

National Institute of Technology , Raipur (C.G.)

Course of Study & Scheme of Examination				B. Tech. VII Semester								Branch:	Biotechnology
S.No.	Board of Studies	Sub. Code	Subject Name	Periods/week				Examination Scheme				Total Marks	Credits L+(T+P)/2
				L	T	P	TA	FE	SE	T.C.A.	ESE		
1	Biotechnology	BT 20711 BT	Genomics	3	1	-	20	15	15	50	70	120	4
2	Biotechnology	BT 20712 BT	Microbial Technology	3	1	-	20	15	15	50	70	120	4
3	Biotechnology	BT 20713 BT	Unit Operation	3	1	-	20	15	15	50	70	120	4
4	Biotechnology	BT 2073* BT	Elective I	4	1	-	20	15	15	50	70	120	5
5	Biotechnology	BT 20721 BT	Microbial Tech. Lab	-	-	3	30	-	-	30	20	50	2
6	Biotechnology	BT 20722 BT	Unit Operation Lab	-	-	3	30	-	-	30	20	50	2
7			Pract. Training	-	-	-	50	-	-	50	-	50	2
8			Minor Project	-	-	12	100	-	-	100	50	150	6
9	Biotechnology	BT 20723 BT	Seminar& Report writing	-	-	2	50	-	-	50	-	50	1
Total				13	4	20	340	60	60	460	370	830	30

Note : For attendance of a student in every theory and practical class, the teachers are supposed to keep records ultimately in the following format which will be included in the semester mark-sheets.

* for Elective subject code

Format for attendance			
Attendance			Category
> 85		---->	High "H"
> 70 & < 85		---->	Medium "M"
> 60 & < 70		---->	Low "L"
< 60		---->	Detained " D "

Chairman (BOS)

Member (BOS)

Member (BOS)

DEPARTMENT OF BIOTECHNOLOGY SYLLABUS

Name of the Subject	Genomics	Subject Code	BT 20711 BT
Semester	7th	Board of Studies	Biotechnology
Maximum Marks	70	Minimum Marks	25
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits L+P
03	01	00	4

Unit 1: Introduction

Features of prokaryotic, eukaryotic & organellar genomes, Genome sizes- C value paradox, Gene counting, Structural, Functional genomics. DNA sequencing: Principles of DNA sequencing, Automated DNA sequencing, Shotgun sequencing- contig assembly.

Unit 2: Analysis of sequence data

Analysis & Annotation- ORF, Exon- Intron boundaries, Other features of nucleic acid sequencing, Protein motifs & domains, Databanks, Sequence comparisons. Nature of genetic variation- SNP, Methods to study variation- RFLP, PCR, based methods, Genome- wide comparisons.

Unit 3: Comparative Genomics

Human Genome Project, Phylogenetic Trees, Arabidopsis genome and other genome projects, Synteny, Genome evolution.

Unit 4: Analysis of Gene Expression

Functional Genomics- Analysis transcription- Northern blot, RNase protection assay, RT-PCR, Primer extension analysis, SI- nuclease protection assay, Comparing transcriptomes- subtractive hybridization, differential display, SAGE, Reporter genes.

Unit 5: Application

Gene in health and disease, Genomic disorders and molecular medicines, pharmacogenomics , Gene banks, Legal status of gene bank.

Text/ Reference Books

1. Handbook of Comparative Genomics: Principle and Methodology by Cecilia Saccone, Graziano Pesole. Wiley- LISS Publication(2003).
2. Comparative Genomics by Meldy S. Clark.Kluwer Academyic Publishers(2001)
3. Essentials of Genomics & Bioinformatics C. W.Sensen, Wiley (2003).
4. Discovery Genomics, Proteomics & Bioinfo, A.M. Cambell, C.S.H. Press, (2003)
5. Various research and review journals like nature Biotechnology, Current option, Trends and Annual Reviews.

DEPARTMENT OF BIOTECHNOLOGY SYLLABUS

Name of the Subject	Microbial Technology	Subject Code	BT 20712 BT
Semester	7th	Board of Studies	Biotechnology
Maximum Marks	70	Minimum Marks	25
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits L+P
03	01	03	4+2

Unit 1: Introduction

Introduction to Microbial Technology; Basic idea on fermentation process; Submerged, Stationary, Solid and Semisolid with their merits and demerits. Media for industrial fermentation.

Unit 2: Basic Requirements

Equipment and accessories for industrial processes. Microbial growth kinetics. Sterilization; Batch sterilization and Continuous sterilization. Media Sterilization. Filter Sterilization.

Unit 3: Microbial Production

Production of Organic acid, Solvent, Antibiotics, Polysaccharides, Enzymes, Vitamins, Pigments, Wine, Dextran, Aroma.

Unit 4: Microbial Product Modification processes

Isolation of Industrially important micro-organisms. Preservation of industrial important microorganism. Improvement of microorganism. The Improvement of industrial strains by modifying properties other than the yield of product.

Unit 5: Industrial and Medicinal Applications

Application of enzymes in industrially analytical purpose and medical therapy. Biodegradation of cellulose and lignin. Production of Biodiesel and Rapeseed methyl esters. Microbial metabolic products; Primary metabolites and Secondary metabolites.

Text Books:

1. Principles of Fermentation Technology, second edition, by P.F.Stanbery, A. Witaker and S.J.Hall.
2. Manual of Industrial Microbiology and Biotechnology, second edition by L. Demain and Julian E. Devies.

Reference Books:

1. Biotechnology by Dr. U. Satyanarayana

National Institute of Technology, Raipur (C.G.)

2. Industrial Microbiology by A. H. Patel.

DEPARTMENT OF BIOTECHNOLOGY SYLLABUS

Name of the Subject	Unit Operations	Subject Code	BT 20713 BT
Semester	7th	Board of Studies	Biotechnology
Maximum Marks	70	Minimum Marks	25
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits L+P
03	01	03	4+2

Unit 1: Introduction

Solids, Characteristics of solid particles, types of standard screen series . Screening and other separation methods: screen analysis, estimation of particle size, surface area and particle population based on screen analysis, Storage and conveying of solids, ideal and actual screens, principles of elutriation, flotation, jigging, cyclone separator, hydroclones, electrostatics and magnetic separation processes.

Unit 2: Size Reduction

Size reduction and enlargements, crushers, grinders, ultrafine grinders, energy and power requirements in comminution, Crushing laws and work index, Open-circuit and closed circuit operation.

Unit 3:- Mixing and Agitation

Axial and radial flow impellers, prevention of vortex and swirling, Liquid-Liquid, Liquid-Solid, Solid-solid mixing operations and equipments, power consumption in agitated vessels mixing index.

Unit 4: Separation Techniques

Sedimentation, settling velocity, flocculation, thickener, thickener design, Classifier. Filtration, filter media, filter aids, batch and continuous filtration, filtration equipments, filter press, leaf, cartridge, vacuum filter, rotary drum filters. Advanced separation processes: Dialysis, ultrafiltration, reverse osmosis and membrane separation.

Unit 5: Conveyors

Conveyors, Belt conveyor, bucket elevator, flight conveyor, apron conveyor, screw conveyor, pneumatic conveying.

Name of text books:

1. Unit operations of Chemical engineering by W.L. McCabe
2. Unit operations I by Hiramath Kulkarni
3. Unit operations I by K. A. Gavhane

DEPARTMENT OF BIOTECHNOLOGY SYLLABUS

Name of the Subject	Bioprocess Technology	Subject Code	BT 20731BT
Semester	7th	Board of Studies	Biotechnology
Maximum Marks	70	Minimum Marks	25
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits L+P
04	01	00	5

Unit 1- Food Industry: Introduction to food industry, food storage, food processing, consumer food processing, dairy products, fruits and vegetable products, poultry and meat product

Unit 2- Biotechnology: Genetic engineering, Introduction to biotechnology, Pharmaceutical industries, Agriculture application, petroleum products and role of biotechnology in field of pollution control

Unit 3- Pharmaceutical Industry & Polymer Industry: Growth of industry, Economy of industry, methods of production of penicillin Polymerization: Chemistry of polymerization Engineering properties of polymers. Technology: Plastic, rubber, polymer oils, fibers

Unit 4- Paper & Pulp Industry : Paper and Pulp industry, Agents, principles, equipments, technology

Unit 5- Oil & Wax Industry, Soap & Detergent Industry: Technology of oil, fats and waxes, soap and detergents industries

Name of Text Books:

1. Groggings, Unit Processes in Organic Synthesis
2. Shreve, Chemical Process Industries.

Name of Reference Books:

1. Dryden, Outlines of Chemical Technology.

DEPARTMENT OF BIOTECHNOLOGY SYLLABUS

Name of the Subject	Cancer Biology	Subject Code	BT 20732 BT
Semester	7th	Board of Studies	Biotechnology
Maximum Marks	70	Minimum Marks	25
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits L+P
04	01	00	5

Unit 1: Introduction

Introduction to Cancer Biology, phenotypic characteristic of cancer cell. Cell cycle and proliferation- cyclins, cdk's and detection of tumour cell growth. Cell cycle checkpoints.

Unit2: Oncogenesis

Oncogenes and tumour suppressor genes.Genetic Basis of cancer– mutational incident. Cytogenesis abnormalities, BRCA genes. Introduction to retroviruses.

Unit 3: Apoptosis

Apoptosis and cancer– overview of cell death process, apoptosis signaling pathways, abnormalities and detection. Types of cancer.

Unit 4: Metastasis

Tumour progression and metastasis– steps of metastasis, associated genes and organ specificity.

Unit 5: Diagnosis and Therapy

Cancer therapeutics: surgical, chemotherapy, radiation and drug resistance. Cancer prevention– chemoprevention,, hormone therapy and antioxidant treatment.

Name of Text Books:

1. A. L. Lehninger, D.L. Nelson, M.M. Cox- “ Principles of werth publishers, 2000. 2. L. stryer, J.M. Berge, J.L. Tymoezko-“Biochemistry “ W.H. freeman & Co. 2002.

Name of Reference Books:

1. Cell & Molecular Biology “concepts & Experiments” Geratd Karp, John Wiley & Son's. 2. The Cell- A molecular approach, Gn Cooper Asm Press.

DEPARTMENT OF BIOTECHNOLOGY SYLLABUS

Name of the Subject	Molecular Pathogenesis	Subject Code	BT 20733BT
Semester	7th	Board of Studies	Biotechnology
Maximum Marks	70	Minimum Marks	25
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits L+P
04	01	00	5

Unit 1- General clinical laboratory techniques and procedures: Volumetric analysis, balancing and weighing, concept of solute and solvent, units of measurement. Specimen collection and processing from blood, urine, spinal fluid, saliva and synovial fluid. Sample preservation and transportation.

Unit 2- Clinical Enzymology : Principle of diagnostic enzymology, liver, cardiac and skeleton enzymes, digestive enzymes, etc.

Unit 3- General Function Test: Liver function test, cardiac function test, renal function test, thyroid function test. Reproductive endocrine function test.

Unit 4- Immunodiagnostic: Immuno assay classification and commercial technologies. DNA based diagnostic – PCR, RFLP, ASSCP, Micro array, and FISH. Cell based diagnostic- Antibody markers, CD markers and bioassays.

Unit 5- Biosensors: Concept and applications, non invasive biosensors in clinical analysis. Introduction to biochips and their applications in modern science.

Name of Text Books:

1. Commercial Biosensors.- Graham Ramsay, John Wilay Son, INC. (1998).
2. Essentials of Diagnostic Microbiology . Lisa Anne shimeld.

Name of Reference Books:

1. Diagnostic Microbiology Balley & Scott's.
2. The Science of laboratory Diagnosis, Crocker Burnelt

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Subject : Microbial Technology

Subject Code : BT20721BT

End Semester Exam Marks : 20

List of Experiments:

1. Microbial strain improvement and preservation techniques.
2. Amino acid production and purification.
3. Alcohol production.
4. Citric acid production.
5. Antibiotic production and screening.
6. Microbial degradation of soil pollutant.
7. Amylase production and analysis.
8. Screening and selection of auxotrophic mutants.

List of Equipments/Machine Required:

1. Autoclave
2. Hot Air Oven
3. Laminar Air Flow
4. Microscope
5. Water Bath
6. Colony Counter
7. Digital Balance
8. Rotating Incubator
9. BOD Incubator
10. Distillation Unit

Text Books:

1. Principles of fermentation Technology, second edition, by Stanberry, Whitaker and Hall.
2. Industrial Microbiology by A.H. Patel
3. Experimental Microbiology, Plant Pathology and Biotechnology by K. R. Aneja

Subject: Unit Operation Lab

Subject Code: BT20722BT

End Semester Exam Marks : 20

List of Experiments :

1. To determine the size distribution of a sample of particulate solid by sieve analysis and to evaluate the average particle diameter.
2. To determine the size distribution of the product of laboratory rod mill.
3. To determine the size distribution of the product of laboratory ball mill.
4. To evaluate the overall effectiveness of given screen.
5. To determine the power required in size reduction and to evaluate the Rittinger's Constant in respect of Laboratory Rod Mill.
6. To determine the degree of mixing of a given binary solid system in Tumbler Mixer.
7. To determine the size distribution in a mass of fine solids by the method of decantation.
8. To study the settling characteristics of the given slurry.
9. To determine the power required for crushing in Roll Crusher.
10. Study of separation of two liquids in laboratory Centrifuge.
11. Study of Filter Press.
12. To determine the power required in size reduction and to evaluate the Rittinger's Constant in respect of Ball Mill.

List of Equipments/Machine Required:

1. Sieve Shaker
2. Rod mill
3. Ball mill.
4. Tumbler Mixer
5. Roll Crusher
6. Filter Press
7. Centrifuge

Recommended Books:

1. W. L. McCabe, J. C. Smith & Peter Harriott, 'Unit Operations of Chem. Engg.' 5th Ed. McGraw Hill Pub.
2. Badger & Banchero, 'Introduction to Chemical Engg.' McGraw Hill
3. Brown et al., 'Unit operations', John Wiley sons.