

Environmental Biotechnology

Module Number	CEBg; 6444			
Module Title	Environmental Biotechnology			
PG Program	MSc. in Biochemical Engineering			
ECTS	6			
Credit hrs.	3			
Module Work load distribution in hours				
	Contact/ interactive	Individual/ Self study	Collaborative/ Exam preparation	Total
	72	84	24	180
Objectives	<p>The objectives of this course are to:</p> <ul style="list-style-type: none"> Identify and characterize the most important contaminants in the Bioprocess and other industrial wastes Analyze the effect of different contaminant on different bioprocess and in analytical techniques Identify the stabilization methods of different aerobic and anaerobic sludge and swage treatments Characterize and evaluate different biological waste treatment Mechanisms of the specific application of microorganisms to remove pollutants Bioreactor performance in biological treatment of different contaminants. Study case Reuse/recycle the biological waste to clean technology such as energy, biofuel, bio fertilizer through bioremediation 			
Module Outcomes	<p>After completing this module, students will be able to:</p> <ul style="list-style-type: none"> Identify different contaminant and treatment in order to eliminate or reduce the effect coming from them Know different types of biological treatment and bioreactors Design bioreactor for biological waste treatment 			
Module Description/ contents	<p>Biotechnological solutions to environment-related problems.</p> <p>Wastewater treatment: Wastewater characterization, types of WWT, biological removal of organics, aerobic and anaerobic processes, biological nitrogen and phosphorus removal.</p> <p>Suspended cell and attached (anchored) cell processes for carbon, nitrogen and phosphorus removal.</p> <p>Conventional as well as recent developments in bioreactor configurations for wastewater treatment.</p> <p>Design calculations.</p> <p>Treatment of sludge: Aerobic and anaerobic sludge stabilization, heavy metal bioleaching.</p> <p>Solid waste treatment: Waste characterization, basis of biological solid waste treatment, composting, sanitary land-filling of solid wastes, waste to energy</p>			

	processes, biogas production, biodiesel, bioethanol and biomethanol recovery. Treatment of xenobiotic compounds: Basic concepts, biological treatment processes targeting xenobiotic and their design; Bioproducts recovery.
Pre-requisite	Biochemistry, Bioprocess Industrial Microbiology and Genetics Engineering, Chemistry, Fundament of Biochemical Engineering.
Semester	II
Status of the course	Compulsory
Teaching & Learning Methods	Lecture, Homework assignments, Oral presentations by the students, Lab. Practices, final exam..
Assessment/ Evaluation & Grading System	Seminars, assignments and lab practices 30-40% Final exam 60-70%
Attendance Requirements	At least 80% of the Lecture time
Literature	<ol style="list-style-type: none"> 1. Stanier R.Y., Ingraham J.L., Wheelis M.L., Painter R.R., General Microbiology, Mcmillan Publications, 1989. 2. Foster C.F., John Ware D.A., Environmental Biotechnology, Ellis Horwood Ltd., 1987. 3. Chakrabarty K.D., Omen G.S., Biotechnology And Biodegradation, Advances In Applied Biotechnology Series, Vol.1, Gulf Publications Co., London, 1989. 4. Bailey J.E. & Ollis, D.F. Biochemical Engineering Fundamentals, 2nd Ed., McGraw Hill, 1986 5. Alan Scragg., Environmental Biotechnology,