Certificate course	December (Even Semester)	Biogas Technology
PO's Aligned – As listed below		Credit- 02 (T-1, P-1), Total Number of Teaching Hours- 45Hrs

PROGRAMME OUTCOMES (POs)

PO-1: Experimental & Analytical Proficiency: The curriculum emphasizes mastery in designing and conducting scientific experiments using standard methodologies. Students critically evaluate and interpret data to derive reliable, reproducible scientific conclusions.

PO-2: Environmental Consciousness & Sustainability: The program cultivates the ability to apply analytical knowledge to global sustainability challenges. Students are encouraged to propose evidence-based solutions that align with soil analysis and sustainable development goals

Programme Specific Outcomes (PSOs)

PSO1: Mastery in Microbiology and Innovations: Candidates will acquire proficiency in anaerobic microbiological techniques to produce biogas from various feedstocks and its applications.

PSO2: Application of Microbiology to Health, Agriculture, and Industry: Candidates will apply microbiological knowledge to develop practical solutions in environmental biotechnology, and agriculture..

Course Outcomes (COs)

CO1: Explain the principles of anaerobic digestion of feedstocks to produce biogas

CO2: Apply methods to operate, maintain, and evaluate different types of biogas plant models; analyze biogas; and assess the economic and environmental viability of biogas systems

Mapping matrix of POs , PSOs and COs

	POs			PSOs		
CO \ PO	1	2	CO Avg	1	2	CO Avg
CO1	2	3	2.5	1	2	1.5
CO2	3	3	3.0	2	2	2.0
PO /CO Avg	2	3	2.5	3	3	3.0

(1-weak correlation; 2-medium correlation; 3-strong correlation)

This course will provide theoretical as well as practical knowledge about Biogas Technology.

Teaching Pedagogy

1. Lecture method
2. Seminar method
3. Demonstrations method

Teaching Methods and Tools

1.Direct Teaching using Black board,
2. Presentations,
3. Multimedia resources,
4. Diagrams and Layouts,
5. Group discussion and activity,
6. Experimentation,
7. Hands on training

Detailed Syllabus		
Unit-1 Theory (Credit: 01, Teaching Hours: 15)		
	Title	**Number of Teaching Hours**
1	Introduction: Definition, History of biogas	1
2	How biogas is produced? (Biochemistry)	2
3	Use of different raw materials for biogas production	4
4	Factors affecting the production of biogas	4
5	Utilization of digested slurry	3
6	Economics of biogas plant	1
	Unit-2 Practical (Credit: 01, Teaching Hours: 30)	
7	Qualitative (by Orset apparatus) and quantitative (by water displacement method) analysis of biogas production	9
8	Types of biogas plant models	5
9	How to operate the biogas plants?	4
10	Maintenance of biogas plants	7
11	Uses of biogas	5

Assessment Method	
Internal/Online Assessment (40%)	1. Written test (20 Marks) 2 .Quiz / Group Discussion (10 Marks) 3. Assignments / Seminar (10 Marks)
External Assessment (60%)	Term End Theory examination (Written test 60 Marks)

References-

1. Biogas Systems: Principle and Applications, K.M.Mital, New Age International(P) Limited, New Delhi,(1996)
2. Biogas Technology: A Practical Handbook, K. C. Khandelwal, S.S. Mahdi, Tata McGraw-Hill, 1989.