practical papers	Marks Theory	Internal Assessment and Sessional
T H R E E	I	Genetic Engineering	80	20
	II	Biology of Immune System	80	20
	III	Bioprocess Engineering and Technology	80	20
	IV	Environmental Biotechnology	80	20
	Lab - One		80	
	Lab – Two	Based on theory paper I and II	80	
		Based on theory paper III and IV		
	Seminar		20 20	

TOTAL MARKS – 600

COURSE OUTCOME

At the end of this course, a student will have developed ability to:

PAPER	PAPER NAME	COURSE OUTCOME
PAPER I	GENETIC ENGINEERING	CO-1. Explain scope of genetic engineering and recombinant DNA technology
		CO-2. Explain basic and working principle genetic cloning vectors
		CO-3. Explain mechanism of protein engineering and processing of recombinant protein
PAPER II	BIOLOGY OF IMMUNE SYSTEM	CO-1. The basic properties of immune system .
		CO-2. Mechanisms of antigen-antibody interactions
		CO-3. Biotechnological applications of hybridoma technology
PAPER III	BIOPROCESS ENGINEERING AND TECHNOLOGY	CO-1. Gives an introduction to bioprocess engineering
		CO-2. Explain types and properties of bioreactor
		CO-3. Explain the mechanism of downstream processing
		CO-4. Explain the industrial productions of alcohol, acid, antibiotics and food technology
PAPER IV	ENVIRONMENTAL BIOTECHNOLOGY	CO-1. Explain the fundamentals of environmental pollution and treatment through biotechnology
		CO-2. Express the role of GMO , Biodegradation, waste water treatment.
		CO-3. Understand the concept of biopesticides, IPR and solid Wastes
LAB COURSE V	BASED ON PAPER I AND II	Understand the process of DNA isolation and extraction , Blood test, ELISA test and Immunodiffusion
LAB COURSE VI	BASED ON PAPER III AND IV	To get the knowledge of bacterial and fungal growth curve , TDS, BOD, DO and COD, and MPN

SCHEME OF SEMESTER IV EXAMINATION

Semester	Paper code	Title of Theory/Practical papers	Marks Theory	Internal assessment and Sessional
F O U R T H	I	Basic Concepts of Bioinformatics and Nano-biotechnology	80	20
	II	Advance techniques in Biotechnology	80	20
	III	Animal Biotechnology	80	20
	IV	Functional Genomics and Proteomics		
	Lab -One	Based on theory paper I and II	80	
	Lab – Two	Based on theory paper III and IV	80	
	Seminar	Paper I and II Paper III and IV	20 20	

TOTAL MARKS – 600

COURSE OUTCOME

At the end of this course, a student will have developed ability to:

PAPER	PAPER NAME	COURSE OUTCOME
PAPER I	BASIC CONCEPTS OF BIOINFORMATICS AND NANO-BIOTECHNOLOGY	CO-1. To understand the knowledge of basic of bioinformatics : scope and application
		CO-2. Explain the process and use of Bioinformatics software tools
		CO-3. Classify basic principles of Nano-biotechnology
PAPER II	ADVANCE TECHNIQUES IN BIOTECHNOLOGY	CO-1. Knowledge of principle of spectrophotometer, electrophoresis and chromatographic.
		CO-2. Study of PCR, Blotting and DNA sequencer
		CO-3. To know about the basics of Microscope, RIA and ELISA
PAPER III	ANIMAL BIOTECHNOLOGY	CO-1. Identify and define various types of cell line culture
		CO-2. State and compare the differences Primary, Secondary and Established cell line
		CO-3. Understand and explain the concept of tissue engineering and Transgenic Animal
PAPER IV	FUNCTIONAL GENOMICS AND PROTEOMICS	CO-1. Appreciate concepts and methods from protein chips and protein –protein interaction
		CO-2. Explain the ethical, cross-cultural and historical context of environmental issues.
		CO-3. Discuss the concept of proteomics and genomics
		CO-4. To understand the structure and functions of genomics and proteomics
LAB COURSE VII	BASED ON PAPER I AND II	1.To study the sequence alignment BLAST, CLUSTAL W 2.Understand the process of spectrophotometer determination, and chromatographic, separation of DNA and Protein by Electrophoresis
LAB COURSE VIII	BASED ON PAPER III AND IV	1. Understand whole genome databases, SWISS- PORT, VAST and Gene bank databases . 2.Extraction and estimation of DNA from Blood, Spleen and Muscle tissue



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Kalyan Post Graduate College
Bhilai Nagar (C.G.)