

M.G. Science Institute, Autonomous

Affiliated to Gujarat University, Ahmedabad

(Managed by The Ahmedabad Education Society)

Department of Biotechnology

Programme: Bachelor of Science (Hons.) in Biotechnology

SYLLABUS

(Effective from Academic Year 26-27)

Semester: V	Title: Analytical techniques III	Credit:
Course Code: BTMSEC356 A (T)		2hr/week

Course Outcomes (COs):

After successful completion of this course, students will be able to:

CO1: Understand the principles and types of PCR and their applications in molecular biology.

CO2: Describe the methodology

CO3: Explain the

CO4: Evaluate the advantages, limitations,

CO5: Apply the knowledge of molecular markers in biotechnology research and diagnostics.

CO/PO Map

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	1	3		1	
CO2	2		3		2		1
CO3	2	2		3			
CO4		2	2				
CO5	1	3			2	2	

Unit 1 Polymerized chain reaction

Teaching hours 15

- Principle and components of PCR
- Primer design and PCR setup
- Types of PCR: Conventional, Real-Time PCR (qPCR), Multiplex PCR, Nested PCR, RT-PCR
- Applications of PCR in disease diagnostics, forensics, and agriculture

Unit 2: DNA Sequencing

Teaching hours 15

- Introduction to DNA sequencing: History, overview and significance
- DNA sequencing technique: Maxam Gilbert, Sangers sequencing, Automated Sangers sequencing
- DNA sequencing technique: Next generation sequencing techniques.
- Applications of DNA sequencing

References:

1. Brown, T.A. (2016). *Gene Cloning and DNA Analysis: An Introduction*. 7th Edition. Wiley-Blackwell.
2. Sambrook, J., & Russell, D.W. (2001). *Molecular Cloning: A Laboratory Manual*. 3rd Edition. Cold Spring Harbor Laboratory Press.
3. Primrose, S.B., & Twyman, R.M. (2013). *Principles of Gene Manipulation and Genomics*. 7th Edition. Wiley-Blackwell.
4. Gupta, P.K. (2009). *Elements of Biotechnology*. Rastogi Publications.
5. Glick, B.R., & Pasternak, J.J. (2010). *Molecular Biotechnology: Principles and Applications of Recombinant DNA*. 4th Edition. ASM Press.

Semester: V	Title: Ecosystems, Natural Resources, and Biodiversity	Credit:
Course Code: BTMSEC356 B (T)		2hr/week

Course Outcomes:

Upon successful completion of this course, students will be able to:

- CO1: Understand the structure and function of ecosystems and the importance of biodiversity.
 CO:2 Analyze key environmental issues, including pollution and climate change
 CO3: Apply the principles of sustainable development to environmental problem-solving.
 CO4: Evaluate the role of individuals and society in environmental conservation.
 CO5: Gain awareness of environmental policies and ethical responsibilities. CO/PO mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	3			
CO2	3		3		2		
CO3				2		1	
CO4	2	2		1			1
CO5	1	2	1		2	2	

Unit I: Ecosystems, Natural Resources, and Biodiversity

Teaching hours: 15

1.1 Introduction to Environmental Studies, Definition, scope, and importance

- Components of the environment: atmosphere, hydrosphere, lithosphere, and biosphere

1.2 Ecosystems

- Structure and function of an ecosystem
- Food chains, food webs, and ecological pyramids, Energy flow and nutrient cycles
- Types of ecosystems: forest, grassland, desert, aquatic (pond, river, ocean)

1.3 Natural Resources

- Renewable and non-renewable resources
- Forest resources, Water resources
- Energy resources: growing energy needs, alternate energy sources

1.4 Biodiversity and Conservation

- Levels of biodiversity: genetic, species, and ecosystem

- Biodiversity in India: hotspots and threats, Conservation of biodiversity: in-situ and ex-situ methods

Unit II: Environmental Issues and Sustainable Practices

Teaching hours 15

2.1 Environmental Pollution

- Types: air, water, soil, noise, and plastic pollution
- Causes, effects, and control measures, Solid waste management and e-waste

2.2 Global Environmental Challenges

- Climate change and global warming, Ozone layer depletion, Acid rain
- Environmental disasters and risk reduction

2.3 Sustainable Development and Environmental Ethics

- Concept of sustainable development, Environmental impact assessment (EIA)
- Role of individuals and communities in environmental conservation
- Principles of environmental ethics and responsible citizenship

2.4 Environmental Legislation and Initiatives

- Key environmental laws in India: Environment Protection Act, Wildlife Protection Act, Forest Conservation Act, Role of government and NGOs
- International environmental agreements: Rio Summit, Kyoto Protocol, Paris Agreement

Reference Books:

1. Erach Bharucha – *Textbook of Environmental Studies for Undergraduate Courses*, University Grants Commission.
2. R. Rajagopalan – *Environmental Studies: From Crisis to Cure*, Oxford University Press.
3. Anubha Kaushik and C.P. Kaushik – *Perspectives in Environmental Studies*, New Age International Publishers.
4. William Cunningham & Mary Cunningham – *Principles of Environmental Science: Inquiry and Applications*, McGraw-Hill Education.
5. P.D. Sharma – *Ecology and Environment*, Rastogi Publications.

