	Mahatma Gandhi University **School of Environmental Sciences**
Programme:	1. **MSc. Environment Science and Management**

SEMESTER I

Ecology and Environment	
Core	
ES M21 C 01	

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO No.
1.	Explain the concept of ecology and relevance of environmental science	U	1
2	Able to distinguish the structure, organization and processes in various ecosystems	A	1, 10
3.	Develop a knowledge on the structural and functional aspects of a population as an ecological unit	Ap	1, 2
4	Understand and analyse the concept of biological community, changes and interactions within community	U, A	6,9
5	Develop skill on applied aspects of ecology including mathematical or conceptual model of population or community dynamics to analyse the various factors of population growth and regulation.	Cr	7, 8

	Environmental Geosciences
	Core
	ES M21 C 02

CO No.	At the end of the course, the student will be able to:	Taxonomic Level (TL)	PSO
1.	Explain the basics of Earth systems its processes and landforms	U	1
2	Distinguish various Plate tectonic processes and resultant features	A	1
3.	Identify major minerals, rocks and structures on the Earth	Ap	1
4	Distinguish the major land forms formed by the action of various geological agents	A	1, 4
5	Analyse the interrelationship between various spheres (Atmosphere, Lithosphere and Hydrosphere) of the Earth	E	1
6	Describe the various resources of the earth and its environmental impacts due its exploration	U	2, 3
7	Appraise the different geo-scientific approaches for sustainable environment	E	2

	Environnemental Chemistry
	Core
	ES M21 C 03

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Describe the basics of environmental chemistry	R	1
2	Demonstrate knowledge of chemical and biochemical principles of fundamental environmental processes in air, water, and soil.	U	1, 3
3.	Describe the chemistry of air, water and soil pollutants	E	3
4.	Apply basic chemical concepts to analyse chemical processes involved in different environmental problems (air, water & soil)	Ap	2
5.	Describe Chemical and physical factors involved in Fate and transport of pollutants	Ap	1, 3
6.	Explain energy crisis and different aspects of sustainability	E	2, 6
7.	Discuss local and global environmental issues	A	2, 4

	Environmental Pollution and Control
	Core
	ES M21 C 04

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Identify and distinguish the sources and types of water, air, and soil pollution.	R	2, 3
2	Articulate knowledge about impact and control measures of water, air, and soil pollution.	U	3

3.	Describe environmental analysis for various water, air and soil quality parameters	E	3, 8
7	Expound the water and waste water treatment	U	5
5	Explain Fate and transport of pollutants and distinguish the regional and global impact of pollution	A	2, 3
6	Describe Radioactive pollution and radioactive waste management methods	U	5
7	Conduct environmental sampling and analysis	Ap	7, 8

Research Methodology and Statistics
Elective
ES M21 C 05

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Describe the various research methods and statistical technique for doing research	U	7,8
2	Infer the literature; data analysis and result presentation procedures.	U	7
3.	Develop testing hypothesis for research	A	7
4	Appraise various statistical technique for doing research	E	8
5	Interpret and explain research articles in their academic discipline.	U	7,8
6	Apply statistical soft wares for data analysis	A	8

	Lab course-I (Environmental Chemistry, Geosciences and Ecology)
	Core
	ES M21 C 06

CO No.	At the end of the course, the student will be able to:	Taxonomic Level (TL)	PSO
1.	Understand the basic principles of the analysis of water, air, soil quality parameters	U	1, 2, 3, 4, 6
2	Carry out analysis of physico-chemical parameters of air, water and soil	U	1, 2, 6
3.	Conduct noise pollution measurement	Ap	1, 3
4	Carry out ecological assessment	Ap	1, 3, 5
5	Identify various rocks and minerals	Ap	1, 3
6	Draw rose diagrams for various geological analysis	A	6, 8
7	Conduct geological field survey	Ap	6, 8

	Introduction to Disasters and its management
	Elective
	ES M21 E 07

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Explain the relation between Earth's processes and disasters	U	1, 2
2	Distinguish various types and causative factors of disasters	An	1, 2
3.	Illustrate the key concepts of disaster management	U	2
4	Analyse the International disaster management system	An	6
5	Assess the disaster management strategies in India	E	9, 10

Energy Resources
Elective
ES M21 E 08

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Describe the basics of energy, their units; understand different forms of Energy and their transfer ; Gains an idea of Global Energy Status	U, R	1, 4, 6
2	Understand and classify sources of Energy based on renewability; To understand the functioning of a Nuclear Power plant and Evaluate the sustainability of Nuclear Energy; To assess the Environmental Impacts of Energy resources.	U,A,E	4, 6
3.	Classify different kinds of renewable Energy sources; To assess the Environmental Impacts	U,E	1, 2
4	Understand different energy resources available in India; to assess their potential at present and in future	U,A,E,R	1, 2
5	To assess the environmental pollution and other issues associated with energy generation and consumption. Identify suitable techniques to solve environmental issues.	U,A,Ap.	1, 3, 4
6	Explain the importance of Energy Auditing and list different categories of Energy Auditing .Plan to conduct a suitable energy audit for different kinds of energy users.	U, R,C	7, 8

	Nature Studies-Field skills and techniques
	Elective
	ES M21 E 09

CO No.	At the end of the course, the student will be able to:	Taxonomic Level (TL)	PSO
1.	Understand the basics of sampling of water and sediment, soil and air	U	1
2	Conduct the sampling of air, water and soil	Ap	3, 5
3.	Conduct the sampling aquatic organisms	Ap	3, 5
4	Carry out biodiversity assessment	Ap	3
5	Conduct quadrate study	Ap	3
6	Identify various rocks and minerals	U	1
7	Conduct geological field survey	Ap	1

Introduction to Remote Sensing, GNSSs and GIS

Core

ES M21 E 10

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Demonstrate the basics of mapping concepts and Geodesy	U	1
2	Understand the various data formats and data types in GIS	U	6
3.	Understand the significance of various satellite based remote sensing products	U	6
4	Apply the spatial and non- spatial data using various methods	Ap	7,8
5	Appraise the importance of spatial planning in environment management	E	6,7,8
6	Design methods to solve the environmental issues based on various spatial data products	C	1, 2, 6, 7. 8
7	Outline and Evaluate the role of navigational satellite systems in geoinformatics	U, E	7, 8

SEMESTER II

Analytical Techniques and Instrumentation
Core
ES M21 C11

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Explain the analytical errors and describe clean analysis	R	3
2	Explain gravimetric, volumetric, spectroscopic and chromatographic analysis	R,U	3
3.	Do gravimetric, volumetric, spectroscopic and chromatographic analysis	Ap	3
7	Explain the applications of gravimetric and volumetric methods	U	3, 5
5	Describe the applications of spectroscopic methods	U	3 ,5
6	Explain radiation detectors	R	3
7	Describe the applications of chromatographic methods	U	3, 4, 5

Environmental Laws, Ethics, Education and Policy
Core
ES M21 C12

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1	Describe the history of environmental law	R	1,4
2	Articulate the environmental laws and policies in Kerala and India	U	1,2
3	Describe principles of international laws	R	1,9
4	Expound the forest laws in India	U	1,9,10
5	Describe environmental education	U	9,10
6	Evaluate the development activities based on environmental laws	Ap	2,9
7	Do environmental awareness	Ap	9,10

Environmental Economics and Sustainable Development
Core
ES M21 C 13

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO

1.	Explain the basics of concepts and theories of environmental economics and sustainable development	U	1, 2
2	Distinguish various problems which threatens sustainability	A	2, 4
3.	Identify methods, tools, and techniques for sustainability	R	6
4	To build at the individual level, qualitative and quantitative skills/capabilities for bringing essential environmental considerations into economic planning, policies and developmental projects,	Ap	7
5	Describe the environmental problems and its impacts	E	1, 7
6	To synthesize the new field of environment and economics in an holistic approach towards solution of environmental problems	C	7, 8

Environmental Biotechnology and Waste Management
Core
ES M21 C 14

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Describe the basics of molecular biology and environmental biotechnology and its relevance	U, R	1,
2	Understand the techniques involving Biotechnology applicable to combat air, soil and water pollution. To assess the efficiency of different wastewater treatment techniques.	U,A,E	1, 2
3.	Classify different kinds of biotechnological applications in Agriculture like organic fertilisers and biopesticides. Understand the concept Ecological Engineering – a blend	U,A	1, 2

	of Ecology and Engineering to control water pollution. To apply the appropriate bioplastics producing technique to overcome the plastics menace		
4	Understand different solid waste management steps; to assess their potential at present and in future. To describe the need of zero waste concept	U,A,E,R	5, 6
5	Explain the importance of Ecological Sanitation – a new emerging concept of circular economy in sanitation sector.	U, R,C	3, 5

	Biodiversity and Conservation Biology
	Core
	ES M21 C15

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1	Understand the basic concepts of Biodiversity and conservation biology	A	1, 2, 6
2	Study the distribution, significance and threats of biodiversity	U, An	2,4,6, 10
3	Understand and evaluate the various initiatives for biodiversity conservation	U, E	4,6,9,10
4	Understand and explain the concept of human ecology and natural history.	U, An	1,6, 10
5	Understand and analyse the legal and policy aspects of conservation science	U, An	1,6,9, 10

Lab Course II (Environmental Chemistry, Microbiology, Biotechnology, RS & GIS)	
Core	
ES M21 C16	

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1	Understand the basic principles of the analysis of water, air, soil quality parameters	R	3
2	Assessphysico-chemical parameters of air, water and soil	Ap	3,5,8
3	Do air pollution Monitoring	Ap	3,8
4	Assess microbial pollution	Ap	3
5	Identify and isolate various microbes from the environment	Ap	3,6
6	Createmap using GIS platform and assess remote sensing data	U, Ap, An, E, C	3,6,8
7	Do environmental pollution monitoring	Ap	3,4,6,8

Ecotoxicology
Elective
ES M21 E17

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1	Describe sources and fates of chemicals in the environment	R	2
2	Explain mechanisms for adverse effects of chemicals	U	2,3
3	Estimate the risk for adverse effects of a chemical on different biological organisation levels based on knowledge about the toxicity, degradability, and bioavailability of the chemical	E	2
4	Do toxicological testing of environmental pollutants	Ap	3
5	Explain the significance of sanitation and carryout awareness on awareness on sanitation and health	E,Ap	2,3
6	Explain food security in terms of contamination of food and control measures	A	2
7	Explain the toxicokinetics and toxicodynamics	Ap	2

	Green Chemistry and Nano Technology
	Elective
	ES M21 E 18

CO No.	At the end of the course, the student will be able to:	Taxonomic Level (TL)	PSO
1.	Explain green chemistry	R	2,3
2	Describe the applications of green chemistry	U	2,3
3.	Describe green synthesis	R, U	2,3
4.	Explain Green technologies for waste management	R, U	3,5
5.	Explain nanotechnology for environmental benefits	R	2,3,5
6.	Explain green synthesis of nanoparticles and their characterization.	R, U	3,5
7.	Apply the nano technology in environmental monitoring and remediation.	U, A	3,5

	Fundamentals of Management
	Elective
	ES M21 E 19

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Explain factors that contribute to management evolution	R	1, 9
2	Analyse and assess the influence of historical forces on current management strategies.	A	1,9,10
3.	Identify and analyse social responsibility and ethical issues that arise in corporate circumstances, and communicate your personal position on these topics coherently.	Ap	10
4.	Explain how businesses adapt to a changing environment and suggest management approaches for influencing and controlling the internal environment.	U	9, 10
5.	Develop the process of management's four functions: planning, organizing, leading, and controlling	Ap	9
6.	Interpret and properly use vocabularies within the field of management to articulate one's own position on a specific management issue and communicate effectively with varied audiences.	U	8,9
7.	Identify the areas to control and Selecting the Appropriate controlling methods/Techniques	E	7

	Environnemental Microbiology		
	Elective		
	ES M21 E 20		

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO No
1	Various microorganisms in the environment with their basic characteristics	R	1,2
2	Understand and apply the various techniques for the isolation and characterization of microorganisms from environmental compartments	U, A	3, 5
3	Understand and evaluate the role of microorganisms in various biogeochemical cycles and other environmental processes	U, E	3, 5
4	Understand and analyse the role of microorganism in various diseases	U	5, 7
5	Analyse and apply the role of microorganisms in various environmental applications	A, Ap	5, 7

SEMESTER III

Environmental Management
Core
ES M21 C 21

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO
	Upon completion of this course, students will be able to;		
1	Understand the basic concepts of Environment Management	U	1, 2
2	Understand and evaluate the fundamental concepts of ecosystem management	U, E	2,6,9
3	Understand and analyse the fundamental concepts of environmental planning and Management with various standards	U, An	1, 2, 9, 10
4	Explain and apply the application of environmental planning and management in managing disasters	U, A	2,4,6,9,10
5.	Explain and apply the ecosystem restoration in environment management	U, A	2,4,6,9,10
*Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

Environmental Engineering
Core
ES M21 C 22

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)
1.	Understand air and water resource management, solid waste management through the concept of System approach. Describe the basics of mass balance analysis in Environmental Engineering	U, R, A
2	Understand various steps and techniques of water and wastewater treatment. Apply system approach in water resource management.	U,A,E
3.	Describe air quality standards. To understand meteorological factors in air pollution and apply theories and models in air pollution / emission dispersion.	U,A
4	Understand different air pollution control techniques.	U,E,R
5	Explain the importance of Solid waste Management with the concept of system approach. Evaluate various techniques in solid waste processing and disposal.	U, R,C
6	Understand noise pollution concept, analyse the ambient noise level; Describe the risks associated with industries and analyse the risk using various risk analytical techniques	U,A,R,E

	Environmental Impact Assessment
	Elective
	ES M21 C 23

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1	Describe the global changes and sustainability	R	2,9
2	Explain the EIA process, LCA, Environmental audit	R, U	2,6,8,9
3	Explain the role of various agencies in EIA	R	2,6,9
4	Assess the project impacts and role of public participation in EIA	E	2,6,9
5	Do EIA using various methodologies	Ap	6,8,9
6	Do Environmental Audit	Ap	6,8,9
7	Explain the LCA and EMS	U	6,8,9

Resource Management
Core
ES M21 C24

CO No.	Expected Course Outcome	Learning Domains	PSO
	Upon completion of this course, students will be able to;		
1	Understand the basic concepts of Natural Resources	U	1, 2
2	Understand and evaluate the fundamental concepts of ecosystem management	U, E	2,6,9
3	Analyse and evaluate the various strategies for water resource management	An, E	3, 6, 9, 10
4	Understand and analyse the management of various physical and biological resources	U, An	4,6,9,10
Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

Lab Course III (RS & GIS and Instrumental analysis)
Core
ES M21 C25

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1	Explain the basic principles of the analytical equipment	R	3,5,8
2	Do environmental analysis using spectroscopic and chromatographic techniques	Ap	3,5,8
3	Do air pollution Monitoring using online equipment	Ap	3,8
4	Explain the sample processing techniques for the instrumental analysis	U	3,8
5	Do satellite imagery processing	Ap	3,6
6	Assess environmental changes using GIS platform	Ap	3,6
7	Explain advanced methods in RS & GIS	U, Ap, An, E, C	3,6,8

Climate Change & Governance
Elective
ES M21 E 27

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Describe the basics of Climate Change and explains the changes occurred so far and prediction of the future changes	U, R,	1,2
2	Explain the causes of climate change and analyses the impacts of climate change	U,R,A	2,4
3.	Explain various procedures of inventorying the greenhouse gas emissions (GHG).	U,A,E	3,4
4	Evaluate long term mitigation pathways.	A	3,4
5	Explain various climate change adaptation methods, integrated natural resource management systems; evaluate various information systems including early warning systems.	U,A,R	4
6	Explain the global action and governance for climate change mitigation	U, R,C	9
7	Describe various technical and financial aids for climate change mitigation and adaptation	U	9

Program   M.Sc. Environment Science and Disaster Management

SEMESTER I

	Introduction to Environment & Ecosystems
	Core
	ES M21 C 51

CO No.	At the end of the course, the student will be able to:	Taxonomic Level (TL)	PSO
1.	Explain the concept of ecology and relevance of environmental science	U	1
2	Able to distinguish the structure, organization and processes in various ecosystems	A	1, 10
3.	Develop a knowledge on the structural and functional aspects of a population as an ecological unit	Ap	1, 2
4	Understand and analyse the concept of biological community, changes and interactions within community	U, A	6,9
5	Develop skill on applied aspects of ecology including mathematical or conceptual model of population or community dynamics to analyse the various factors of population growth and regulation.	Cr	7, 8

Earth System Processes and Landforms
Core
ES M21 C 52

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO No.
1.	Explain the basics of Earth systems its processes and landforms	U	1
2	Distinguish various Plate tectonic processes and resultant features	A	1
3.	Identify major minerals, rocks and structures on the Earth	Ap	1
4	Distinguish the major land forms formed by the action of various geological agents	A	1, 4
5	Analyse the interrelationship between various spheres (Atmosphere, Lithosphere and Hydrosphere) of the Earth	E	1
6	Describe the various resources of the earth and its environmental impacts due its exploration	U	2, 3
7	Appraise the different geo-scientific approaches for sustainable environment	E	2

	Natural and anthropogenic disasters
	Elective
	ES M21 C 53

CO No.	At the end of the course, the student will be able to:	Taxonomic Level (TL)	PSO No.
1.	Explain the relation between Earth's processes and disasters	U	1, 2
2	Distinguish various types and causative factors of disasters	An	2, 3
3.	Illustrate the key concepts of disaster management	U	3
4	Analyse the International disaster management system	An	3, 5, 6
5	Assess the disaster management strategies in India	E	3, 5, 6
6	Analyse the relation between disasters and development	An	8, 10

	Pollution hazards and its Management
	Core
	ES M21 C 54

CO No.	At the end of the course, the student will be able to:	Taxonomic Level (TL)	PSO No.
1.	Identify and distinguish the sources and types of water, air, and soil pollution.	R	2, 3
2	Articulate knowledge about impact and control measures of water, air, and soil pollution.	U	3
3.	Describe environmental analysis for various water, air and soil quality parameters	E	3, 8
7	Expound the water and waste water treatment	U	5
5	Explain Fate and transport of pollutants and distinguish the regional and global impact of pollution	A	2, 3
6	Describe Radioactive pollution and radioactive waste management methods	U	5
7	Conduct environmental sampling and analysis	Ap	7, 8

Research Methodology and Statistics
Elective
ES M21 C 05

CO No.	At the end of the course, the student will be able to:	Taxonomic Level (TL)	PSO
1.	Describe the various research methods and statistical technique for doing research	U	7,8
2	Infer the literature; data analysis and result presentation procedures.	U	7
3.	Develop testing hypothesis for research	A	7
4	Appraise various statistical technique for doing research	E	8
5	Interpret and explain research articles in their academic discipline.	U	7,8
6	Apply statistical soft wares for data analysis	A	8

	Lab course-I (Environmental Chemistry, Géosciences and Ecology)
	Core
	ES M21 C 07

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO No.
1.	Understand the basic principles of the analysis of water, air, soil quality parameters	U	1, 2, 3, 4, 6
2	Carry out analysis of physico-chemical parameters of air, water and soil	U	1, 2, 6
3.	Conduct noise pollution measurement	Ap	1, 3
4	Carry out ecological assessment	Ap	1, 3, 5
5	Identify various rocks and minerals	Ap	1, 3
6	Draw rose diagrams for various geological analysis	A	6, 8
7	Conduct geological field survey	Ap	6, 8

	Introduction to Remote Sensing, GNSSs and GIS
	Core
	ES M21 E 10

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Demonstrate the basics of mapping concepts and Geodesy	U	1
2	Understand the various data formats and data types in GIS	U	1, 2
3.	Understand the significance of various satellite based remote sensing products	U	2, 8
4	Apply the spatial and non- spatial data using various methods	Ap	2
5	Appraise the importance of spatial planning in environment management	E	6, 7. 8
6	Design methods to solve the environmental issues based on various spatial data products	C	8
7	Outline and Evaluate the role of navigational satellite systems in geoinformatics	U, E	6, 7

	Chemical systems in Environment
	Core
	ES M21 E 55

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO No.
1.	Describe the basics of environmental chemistry	R	1
2	Demonstrate knowledge of chemical and biochemical principles of fundamental environmental processes in air, water, and soil.	U	1, 3
3.	Describe the chemistry of air, water and soil pollutants	E	3
4.	Apply basic chemical concepts to analyse chemical processes involved in different environmental problems (air, water & soil)	Ap	2
5.	Describe Chemical and physical factors involved in Fate and transport of pollutants	Ap	1, 3
6.	Explain energy crisis and different aspects of sustainability	E	2, 6
7.	Discuss local and global environmental issues	A	2, 4

	Basic Life Skills/First Aid for Disaster Management
	Elective
	ES M21 E 56

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Explain the links between life skills and disaster management	U	6
2	Articulate knowledge about first aid in various emergencies	A	6, 7
3.	Inculcate basic methods in first aid and life support	A	6, 7
4	Demonstrate the working principle of first aid and disaster response equipment	U	6, 7
5	Critically evaluate the coping information, and linkage with services during disaster situations	E	6, 7, 8
6	Adapt first aid skills in disaster response	C	6, 7

| **Field skills and techniques in Disaster Management** |
| **Elective** |
| **ES M21 E 57** |

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Identify the methodologies of field works in different disaster management spectrum and real time field actions	A	4
2	Explain the international code of conduct in disaster response	U	6
3.	Develop skills for working with vulnerable communities	A	5
4	Demonstrate the qualitative and quantitative methods in field work	U	8
5	Build a perspective on local disaster management committees and task forces	C	6, 7
6	Analyse the links between techniques, ethics and skills of field practice and disaster management	An	8

SEMESTER II

Analytical Techniques and Instrumentation
Core
ES M21 C11

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Explain the analytical errors and describe clean analysis	R	3
2	Explain gravimetric, volumetric, spectroscopic and chromatographic analysis	R,U	3
3.	Do gravimetric, volumetric, spectroscopic and chromatographic analysis	Ap	3
7	Explain the applications of gravimetric and volumetric methods	U	3, 5
5	Describe the applications of spectroscopic methods	U	3 ,5
6	Explain radiation detectors	R	3
7	Describe the applications of chromatographic methods	U	3, 4, 5

Environmental Laws, Ethics, Education and Policy
Core
ES M21 C12

CO No.	At the end of the course, the student will be able to:	Taxonomic Level (TL)	PSO
1	Describe the history of environmental law	R	1,4
2	Articulate the environmental laws and policies in Kerala and India	U	1,2
3	Describe principles of international laws	R	1,9
4	Expound the forest laws in India	U	1,9,10
5	Describe environmental education	U	9,10
6	Evaluate the development activities based on environmental laws	Ap	2,9
7	Do environmental awareness	Ap	9,10

	Environmental Biotechnology and Waste Management
	Core
	ES M21 C 14

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Describe the basics of molecular biology and environmental biotechnology and its relevance	U, R	1,
2	Understand the techniques involving Biotechnology applicable to combat air, soil and water pollution. To assess the efficiency of different wastewater treatment techniques.	U,A,E	1, 2
3.	Classify different kinds of biotechnological applications in Agriculture like organic fertilisers and biopesticides. Understand the concept Ecological Engineering – a blend of Ecology and Engineering to control water pollution. To apply the appropriate bioplastics producing technique to overcome the plastics menace	U,A	1, 2
4	Understand different solid waste management steps; to assess their potential at present and in future. To describe the need of zero waste concept	U,A,E,R	5, 6
5	Explain the importance of Ecological Sanitation – a new emerging concept of circular economy in sanitation sector.	U, R,C	3, 5

Biodiversity and Conservation Biology
Core
ES M21 C 15

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PSO No.
	Upon completion of this course, students will be able to;		
1	Understand the basic concepts of Biodiversity and conservation biology	A	1, 2, 6
2	Study the distribution, significance and threats of biodiversity	U, An	2,4,6, 10
3	Understand and evaluate the various initiatives for biodiversity conservation	U, E	4,6,9,10
4	Understand and explain the concept of human ecology and natural history.	U, An	1,6, 10
5	Understand and analyse the legal and policy aspects of conservation science	U, An	1,6,9, 10
*Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)			

	Public health aspects and emergency services in disaster management
	Core
	ES M21 C 58

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Explain the relation between Disaster Medicine and its importance in Public Health Care	U	2,4, 5, 6, 7
2	Understand the role of hospitals in disaster management	U	3, 5
3.	Analyse the public health issues during disasters	An	4,5, 7
4	Asses the public health preparedness for disasters	E	2, 4, 6
5	Developing Disaster Health management plan	C	4, 5,6, 7

	Lab Course II (Environmental Chemistry, Microbiology, Biotechnology, RS & GIS)
	Core
	ES M21 C16

CO No.	At the end of the course, the student will be able to:	Taxonomic Level (TL)	PSO
1	Understand the basic principles of the analysis of water, air, soil quality parameters	R	3,8
2	Analysis of physico-chemical parameters of air, water and soil	Ap	3,5,8
3	Do air pollution Monitoring	Ap	3,8
4	Explain applications of advanced geospatial technologies for disaster management	Ap	3,8
5	Apply GIS in disaster management	Ap	3,6,8
6	Create map using GIS platform and assess remote sensing data	U, Ap, An, E, C	3,6,8
7	Do environmental pollution monitoring	Ap	3,4,6,8

Ecotoxicology
Elective
ES M21 E17

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1	Describe sources and fates of chemicals in the environment	R	2
2	Explain mechanisms for adverse effects of chemicals	U	2,3
3	Estimate the risk for adverse effects of a chemical on different biological organisation levels based on knowledge about the toxicity, degradability, and bioavailability of the chemical	E	2
4	Do toxicological testing of environmental pollutants	Ap	3
5	Explain the significance of sanitation and carryout awareness on awareness on sanitation and health	E,Ap	2,3
6	Explain food security in terms of contamination of food and control measures	A	2
7	Explain the toxicokinetics and toxicodynamics	Ap	2

Disaster Risk Reduction and Sustainable Development
Elective
ES M21 E 59

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Interpret the vulnerability concept in disaster management	U	2, 4, 5
2	Understand the basic theories of disaster and its relation to development	U	2, 3
3.	Determine the political and economic facets of disasters	E	5
4	Appraise the relationship between disasters and sustainable development	E	3, 5
5	Evaluate the social, political and economic constraints in preventing disasters for sustainable development	E	3, 5

	Applications of Science and Technology in Disaster Management
	Elective
	ES M21 E 60

CO No.	At the end of the course, the student will be able to:	Taxonomic Level (TL)	PSO
1.	Explain the applications of science and technology in disaster management.	U	3, 4,7
2	Understand the basic knowledge about various data management systems and its use in humanitarian operations	U	10
3.	Identify the sources of information that can be used in humanitarian operations	A	4, 7
4	Distinguish various aid models and systems for humanitarian logistics	An	7
5	Compare the early warning systems in disaster management	E	4, 7
6	Determine the best practices and models for disaster management	E	2, 3, 4, 7

Social Work Approaches and Practices
Elective
ES M21 E 61

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Explain the role of social work in disaster management	U	3, 4, 6, 9
2	Understand the basic concepts of social work	U	9
3.	Elaborate on the work of communities in social action	An	6, 9
4	Identify the strategies in rural appraisal	A	9
5	Illustrate social welfare administration	U	4, 9
6	Evaluate role of NGO's in disaster management	E	4, 6, 9

SEMESTER III

	Disaster Risk Assessment & Mitigation
	Core
	ES M21 C 62

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Understand the disaster risk, relief and recovery management	U	3, 4
2	Distinguish various types of global policies and practices in disaster risk reduction	An	3, 4, 6
3	Identifying the economic impacts of disasters and to demonstrate different assets for its management	A	5, 6
4	Deduct better management strategies for natural and anthropogenic hazards	E	6
5	Explore the risk communication strategies and to analyse various early warning systems	An	7
6	Compare various risk management ,methods of natural hazards	E	6, 7
7	Articulate knowledge in the dimensions of disaster risk management	An	10

Standards in Humanitarian Aid, Relief and Rehabilitation
Core
ES M21 C 63

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Understand the interlinks of humanitarian assistance and disaster relief	U	2,3,4, 5
2	Distinguish various types of international humanitarian standards	An	1. 4. 5. 6.
3.	Illustrate the key concepts of operation management in emergencies	U	3, 4, 5
4	Analyse the International humanitarian logistics system	An	3, 4, 5
5	Compare various humanitarian standards and best practices	E	5, 6, 7, 8
6	Analyse the ethical considerations of humanitarian system	An	6, 7, 8

	Community Based Disaster Management
	Core
	SES MP C 64

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Articulate knowledge about CBDRM process and techniques	U	
2	Distinguish various societal dimensions of disaster management	An	
3.	Understand various risk reduction practices for vulnerable groups	U	
4	To familiarize the origin and development of social work in India	U	
5	Build a perspective on community oriented disaster planning	E	
6	To expertise in participatory approaches in DRR	An	

Governance, Law and Policies in Disaster Management
Core
ES M21 C 65

CO No.	*At the end of the course, the student will be able to:*	Taxonomic Level (TL)	PSO
1.	Explain the basics of Public Administration	U	3
2	Summarize the Disaster Management act of India	U	3, 7
3.	Distinguish the different facets of decision making in Disaster Management	An	3, 7
4	To familiarize with different policies in Disaster Management	U	3, 7
5	Interpret the pros and cones of about the role of five year plans in Disaster Management	E	3, 4
6	Elaborate and development of new policies in Disaster Management	C	3,4, 10

	Lab Course III (RS & GIS and Instrumental analysis)
	Core
	ES M21 C25

CO No.	At the end of the course, the student will be able to:	Taxonomic Level (TL)	PSO
1	Explain the basic principles of the analytical equipment	R	3,5,8
2	Do environmental analysis using spectroscopic and chromatographic techniques	Ap	3,5,8
3	Do air pollution Monitoring using online equipment	Ap	3,8
4	Explain the sample processing techniques for the instrumental analysis	U	3,8
5	Do satellite imagery processing	Ap	3,6
6	Assess environmental changes using GIS platform	Ap	3,6
7	Explain advanced methods in RS & GIS	U, Ap, An, E, C	3,6,8

Climate Change & Governance
Elective
ES M21 E 27

CO No.	*At the end of the course, the student will be able to:*	**Taxonomic Level (TL)**	**PSO**
1.	Describe the basics of Climate Change and explains the changes occurred so far and prediction of the future changes	U, R,	1,2
2	Explain the causes of climate change and analyses the impacts of climate change	U,R,A	2,4
3.	Explain various procedures of inventorying the greenhouse gas emissions (GHG).	U,A,E	3,4
4	Evaluate long term mitigation pathways.	A	3,4
5	Explain various climate change adaptation methods, integrated natural resource management systems; evaluate various information systems including early warning systems.	U,A,R	4
6	Explain the global action and governance for climate change mitigation	U, R,C	9
7	Describe various technical and financial aids for climate change mitigation and adaptation	U	9