

**B.Sc- III Year, Semester –VI**  
**PAPER-VI**  
**MICROBIAL TECHNOLOGY**

**Unit I**

- 1.1. Introduction to industrial biotechnology, scope and applications
- 1.2. Principles and exploitation of microorganisms and their products
- 1.3. Isolation and screening of microorganisms for industrial products
- 1.4. Strategies for Strain improvement (mutation, selection, recombination)

**Unit II**

- 2.1 Principles of Fermentation technology
- 2.2 Fermentation concept and Design
- 2.3 Types of Fermentations, Formulation and Design of fermentation Media
- 2.4 Substrates used as Carbon and Nitrogen Inoculum development.

**Unit III**

- 3.1 Microbial production of Organic acids (Lactic acid and citric acid)
- 3.2 Microbial production of Amino acids (Glutamic acid and Aspartic acid)
- 3.3 Fermentation by microbes for food additives: dairy products (Bread and SCP), beverages (Beer and Wine) and antibiotics (Penicillin and Streptomycin,)
- 3.4 Therapeutic drugs: Monoclonal antibodies and insulin,

**Unit IV:**

- 4.1 Factors affecting fermentation process.
- 4.2 Preservation methods of microorganisms.
- 4.3 Food Spoilage by extrinsic and intrinsic factors.
- 4.4 Biofuels: Alcohol, Methane.

### CORE-VI: PRACTICALS

1. Screening of Microorganisms (primary selection, secondary selection)
2. Production of Citric acid
3. Screening of amylase producing microorganisms
4. Isolation of microorganisms from spoilage food.
5. Production of wine using common yeast
6. Production of hydrogen or biogas using cow/cattle dung

### SPOTTERS:

1. Fermented food
2. Bioreactor
3. SCP
4. Insulin
5. Biogas
6. Amylase
7. MAB
8. Penicillin
9. Down stream process
10. Methane

### REFERENCE BOOKS

1. Text Book of Biotechnology - By H.K. Das (Wiley Publications)
2. Biotechnology -By H.J. Rehm and G. Reed. VIH Publications, Germany
3. Biogas Technology - By b.T. Nijaguna
4. Biotechnology - By K. Trehan
5. Industrial Microbiology - By L.E. Casida
6. Food Microbiology - By M.R. Adams and M.O. Moss
7. Introduction to Biotechnology - By P.K. Gupta
8. Essentials of Biotechnology for Students - By Satya N. Das
9. Bioprocess Engineering - By Shuler (Pearson Education)
10. Essentials of Biotechnology - By Irfan Ali Khan and AtiyaKhanum (Ukaaz Publications)



B. Sc. Biotechnology Syllabus, Kakatiya University (CBCS)

Board of Studies in Biotechnology  
Kakatiya University  
Warangal - 506 009 (A.P.)

**B.Sc- IIIYear, Semester –VI**  
**ELECTIVE PAPER-(A)**  
**ANIMAL BIOTECHNOLOGY**

**UNIT-I**

- 1.1. Animal tissue culture, history, requirements for animal cell culture
- 1.2. Substrate, liquids, culture mediums-Natural (Clots, Biological fluids, Tissue extracts), complex natural and chemically defined media
- 1.3. Explant-culture of explants, Cell culture technique- initiation, preparation and sterilization of media, isolation of explants, disaggregation of explants, culture, subculture
- 1.4. Cell lines, evolution of cell lines, maintenance of cell lines, Large scale culture of cell lines- monolayer, suspension and immobilized cell culture, Development of primary culture and cell lines, subculture

**Unit-II**

- 2.1. Cultured cells and evolution of continuous cell lines (established cell lines)
- 2.2. Commonly used cell lines - their origin and characteristics
- 2.3. Cell line preservation and characterization
- 2.4. High level expression of foreign gene in animal cells-expression vectors, enhancers, regulatory sequences. The need to express foreign genes in animal cells: advantage and disadvantages.

**Unit-II**

- 3.1. Transfection methods of animal cells (Calcium phosphate, DEAE-dextran, Lipofection, Electroporation, Microinjection, Embryonic stem cell transfer)
- 3.2. Selection of recombinant cells with various marker genes (Thymidine Kinase, Dihydrofolate reductase, CAD protein, XGPRT, HAT, Neomycin phosphotransferase )
- 3.3. Production of transgenic animals (Mice, Cattle, Sheep, pigs, Fish and Birds)
- 3.4. Applications, advantages and disadvantages of animal tissue culture and Ethical issues related to transgenic animals.

**Unit -IV**

- 4.1. Stem cells: Characteristic features, maintenance, culture and Applications of Embryonic and adult stem cells.
- 4.2. Animal cloning- Nuclear transfer and embryonic stem cell method
- 4.3. Molecular pharming: Transgenic animals and their applications, methods used for transgenesis with reference to transgenic mice ,cattle, sheep, goats, pigs, chicken and fish.
- 4.4. Animal cells as a bioreactors for the production of commercially important products



## **PRACTICALS**

1. Preparation of media
2. Isolation of cells from Chick embryo
3. Establishment and maintenance of primary cell cultures
4. Subculture of monolayer cells
5. Subculture of suspension cells
6. Determination of viable cells by trypan blue test

## **SPOTTERS:**

1. Trypsinization
2. Monolayer
3. Transgenic Mice
4. Lipofection
5. Microinjection
6. Cell lines
7. Marker genes
8. Bioreactor
9. HAT
10. Dolly

## **REFERENCE BOOKS**

1. Strategies in Transgenic Animal Sciences - By Glemn M.M. and James M. Robl ASM Press 2000.
2. Practical Biotechnology – Methods and Protocols - By S. janarthanan and S. Vincent (Universities Press)
3. Animal Cells as Bioreactors - By Terence Gartoright, Cambridge Univ Press
4. Molecular Biotechnology - By Chinnarayappa (Universities Press)
5. Principles and Practice of Animal Tissue Culture - By SudhaGangal (Universities Press)
6. Introduction to Veterinary Genetics - By F.W. Nicholas, Oxford University Press
7. Biotechnology – By U. Satyanarayana
8. Essentials of Biotechnology for Students - By Satya N. Das

**SEMESTER-VI  
ELECTIVE THEORY (B)  
ENVIRONMENTAL BIOTECHNOLOGY**

**Unit-1**

- 1.1 Introduction to environment and pollution
- 1.2 Types of pollution- air, water and land pollutions
- 1.3 Types of pollutants–inorganic, organic and biotic sources
- 1.4 Sources of pollution – domestic waste, agricultural waste, industrial effluents and municipal waste

**Unit-II**

- 2.1 Renewable and non-renewable energy resources
- 2.2 Fossil fuels as energy source and their impact on environment
- 2.3 Non-conventional source – biomass as source of bioenergy
- 2.4 Types of biomass – plant, animal and microbial biomass

**Unit-III**

- 3.1 Microbial treatment of waste water (sewage of industrial effluent)- aerobic and anaerobic methods
- 3.2 Solid waste and management; Bioremediation– concepts and types (in-situ and ex-situ); Bioremediation of toxic metal ions– biosorption and bioaccumulation
- 3.3 Microbial bioremediation of pesticides and Xenobiotic compounds
- 3.4 Phytoremediation- concepts and application

**Unit – IV:**

- 4.1. Climate change, greenhouse gases and global warming, Impact of pollution on environment and measurement methods.
- 4.2. Production of biofuels, bioethanol&biomethanol
- 4.3. Conservation of biodiversity.
- 4.4. Carbon Sequestration – Vision, methods and managerial strategies.



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### **ELECTIVE (B): PRACTICALS**

1. Estimation of BOD in water samples
2. Estimation of COD in water samples
3. Estimation of total dissolved solid in water samples
4. Isolation of microorganisms from soil/industrial effluents
5. Production of biogas using cow/cattle dung
6. Bioremediation

### **SPOTTERS:**

1. Aerosols
2. Biomagnification
3. Tidal energy
4. Habitat destruction
5. Biodegradable plastic – Poly hydroxy butyrate
6. Elinino affect
7. Coral reefs
8. Xenobiotic compounds
9. Global warming
10. Bioethanol

### **RECOMMENDED BOOKS**

1. Text Book of Biotechnology - By H.K. Das (Wiley Publications)
2. Biotechnology -By H.J. Rehm and G. Reed. VIH Publications, Germany
3. Biogas Technology - By B.T. Nijaguna
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**KAKATIYA UNIVERSITY**  
**U.G. B.Sc. Final Year (Under CBCS)**  
**Semester – VI: Generic Elective Paper-II**  
**(FOR ALL SCIENCE FACULTY DEPARTMENTS)**

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**WATER RESOURCES MANAGEMENT**

**UNIT-I**

1. Importance of Natural Resources – Different Types Resources
2. Significance of Water Resources and their uses
3. Conservation of water and recycling of the water – Global distribution of water
4. Water shed programmes and their management
5. Storing the rain water in tanks and recharging ground water.

**Unit-II**

6. Rain water harvesting in rural areas (chekdam, trenches etc.,)
7. Over use of surface and ground water and control measures.
8. Aims, objectives and implementation of Mission Bhagiratha (Telangana Government Drinking water programme )
9. Aims, objectives and implementation of Mission Kakatiya (Telangana Government minor irrigation programme)
10. Issues and challenges in Water Resources Management

*P. Narasimha Rao*  
*Dean FSS. K.U.*

**KAKATIYA UNIVERSITY**  
**U.G. Skill Enhancement Course - IV**  
**(Under CBCS)**  
**B.Sc. Final Year (GE-2)**  
**SEMESTER - VI**  
**(FOR ALL SCIENCE FACULTY DEPARTMENTS)**

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**QUANTITATIVE APTITUDE TEST**

**Credits: 2**

**Theory: 2 hours/week**

**Marks - 50**

**Unit – I ARITHMETICAL ABILITY**

- 1.1 Arithmetical Ability:** Ratio & Proportion
- 1.2 Arithmetical Ability:** Time & Work, Time & Distance
- 1.3 Arithmetical Ability:** Simple Interest, Compound Interest
- 1.4 Arithmetical Ability:** Stocks & Shares

**Unit – II DATA INTERPRETATION**

- 2.1 Data Interpretation:** Tabulation
- 2.2 Data Interpretation:** Bar Graphs
- 2.3 Data Interpretation:** Pie Charts
- 2.4 Data Interpretation:** Line Graphs

**Text Book:** Quantitative Aptitude by Dr. R.S. Aggarwal