

KAKATIYA UNIVERSITY
Under Graduate Courses (Under CBCS 2020 – 2021 onwards)
B.SC. BIOTECHNOLOGY III YEAR
SEMESTER – VI

Elective Course DSE-6

ENVIRONMENTAL BIOTECHNOLOGY
(ELECTIVE - a)

UNIT-I

- 1.1.Introduction to environment and pollution.
- 1.2.Types of pollution- air, water and land pollution.
- 1.3.Types of pollutants- inorganic, organic and biotic sources.
- 1.4.Sources of pollution- domestic waste, agriculture waste, industrial effluents, municipal waste.
- 1.5. Biomonitoring of environmental pollutants by bioindicators.
- 1.6. Emission control biotechnology - air sampling techniques

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 as bio energy.
- 2.4.Types of biomass- plant, animal and microbial biomass.
- 2.5.Biodelignification by enzymes.
- 2.6.Biodesulphurisation of coal.

UNIT-III

- 3.1. Microbial treatment of waste water (sewage of industrial effluents)- aerobic and anaerobic methods.
- 3.2. Solid waste and management- bioremediation- concepts and types (insitu and exsitu).
- 3.3. Bioremediation of toxic metal ions- bio sorption and bioaccumulation.
- 3.4. Microbial bioremediation of pesticides and xenobiotic compounds.
- 3.5. Phytoremediation- concepts and applications.
- 3.6. Degradative plasmids and genes in biomining.

UNIT-IV

- 4.1.Climate change, Green house gases and global warming.
- 4.2.Impact of pollution on environment and measurement methods.
- 4.3.Production of bio fuels, Bio ethanol and Bio methanol.
- 4.4.Conservation of Biodiversity.
- 4.5.Carbon sequestration- vision, methods and managements strategies.
- 4.6. GEMS and their impact on environment.

PRACTICAL PAPER –VI

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 hydroxyl butyrate
6. El Niño effect
7. Coral reefs
8. Xenobiotic compounds
9. Global warming
10. Bioethanol

REFERENCE BOOKS

1. Text Book of Biotechnology- By H.K. Das (Wiley Publications)
2. Biotechnology- By B.T. Nijaguna
3. Biogas Technology-by K Trehan
4. Industrial Microbiology by L.E. Casida
5. Food Microbiology by M.R. Adams and M.O Moss
6. Introduction to biotechnology by P.K. Gupta
7. Essentials of Biotechnology for Satya N. Das
8. Bioprocess Engineering by Shuler (Pearson Education)
9. Essentials of Biotechnology by Irfan Ali Khan and Atiyakhanum (Ukaaz Publication)

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B.S.C. BIOTECHNOLOGY III YEAR
SEMESTER – VI

Elective Course DSE-6

ANIMAL BIOTECHNOLOGY
(ELECTIVE - b)

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),
Completed natural and chemically defined media.
- 1.3. Explant – culture of explants, cell culture technique – initiation, preparation and sterilization
of media.
- 1.4. Isolation of explants, disaggregation of explants, culture, subculture.
- 1.5. Cell lines, evolution of cell lines, maintenance of cell lines, Large scale culture of cell lines –
monolayer, suspension and immobilized cell culture.
- 1.6. 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.
- 2.5. Expression foreign genes in animal cell - advantages and disadvantages.
- 2.6. Properties of cell lines – Biology and characterisation of cultured cells.

UNIT-III

- 3.1. Transfection methods of animal cells (Calcium phosphate, DEAE – dextran, lipofection,
Electroporation, Microinjection).
- 3.2. Embryonic stem cell transfer.
- 3.3. Selection of recombinant cells with various marker genes (Thymidine Kinase,
Dihydrofolate reductase, CAD protein, DGPRT, HAT, Neomycin phosphotransferase)
- 3.4. Production of transgenic animals (Mice, Cattle, Sheep, pigs, Fish and Birds)
- 3.5. Applications, advantages and disadvantages of animal tissue culture.
- 3.6. 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.
- 4.4. Methods used for transgenesis with reference to transgenic mice, cattle, sheep, goats,
pigs, chicken and fish.
- 4.5. Animal cells as bioreactors for the production of commercially important products.
- 4.6. Cryopreservation – principles.

PRACTICAL PAPER –VI

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. Cells lines
6. Marker genes
7. Bioreactor
8. HAT
9. Dolly
10. Microinjection

REFERENCE BOOKS

1. Strategies in transgenic animal sciences by Glenn MM and James M. Robl ASM Press 2000
2. Practical biotechnology methods and protocols by S. Janarthana and S. Vincent
3. Animal cells as bioreactors by Terence Gartoright, Cambridge university
4. Essentials of biotechnology for students by Sayan N Das
5. Principles and practice of Animal tissue culture by Sudha Gangal university
6. Biotechnology by U. Satyanarayana