Department of Liberal Education
Era University, Lucknow
Course Outline
Effective From: 2023-24

Name of the Program	**B.A. / B.Sc. (LIBERAL EDUCATION)**			**Year/ Semester:**	**1st / 2nd**
Course Name	**Agriculture and Environmental Microbiology**	**Course Code:**	**MB102**	**Type:**	**Theory**
Credits	**05**			**Total Sessions Hours:**	**75 Hours**
Evaluation Spread	**Internal Continuous Assessment:**	**50 Marks**		**End Term Exam:**	**50 Marks**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives	This module will help students to understand following; a. Function of ecosystem; terrestrial, aquatic, atmosphere etc. b. Extremophiles c. Microbial interaction d. Biogeochemical cycling e. Microbial bioremediation; Biofertilizer &Biopesticides f. MPN test/Presumptive test g. Membrane filter technique				

Course Outcomes (CO): *After the successful course completion, learners will develop following attributes:*

Course Outcome (CO)	**Attributes**
CO1	Students will understand the structure and function of ecosystem with natural habitat of diverse protection.
CO2	Students, understand how microbes interact among themselves and with higher plants and animals with the help of various examples and become aware of the important role of microbes play in bio-geochemical cycling of essential elements occurring within an ecosystem.
CO3	Students will gain depth knowledge of the bio-fertilizer, biopesticides its types, advantages and disadvantages.
CO4	Students will learn and gain skill to detect potability of water sample with different test & technique.
Pedagogy	Interactive, discussion-bases, student-centered, presentation.
Internal Evaluation Mode	Mid-term Examination: 20 Marks Activity: 10 Marks

	Class test: 05 Marks Online Test/Objective Test: 05 Marks Assignments/Presentation: 05 Marks Attendance: 05 Marks		
Session Details	**Topic**	**Hours**	**Mapped CO**
Unit 1	**Microorganisms and their habitats** • Structure and function of ecosystem • Terrestrial environment: soil profile and soil microflora • Aquatic Environment: microflora of fresh water and marine habitats • Atmosphere: Aeromicroflora and dispersion of microbes • Animal Environment: Microbes in/on human body (microbiomes) & animal (Ruminants) body • Extreme habitats: Extremophiles: Microbes thriving at high & low temperature, pH. High hydrostatic & osmotic pressures, salinity and low nutrient level. • Microbial succession in decomposition of plant organic matter. **Activity:** Demonstration of soil profiling test and list the recently identified soil microorganisms.	15	CO1
Unit 2	**Microbial Interactions** • Microbe interactions: Mutualism, synergism, commensalism, competition, • Amensalism, parasitism, predation • Microbe-Plant interaction: positive-negative Interaction • Microbe-Animal interaction: positive-negative interaction • Microorganism of rhizosphere, rhizoplane and phylloplane, mycorrhiza (types and its applications). **Biogeochemical cycling** • Carbon cycle: Microbial degradation of cellulose, hemicellulase, lignin and Chitin • Nitrogen cycle: Nitrogen fixation, ammonification, nitrification, denitrification and nitrate reduction • Phosphorous cycle: Phosphate Immobilisation and solubilisation • Sulphur cycle: Microbes involved in sulphur cycle. **Activity:** Observe the mutualism through leguminous roots and relate it with nitrogen fixation	20	CO2

Unit 3	**Microbial Bioremediation** • Principle and degradation of common pesticides • Organic (hydrocarbon, oil spills) and inorganic matter • Biosurfactants. **Biofertilizer** • Definition, Types- Bacterial, Fungal, Phosphate solubilizer, BGA & associative Mode of application • Advantages and Disadvantages **Biopesticides** • Introduction, definition and types of biopesticides • Integrated pest management (IPM) • Mode of action and Factor influencing • Applications, advantages& disadvantages **Activity:** Prepare a list of biofertilizer and biopesticides used commercially and relate it with conventional fertilizer and pesticides.	20	CO3
Unit 4	**Water potablity** • Treatment and safety of drinking water • Methods to detect potability of water sample • Standard qualitative procedure- MPN test/Presumptive test • Confirmed and completed test for faecal-coliforms • Membrane filter technique Presence/Absence test fecal coliform. **Activity:** Determine the OD concentration in water sample and list a few daily activities that can be stoped during water scarcity	20	CO4

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1						2		2		1	3	2	
CO2		2				2			3	1	2	3	1	
CO3		2	2			1			2		3	2	2	
CO4				2	2	3	3		3	2	3	2	2	3

Strongcontribution-3, Averagecontribution-2, Lowcontribution-1,

Suggested Readings:

Text- Books	1. Mehrotra A.S., Plant Pathology, Tata Mcgraw Hill Publications limited, New Delhi. 2. DubeyR.C.and Maheshwari D.K., Textbook of microbiology, S Chand Publications.
Reference Books	1.Hurst, C.J., Environmental Microbiology, ASM press, Washington D.C. 2. Mehrotra A.S., Plant Pathology, Tata Mcgraw Hill Publications limited, New Delhi. 3. Pelczar M.J., Chan E.C.S and Kreig N.R., Microbiology, Mcgraw-Hill Book Company, New York. 4. Prescott Lansing M., Harley John P. and Klein Donald A., Microbiology, WCB Mcgraw- Hill, NewYork.

Para Text	**Unit 1:** **1.https://www.classcentral.com/tag/microbiology** **Unit 2:** **2.https://www.mooc-list.com/tags/biotechnology** **Unit 3:** **3.https://asm.org/articles/2020/december/virtual-resources-to-teach-microbiology-techniques** **Unit4:** **4.https://www.futuredirections.org.au/publication/living-soils-role-microorganisms-soil-health**

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	**Marks**	**Pattern**
Mid Semester	20	**Section A:** Contains **10** MCQs/Fill in the blanks/One Word Answer/ True-False type of questions. Each question carries **0.5 mark.** **Section B:** Contains **07** descriptive questions out of which **05** questions are to be attempted. Each question carries **03 marks**.
Activity	10	Will be decided by subject teacher
Class Test	05	Contains **05 descriptive questions.** Each question carries **01** mark.
Online Test/ Objective Test	05	Contains **10 multiple choice questions.** Each question carries **0.5** mark.
Assignment/ Presentation	05	Assignmet to be made on topics and instruction given by subject teacher
Attendance	05	As per policy
Total Marks	**50**	

Course created by: **Dr. Manaal Zahera** **Signature:**	**Approved by: Dr. Amita Jain** **Signature:**