

Program Education objectives (PEOs): B.Sc. (H.)Environmental Science

- Investigate the complexities of the natural environment and our relationship with it.
- Explore the problems we face in understanding our natural environment and in living sustainability.
- Develop scientific, interpretive and creative thinking skills.
- Learn to apply quantitative analysis and field research techniques.
- Use computer-based geographical information systems to study environmental change.

Program specific outcomes (PSOs): B.Sc. (H.)Environmental Science

1. B.Sc. (H.)Environmental Science student are able to acquire knowledge, competent professionals with a strong foundation of Environmental Science and application to be suitable for vital positions in the academia, industry and government and non-government institutions as skilled manpower.
2. The learners will be able to become effective scientific communicators/collaborators in multidisciplinary teams providing technical leadership to engage with the challenging environmental problems of local, national and global nature.
3. They can opt for higher studies in plant and animal sciences as the environmental science is multidisciplinary in nature.

POs for UG programs:

B.Sc. (H.) Environmental Science

Program Outcomes (POs)	<ol style="list-style-type: none">1. Critical Thinking- Students will demonstrate an understand major concepts of Environment in association with multidisciplinary subjects such as physics, chemistry and mathematics etc. Understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevance in the day-to-day life.2. Effective Communication- Development of various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.3. Social Interaction- Development of scientific outlook not only with respect to science subjects but also in all aspects related to life.4. Effective Citizenship- Imbibe moral and social values in personal and social life leading to highly cultured and civilized personality.5. Ethics- Follow the ethical principles and responsibilities to serve the society.6. Environment and Sustainability- Understand the issues of environmental contexts and sustainable development.7. Self-directed and Lifelong learning- Students will be capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development.
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Course: Fundamentals of Environmental Science**COURSE CODE: ES115****COURSE OBJECTIVES:**

1. To study an environment and ecosystem.
2. To study natural resources.
3. To study biodiversity and conservation.
4. To study environmental pollution, policies and practices.
5. To study human population and environmental ethics.

COURSE OUTCOMES (CO):*After completion of the course, a student will be able to*

COURSE OUTCOME (CO)	DESCRIPTION
CO1	To study an environment and ecosystem.
CO2	To study natural resources.
CO3	To study biodiversity and conservation.
CO4	To study environmental pollution, policies and practices.
CO5	To study human population and environmental ethics.

CO-PO mapping for a course of “UG program”

S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	To study an environment and ecosystem.	3	3	2	3	2	3	2
CO2	To study natural resources.	3	2	2	3	1	3	2
CO3	To study biodiversity and conservation	3	2	2	3	1	3	2
CO4	To study environmental pollution, policies and practices.	3	3	2	3	1	3	2
CO5	To study human population and environmental ethics.	3	2	2	3	2	3	2

Course: Climate Change & Current Issues**Course Code: ES116****Course Objectives:**

- Analyse formation of Solar System, Earth, Atmosphere & Hydrosphere through study of Solar System and history of Earth.
- Analyse role of Plate Tectonics in various Earth Surface Processes.
- Create in student’s ability to understand about changes in Earth’s history with time.
- Evaluate the role of different types of Rocks in Rock Cycle and significance of Weathering and Erosion over Earth Surface.
- Evaluate the role of Atmosphere - Ocean, Atmosphere- Land & Ocean-Land Interface in Earth Surface processes.

COURSE OUTCOMES (CO):

COURSE OUTCOME (CO)	ATTRIBUTES
CO1	Students will be able to Analyze formation of Solar System, Earth, Atmosphere & Hydrosphere through study of Solar System and history of Earth.

CO2	Students will be able to Analyze role of Plate Tectonics in Various Earth Surface Processes.
CO3	Create in student's ability to understand about changes in Earth's history with time.
CO4	Students will be able to Evaluate the role of different types of Rocks in Rock Cycle and significance of Weathering and Erosion over Earth Surface.
CO5	Students will Evaluate the role of Atmosphere - Ocean, Atmosphere- Land & Ocean-Land Interface in Earth Surface processes.

CO-PO mapping for a course of "UG program"								
Cos	Attributes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Students will be able to Analyze formation of Solar System, Earth, Atmosphere & Hydrosphere through study of Solar System and history of Earth.	3	1	2	1	1	1	2
CO2	Students will be able to Analyze role of Plate Tectonics in Various Earth Surface Processes.	3	1	2	1	1	1	2
CO3	Create in student's ability to understand about changes in Earth's history with time.	3	1	2	2	1	2	3
CO4	Students will be able to Evaluate the role of different types of Rocks in Rock Cycle and significance of Weathering and Erosion over Earth Surface.	3	1	2	1	2	1	2
CO5	Students will Evaluate the role of Atmosphere - Ocean, Atmosphere-Land & Ocean-Land Interface in Earth Surface processes.	3	1	2	1	2	1	2
3 Strong contribution, 2 Average contribution , 1 Low contribution								

Course: Basics of Environmental Biology

Course Code: ES117

Course Objectives:

- To Develop basic knowledge of taxonomy, systematics, morphological and taxonomical studies of flora and fauna.
- To Provide Knowledge of developmental phases of ecology and ecological classification.
- To develop knowledge of population ecology.
- To provide basic knowledge of biotic community and microbiology.

Course Outcomes (CO):

At the end of the course students should:

Course Outcome(CO)	Description
CO1	Have an enhanced knowledge of an ecology.
CO2	Be able to make connections and interrelations between various disciplines in the environment.
CO3	Be able to explain the structure and impact of biogeochemical cycles.
CO4	Be able to Illustrate abiotic/biotic interactions and symbiotic relationships.
CO5	Be able to describe ecological and statistical techniques and approaches used in the study of environmental biology.

CO-PO mapping for a course of “UG program”								
S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Have an enhanced knowledge of an ecology.	3	3	2	3	3	3	3
CO2	Be able to make connections and interrelations between various disciplines in the environment.	3	3	2	3	3	3	3
CO3	Be able to explain the structure and impact of biogeochemical cycles.	3	3	2	2	2	3	2
CO4	Be able to Illustrate abiotic/biotic interactions and symbiotic relationships.	3	2	2	3	2	3	2
CO5	Be able to describe ecological and statistical techniques and approaches used in the study of environmental biology.	2	1	1	1	2	1	1

Course: Introduction to Environmental Chemistry

Course Code: ES118

Faculty Name: Dr. Rahila Rahman Khan

Course Objectives:

- Recognize Important chemical reactions in the atmosphere and in water.
- Assess the important chemical reactions in connection with smog formation, ozone chemistry and acid rain chemistry.
- Recognize the importance of pesticides.
- Recognize the importance of chemical reactions in soil.

Course Outcomes (CO):

Course Outcome(CO)	Description
CO1	To impart students a broad outline of the methodology of science in general and Chemistry in particular
CO2	The students will learn the important analytical and instrumental tools used for practicing chemistry.
CO3	Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.
CO4	Students will learn how environmental chemicals effect organisms
CO5	Analyze the causes of pollution in our environment

CO-PO mapping for a course of “UG program”								
S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	To impart students a broad outline of the methodology of science in general and	3	3	3	2	2	3	3

	Chemistry in particular.							
CO2	The students will learn the important analytical and instrumental tools used for practicing environmental chemistry.	3	1	3	1	1	3	3
CO3	Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.	3	3	3	3	3	2	2
CO4	Students will learn how environmental chemicals effect organisms	3	2	3	2	2	3	3
CO5	Analyze the causes of pollution in our environment	3	2	3	2	3	3	3

Course: Ecosystem Dynamics

Course Code: ES121

Course Objectives:

- To develop Basic knowledge of Ecosystem.
- To provide knowledge of bio-geochemical and sedimentary cycles and its importance
- To develop knowledge of major Biomes of the world.
- To provide Knowledge of Ecosystem Energetic.
- To recognize knowledge of effects of disturbances, adaptation and development in ecosystem.

Course Outcomes (CO):

After completion of the course, a student will be able to

Course Outcome(CO)	Description
CO1	Have an enhanced knowledge of an ecosystem.
CO2	Be able to make connections and interrelations of bio-geochemical and sedimentary cycles and its importance.
CO3	Be able to explain the major Biomes of the world.
CO4	Be able to Illustrate the Ecosystem Energetic.
CO5	Be able to describe effects of disturbances, adaptation and development in ecosystem.

CO-PO mapping for a course of “UG program”

S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Have an enhanced knowledge of an ecosystem.	2	3	3	3	3	3	2
CO2	Be able to make connections and interrelations of bio-geochemical and sedimentary cycles and its importance.	1	3	2	2	2	2	2
CO3	Be able to explain the major Biomes of the world.	2	2	2	2	3	2	2
CO4	Be able to Illustrate the Ecosystem Energetic.	3	2	2	1	1	2	2
CO5	Be able to describe effects of disturbances,	1	3	3	3	3	3	1

adaptation and development in ecosystem.								
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Course Name: Atmosphere and Global Climate Change

Course Code: ES 122

COURSE OBJECTIVES:

The purpose of this undergraduate course is to impart basic and key knowledge of Atmosphere and Global Climate Change. This will help in enhancing knowledge of Influence of Meteorological Parameters and Atmospheric Circulation on Climate, contribution of Green Houses Gases in Global warming, remedial measures against Global warming and Climate Change and policies, Global and National Action Plan related to Climate Change mitigation. After successfully completion of course, the student will able explore subject into their respective dimensions.

COURSE OUTCOMES (CO):

COURSE OUTCOME (CO)	ATTRIBUTES
CO1	Students will be able to Analyse Impact of Atmospheric Circulation on World Climate and Influence of Meteorological Parameters & Atmospheric Stability in shaping of Climate.
CO2	Students will be able to Evaluate the role of Remedial Measures in Combating Global Warming and Climate Change.
CO3	Students will be able to Evaluate Various Policies related to Climate Change mitigation Strategies and Create a knowledge base for Global and National Action Plans to combat Climate Change Issues.
CO4	Students will be able to Evaluate contribution of Green Houses Gases in Global warming and thereby bringing Change in Climate.
CO5	Students will Analyse the role of Ozone Depleting Substances in Ozone layer Depletion and efforts for mitigation of Ozone hole Problem.

COURSE OUTCOMES (CO):

COURSE OUTCOME (CO)	ATTRIBUTES
CO1	Students will be able to Analyze Impact of Atmospheric Circulation on World Climate and Influence of Meteorological Parameters & Atmospheric Stability in shaping of Climate.
CO2	Students will be able to Evaluate the role of Remedial Measures in Combating Global Warming and Climate Change.
CO3	Students will be able to Evaluate Various Policies related to Climate Change mitigation Strategies and Create a knowledge base for Global and National Action Plans to combat Climate Change Issues.
CO4	Students will be able to Evaluate contribution of Green Houses Gases in Global warming and thereby bringing Change in Climate.
CO5	Students will Analyse the role of Ozone Depleting Substances in Ozone layer Depletion and efforts for mitigation of Ozone hole Problem.

Course: Biodiversity and Conservation

Course Code: ES203

Course Objectives:

1. Assessment of biodiversity.
2. To predict pattern of biodiversity distribution.
3. To preserve all varieties of old and new flora, fauna and microbes.
4. To identify various threats related to biodiversity.
5. Exploration of biodiversity and importance of biodiversity.
6. The sustainable use of biological resources, fair and equitable sharing of the benefits arising from biodiversity.

Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	In-depth knowledge and critical understanding of the theory and principles of biodiversity and the interrelationships of its levels with the basic effects from infrastructure development in nature conservation areas.
CO2	Knowledge and skills to realize and combine the complexity of the relations and interactions between the ecosystem structures and functions and the human impacts from the one side with the sustainable management aiming at the conservation of species and habitats.
CO3	Describe the threats to biological diversity, that is, direct harvesting, habitat destruction, and introduction of non-native species, among others, and their interactions.
CO4	Describe the threats to biological diversity, that is, direct harvesting, habitat destruction, and introduction of non-native species, among others, and their interactions.
CO5	Approaches for conservation of biodiversity at all level.

CO-PO mapping for a course of “UG program”								
S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	In-depth knowledge and critical understanding of the theory and principles of biodiversity and the interrelationships of its levels with the basic effects from infrastructure development in nature conservation areas.	3	1	2	1	2	2	1
CO2	Knowledge and skills to realize and combine the complexity of the relations and interactions between the ecosystem structures and functions and the human impacts from the one side with the sustainable management	3	2	3	2	2	2	1
CO3	Discuss benefits, services and values harnessed from the biodiversity.	1	1	1	3	2	1	1
CO4	Describe the threats to biological diversity, that is, direct harvesting, habitat destruction, and introduction of non-native species, among others, and their interactions.	1	1	2	1	2	2	1
CO5	Approaches for conservation of biodiversity at all level.	1	2	2	1	2	2	1

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Course: Natural Resource Management and Sustainability

Course Code: ES204

Course Objectives:

- To develop a knowledge of natural resources and its conservation.
- To provide knowledge of renewable and non renewable energy resources and its management techniques.

Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	Be able to Protection of Natural Resources.
CO2	Responsible Use of Natural Resources.
CO3	To Promote energy conservation through efficient land use planning and building design through energy conservation.
CO4	Students are able to understand the benefits of sustainable use of Natural Resources.
CO5	Students are able to encourage conservation of natural resources, the city should work towards ensuring that users are charged for the full local costs of their individual use of water, electricity and sanitary sewers. There should also be educational programs to encourage conservation of natural resources.

CO-PO mapping for a course of “UG program”

S.No.	CO description	PO1	PO 2	PO3	PO4	PO5	PO6	PO7
CO1	Be able to Protection of Natural Resources.	3	3	3	3	3	3	2
CO2	Responsible Use of Natural Resources.	3	3	3	3	3	3	2
CO3	To Promote energy conservation through efficient land use planning and building design through energy conservation.	3	2	2	2	2	2	2
CO4	Students are able to understand the benefits of sustainable use of Natural Resources.	3	2	2	2	2	2	2
CO5	Students are able to encourage conservation of natural resources, the city should work towards ensuring that users are charged for the full local costs of their individual use of water, electricity and sanitary sewers. There should also be educational programs to encourage conservation of natural resources.	3	2	3	2	2	2	2

Course: Human- Wildlife Conflict & Management

Course Code: ES205

Course Objectives:

- To study Role of government in wild life conservation and management.
- Evolution of wildlife conservation and policies regarding protected areas in 21th century.
- To study different types of Environmental Act. for wild life conservation.
- Importance of forest produce to tribal population and tribal right in India.
- Impact of human wild life conflict in environment

Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	To Provided knowledge of government in Biodiversity conservation.
CO2	Be able to explain protected areas and Evolution of wildlife conservation.
CO3	To created knowledge Environmental Act. For wild life conservation.
CO4	To provided knowledge tribal population and tribal right in India.
CO5	To provided knowledge of human wild life conflict.

Course: Environmental Pollution and Human Health**Course Code: ES206****Course Objectives:**

To help the social groups and individuals to acquire knowledge of pollution and environmental degradation.

To help social groups and individuals to acquire a set of values for environmental protection.

Environmental pollution also aims at producing scientists with technical and analytical skills, environmental policy makers and researchers.

Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	Explain the effects of water, land and air pollution on environment and suggest ways to reduce them.
CO2	To have experience in real-world problem solving through a research project for an external client
CO3	Develop improved understanding of the principles and application of environmental management tools including legislation and regulation
CO4	evaluate the relations among environment, human, and h ealth.
CO5	Define the concepts acid rain, greenhouse gases and global warming

CO-PO mapping for a course of “ UG program”

S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Explain the effects of water, land and air pollution on environment and suggest	3	2	3	3	3	3	2

	ways to reduce them.							
CO2	Have experience in real-world problem solving through a research project for an external client	3	1	2	2	1	3	3
CO3	Develop improved understanding of the principles and application of environmental management tools including legislation and regulation	3	2	3	3	3	3	3
CO4	evaluate the relations among environment, human, and health.	3	2	3	3	3	3	3
CO5	Define the concepts acid rain, greenhouse gases and global warming	3	1	2	1	1	3	3

Course: Environmental Impact and Risk Assessment

Course Code: ES207

Course Objectives:

- Analyse the role of Project Proponents, Project Developers and Consultant through Study of Environmental Impact Assessment Process.
- Evaluate methods, Scope and methodologies of Environmental Impact Assessment in understanding impacts of developmental Projects on Environment.
- Create an Understanding among Students about Impacts of developmental Projects on Environment through Case studies.
- Analyse importance of Risk Assessment in studying impacts of Project Activities through study of Exposure, Toxicity, Hazard, human and ecological risks.

Course: Environmental Legislation and policy

Course Code: ES210

Course Objectives:

- To protect the man's fundamental rights of freedom, equality and adequate conditions of life in an environment of quality that permits a life of dignity and wellbeing.
- To balance Inter-generational Equity
- Integration of Environmental Concerns in Economic and Social Development
- To apply principles of Environmental Governance
- Efficiency in Environmental Resource Use.

Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	To create knowledge of laws and policies related to environment
CO2	To understand judicious use of environmental resources to meet the need of present and future generation.
CO3	To provide knowledge regarding good governance
CO4	To understand environmental conservation through mutually beneficial multi stakeholder partnerships between local communities

CO5	To ensure efficient use of environmental resources in the sense of reduction in their use per unit of economic output, to minimize adverse environmental impacts.
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CO-PO mapping for a course of “UG program”								
S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	To create knowledge of laws and policies related to environment	3	3	3	3	3	3	2
CO2	To understand judicious use of environmental resources to meet the need of present and future generation.	3	3	3	3	3	3	3
CO3	To provide knowledge regarding good governance	3	3	2	2	3	2	3
CO4	To understand environmental conservation through mutually beneficial multi stakeholder partnerships between local communities	3	2	2	3	2	2	3
CO5	To ensure efficient use of environmental resources in the sense of reduction in their use per unit of economic output, to minimize adverse environmental impacts	3	3	3	3	3	3	3

Course: Basics of Remote Sensing, Geographic information system

Course Code: ES301

Course Objectives:

- To study of remote sensing component and different types of platform.
- Measurement of biodiversity interaction with environment by satellite, sensors and aerial photography.
- Geographical analysis by Raster and vector data.
- Statical analysis of geographical data structure.
- To monitoring forest diversity and urban sprawl analysis by Remote Sensing and GIS Technology.

Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	To develop basic knowledge of remote sensing and GIS.
CO2	To provided knowledge of monitoring biodiversity by satellite, sensors and aerial photography.
CO3	To provided knowledge of Geographical analysis by Raster and vector data.
CO4	To created knowledge of Statically analysis of geographical data structure.
CO5	Be able to describe application of Remote Sensing and GIS Technology.

Course: Land and Soil Conservation and its Management

Course Code: ES302**Course Objectives:**

- To develop the scientific attitude among the students for land and soil conservation.
- To develop attitude towards the fundamental education of soil among the students.
- To develop clear thinking about land use pattern awareness among the students.
- To develop attitude towards soil pollution, its degradation among the students.
- To provide knowledge to students about rational and scientific thinking about the measures to abate soil degradation.

Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	Students can enhance their knowledge about of soil erosion and conservation.
CO2	Students can increase their knowledge about agricultural productivity in sustained manner without deteriorating the soil health.
CO3	Students can get efficient prospect to know about rainfall with development of water harvesting structures such as farm Ponds and Check Dams.
CO4	Restoration of ecological balance by harnessing, conserving and developing natural resources.
CO5	To minimize flood hazards in the valley bottom areas and farm lands by way of preventing silt deposition in the riverbed.

Course: Agro ecology and Agro forestry**Course Code: ES303****Course Objectives:**

Provide general introduction about Agroecology and Agroforestry

To learn about fundamentals, concepts and principles of Agroforestry

To develop silvicultural systems in Agroforestry and their management with its formulation and objectives

To learn about concept and principle of Agroecology with its Agroecological practices

To provide knowledge about Agro-ecological basis for the conversion to organic movements

Course Outcome(Co)	Description
CO1	Knowledge of Agroecology and Agroforestry
CO2	Knowledge about scope of global and national needs for Agroforestry with its practices
CO3	To understand silvicultural systems in Agroforestry and selection of tree species for Agroforestry
CO4	To understand the principle of Agroecology and its role in ecological agriculture
CO5	To learn the conversion of organic movements for crop rotation, crop diversity and enhance soil health

CO-PO mapping for a course of “UG program”								
S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Knowledge of Agroecology and Agroforestry	3	3	3	3	3	3	2
CO2	Knowledge about scope of global and national needs for Agroforestry with its practices	3	3	3	3	3	3	3
CO3	To understand silvicultural systems in Agroforestry and selection of tree species for Agroforestry	3	3	2	2	3	2	3
CO4	To understand the principle of Agroecology and its role in ecological agriculture	3	2	2	3	2	2	3
CO5	To learn the conversion of organic movements for crop rotation, crop diversity and enhance soil health	3	3	3	3	3	3	3

Course: Solid Waste management

Course Code: ES304

Course Objectives:

- To select the most suitable solid waste management options in a specific local context
- To conceptually design waste conversion/treatment processes
- Assess the environmental impact of solid waste management options and criticize the results
- Assess the economic impact of solid waste management options and criticize the results
- Develop innovative solutions of solid waste management in urban areas

Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	Deep knowledge of disposal of solid waste.
CO2	To create awareness among the people about the impact of waste
CO3	Knowledge for the protection of environment through effective waste management techniques.

CO4	Knowledge to reduce and reuse of waste
CO5	Understanding of green techniques for solid waste disposal

CO-PO mapping for a course of “UG program”								
S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Deep knowledge of disposal of solid waste.	3	3	3	3	2	3	2
CO2	To create awareness among the people about the impact of waste	3	3	3	3	3	3	2
CO3	Knowledge for the protection of environment through effective waste management techniques.	3	3	3	3	3	3	3
CO4	Knowledge to reduce and reuse of waste local communities	3	3	3	3	3	3	3
CO5	Knowledge to reduce and reuse of waste	3	3	3	2	2	3	3

Course: Urban Ecosystems

Course Code: ES306

Course Objectives:

- Comprehend basic ecological and environmental concepts and principles related to urban ecosystems.
- Understand major arguments in and the critical concerns of urban political ecology; Describe and appreciate the complex and diverse relationships between cities and ecology, and between human and the built environment.
- Apply principles and concepts of urban ecosystems to analyze our surrounding urban habitats.
- Critically discuss contemporary socio-economic issues of urban ecology in different urban contexts.
- Make policy recommendation for a more sustainable urban future.

Course Outcomes (CO):

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

Course Outcome(Co)	Description
CO1	Able to Identify key issues in urban ecosystem management, and its linkage to urban sustainability and resilience.
CO2	Able to raise attention and public awareness of the importance of urban ecosystem management among scientists, policy makers, and general public.
CO3	Understand Urban Planning
CO4	Advanced knowledge and guidance for better urban ecosystem management.

CO-PO mapping for a course of “UG program”								
S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Able to Identify key issues in urban ecosystem management, and its linkage to urban sustainability and resilience.	3	2	3	2	2	2	2
CO2	Able to raise attention and public awareness of the importance of urban	2	3	3	2	3	2	2

	ecosystem management among scientists, policy makers, and general public.							
CO3	Understand Urban Planning.	3	2	3	3	2	1	2
CO4	Advanced knowledge and guidance for better urban ecosystem management	3	2	3	3	2	1	2

Course: Energy and Environment

Course code: ES311

Course Objectives:

- To understand the Introduction and history related to different forms of energy.
- To provide knowledge of Energy resources and its demand as respect to historical and current perspectives.
- To develop knowledge of Energy consumption and its impact on environment.
- To provide knowledge of Policies for uses of energy.
- To provide deep knowledge of sustainable use of energy.

Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	Be able to describe history related to different forms of energy.
CO2	Be able to Illustrate Energy resources and its demand as respect to historical and current perspectives.
CO3	Be able to explain Energy consumption and its impact on environment.
CO4	Be able to make connections of Policies for uses of energy.
CO5	Have an enhanced knowledge of sustainable use of energy.

CO-PO mapping for a course of “ UG program”								
S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Be able to describe history related to different forms of energy.	3	3	2	2	2	1	1
CO2	Be able to Illustrate Energy resources and its demand as respect to historical and current perspectives.	3	3	2	2	2	1	1
CO3	Be able to explain Energy consumption and its impact on environment.	3	3	2	2	3	2	1
CO4	Be able to make connections of Policies for uses of energy.	2	3	2	2	2	1	1
CO5	Have an enhanced knowledge of sustainable use of energy.	3	3	2	2	3	3	1

Program Educational Objective (PEOs): M.Sc. Environmental Science:

- To impart students with strong knowledge base through theory courses and sessional that makes them suitable for industries, academics, research and consultancies.
- To develop students analytical, computational and research skills through assignments, weekly presentations and modeling software.
- To train the students on developing practical, efficient and cost effective solutions on problems and challenges on environmental sciences and engineering.
- To inculcate among students sensitivity towards social and corporate responsibilities

Programme Specific Outcomes (PSOs):

- Apply the basic concepts of physical, chemical, mathematical, and biological sciences appropriately to the discipline of environmental science.
- Use state-of-the-art techniques, tools and skills necessary for accurate analysis of environmental samples.
- Demonstrate knowledge and understanding of the environmental principles and apply these to his own work, as member and/or leader in a team, to execute multidisciplinary projects.

POs for PG programs: M.Sc Environmental Science

Program Outcomes (POs)	<ol style="list-style-type: none">1. Critical thinking: In depth knowledge of basic and applied area of Environmental Science. Capability to demonstrate knowledge and understanding of major concepts of Environmental Science. Ability to use modern instrumentation techniques to employ critical thinking and efficient problem solving skills in the basic areas of Environmental Science.2. Effective Communication- Excellent communication skills to transmit complex technical information related to Environmental Science in a clear and concise written and verbal manner as oral presentations and compilation in the form of scientific reports.3. Social Interaction- Comprehend to apply contextual multi-disciplinary knowledge to assess societal, health, safety, and cultural issues relevant to the science practices.4. Effective Citizenship- Imbibe moral and social values in personal and social life leading to highly cultured and civilized personality.5. Ethics-: Students will be able to recognize the ethical component of complex situations. Acquired with awareness of work ethics and ethical issues in scientific research as well as plagiarism policies.6. Research related skills: Develop ability to adopt changing scientific environment in the process of sustainable development by using statistical tools.7. Environment and Sustainability- Advanced knowledge of fundamentals of Environmental Science with enhanced command over modern scientific methods, techniques and chemical processes equipped with environment safety measures.8. Self-directed and Lifelong learning- Students will be capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development. They will keep themselves updated with the best international practices and latest development in technologies, which will help them to gain a broader global perspective of the subject. Develop awareness of the role and importance of Environmental Science in interdisciplinary research as
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	well as in daily life.
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Course: Advanced studies in Environment and Ecology

Course Code: ES401

Course Objectives:

- Understand how interactions between organisms and their environments drive the dynamics of individuals, populations, communities, and ecosystems
- Recognize the ecological basis for regional and global environmental issues
- Understand the processes and patterns of evolution, and the role of evolution as the central unifying concept in environmental science
- Understand the Importance and also the the techniques to protect natural Resources

Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	Develop empathy for various life forms and appreciate the various ecological linkages within the web of life.
CO2	Apply the scientific method and quantitative techniques to describe, monitor and understand environmental systems.
CO3	Use interdisciplinary approaches such as ecology, economics, ethics and policy to devise solutions to environmental problems.
CO4	Be proficient in ecological field methods such as wildlife survey, biodiversity assessment, mathematical modeling and monitoring of ecological systems.
CO5	Explain the process and philosophical basis of scientific inquiry.

CO-PO mapping for a course of “ PG program”

S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Develop empathy for various life forms and appreciate the various ecological linkages within the web of life.	3	1	2	2	1	2	3
CO2	Apply the scientific method and quantitative techniques to describe, monitor and understand environmental systems.	3	1	2	1	1	2	3
CO3	Use interdisciplinary approaches such as ecology, economics, ethics and policy to devise solutions to environmental problems.	3	2	2	1	3	2	3
CO4	Be proficient in ecological field methods such as wildlife	3	2	2	1	2	3	3

	survey, biodiversity assessment, mathematical modeling and monitoring of ecological systems.							
CO5	Explain the process and philosophical basis of scientific inquiry.	3	1	3	1	2	2	3

Course: Energy and Green Technologies

Course Code: ES402

Course Objectives:

- To present different concepts of green technologies.
- To acquire principles of Energy efficient technologies.
- To impart knowledge on the methods of reducing CO₂ levels in atmosphere.
- To learn the importance of green fuels and its impact on environment.
- Basic actions to prevent degradation of the environment and harmful effects on humans

Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	Students are able to understand different concepts of green technologies.
CO2	Students are able to understand acquire principles of Energy efficient technologies.
CO3	Students are able to understand impart knowledge on the methods of reducing CO ₂ levels in atmosphere
CO4	Students are able to understand learn the importance of green fuels and its impact on environment.
CO5	Students are able to understand basic actions to prevent degradation of the environment and harmful effects on humans

CO-PO mapping for a course of “UG program”

S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Students are able to understand different concepts of green technologies.	3	2	3	2	3	2	3
CO2	Students are able to understand acquire principles of Energy efficient technologies.	3	2	3	2	2	2	3
CO3	Students are able to understand impart knowledge on the methods of reducing CO ₂ levels in atmosphere	3	2	3	2	2	2	3
CO4	Students are able to understand learn the importance of green fuels and its impact on environment.	3	2	3	3	2	3	3
CO5	Students are able to understand basic actions to prevent degradation of the environment and harmful effects on humans	3	2	3	3	2	2	3

Course: Basics of Environmental Microbiology**Course Code: ES403****Course Objectives:**

1. To know about historical events in microbiology, structural detail of prokaryotic and eukaryotic cell.
2. To understand microbial growth, multiplication and sterilization techniques.
3. Role of microbes in nutrient cycling.
4. Study of different microbial interaction and importance of Soil micro flora.
5. To assess impact of microbes on quality of air and water.
6. Uses of microbes for degradation of waste material

Course Outcomes (CO):

On completion of the course, students are able to:

Course Outcome(Co)	Description
CO1	Get an idea about the historical events in microbiology
CO2	Understand concepts of growth and reproduction of bacteria • Know anatomy of prokaryotic cell • Know structural detail of cells • Understood various parts of cell and its importance.
CO3	Know concepts related with of microbial interaction • Get an idea regarding microbes and their relation with environment.
CO4	Students will get basic knowledge to determine the role of microbes: a. in different habitats, b. in different biogeochemical cycles, c. to determine water quality, d. in degradation of natural organic compounds and selected pollutants in the environment.
CO5	The knowledge can be used to prevent infections and to protect human and environmental health.

CO-PO mapping for a course of “ PG program”

S.No	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	On completion of the course, students are able to get an idea about the historical events in microbiology.	2	1	2	2	2	1	2
CO2	Understand concepts of growth and reproduction of bacteria • Know anatomy of prokaryotic cell • Know structural detail of cells • Understood various parts of cell and its importance.	2	1	1	1	1	2	2
CO3	Know concepts related with of microbial interaction. Gets an idea regarding microbes and their relation	2	1	2	2	1	2	2

	with environment.								
CO4	Students will get basic knowledge to determine the role of microbes: a. in different habitats, b. in different biogeochemical cycles, c. to determine water quality, d. in degradation of natural organic compounds and selected pollutants in the environment.	2	1	2	1	1	2	2	2
CO5	The knowledge can be used to prevent infections and to protect human and environmental health.	2	1	3	1	2	1	1	1

Course: Course: Climate Change & Current Issues
Course Code: ES404

Course Objectives:

- Analyse through study of Elements of Climate impact of Human activities on World Climate.
- Analyse contributions of extreme events of Climate on Earth in bringing about changes in Climate.
- Evaluate the role of Remedial Measures in Combating Global Warming and Climate Change.
- Create a knowledge base for Global and National Action Plans to combat Climate Change Issues.

Course Outcomes (CO):

COURSE OUTCOME (CO)	ATTRIBUTES
CO1	Students will be able to Analyse through study of Elements of Climate, impact of Human activities on World Climate.
CO2	Students will be able to Analyse contributions of extreme events of Climate on Earth in bringing about changes in Climate.
CO3	Create a knowledge base for Global and National Action Plans to combat Climate Change Issues.
CO4	Students will be able to Evaluate the role of Remedial Measures in Combating Global Warming and Climate Change.

CO-PO mapping

Cos	Attributes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Students will be able to Analyse through study of Elements of Climate, impact of Human activities on World Climate.	3	1	2	1	1	2	2	3
CO2	Students will be able to Analyse contributions of extreme events of Climate on Earth in bringing about changes in Climate.	3	1	2	1	1	2	2	3

CO3	Create a knowledge base for Global and National Action Plans to combat Climate Change Issues.	3	1	2	2	1	2	3	3
CO4	Students will be able to Evaluate the role of Remedial Measures in Combating Global Warming and Climate Change.	3	1	2	2	1	2	3	3
3 Strong contribution, 2 Average contribution , 1 Low contribution									

Course: Natural Resources and Management

Course Code: ES406

COURSE OBJECTIVES:

- To have a basic knowledge of Natural resources its classification, concepts and natural resources of India.
- Determine the role played by agricultural practices in soil degradation - Soil erosion – Soil Fertility and Nutrient Management: Organic Farming: Green manuring.
- To understand systematic exploration of mineral deposits, development and conservation of minerals.
- To promote conditions for environmentally sustainable, economically efficient and equitably allocated use of water resources.
- To ensure long-term forest productivity and conservation of forest resources through prompt reforestation, soil conservation, afforestation, and other measures.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

Course Outcome(Co)	Description
CO1	Students will be able to introduced and aware from different types resources and its distribution.
CO2	Students will be able to Analyse contributions soil resources and how soil quality get affected by different events.
CO3	Create a knowledge for sustainable exploration and use and conservation of different types of mineral resources.
CO4	Students will be able to know about importance of water resources, Remedial Measures in conserving water resources.
CO5	The knowledge can be used to prevent deforestation and long-term measures for productivity and conservation of forest resources.

CO-PO mapping for a course of “ PG program”

S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Students will be able to introduced and aware from different types resources and its distribution.	3	1	1	1	2	2	2
CO2	Students will be able to Analyse contributions soil resources and how soil quality get affected by different events.	2	1	2	1	2	2	2
CO3	Create knowledge for sustainable exploration and use and conservation of different types of mineral resources.	3	1	2	1	2	2	2
CO4	Students will be able to know about importance of water resources, Remedial Measures in conserving water resources.	3	1	2	2	2	2	2
CO5	The knowledge can be used to prevent deforestation and long-term measures for productivity and conservation of forest	3	1	2	2	2	2	2

resources.								
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Course: Environmental Toxicology

Course Code: ES408

COURSE OBJECTIVES:

- To have a basic knowledge of toxicology.
- To have knowledge of methods and data used for testing of toxicity.
- To provide knowledge of pesticide toxicology.
- To have knowledge of concept of bioassay.
- To develop knowledge of xenobiotic compounds.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

Course Outcome(Co)	Description
CO1	Have an enhanced knowledge of Toxicology.
CO2	Be able to make connections and interrelations between data used for toxicity testing.
CO3	Be able to explain toxicity caused by pesticides in human body and their environment .
CO4	Be able to explain biassay and related problems.
CO5	Be able to describe xenobiotic compounds.

CO-PO mapping for a course of “ UG program”								
S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Have an enhanced knowledge of Toxicology.	2	2	2	2	2	1	1
CO2	Be able to make connections and interrelations between data used for toxicity testing.	3	2	1	1	2	1	1
CO3	Be able to explain toxicity caused by pesticides in human body and their environment .	2	2	2	2	2	1	1
CO4	Be able to explain biassay and related problems.	1	2	1	1	2	1	1
CO5	Be able to describe xenobiotic compounds.	2	2	1	2	2	1	1

Course: Biodiversity Monitoring and Management

Course Code: ES501

Course Objectives:

1. To understand fundamentals of variations amongst living world
2. To Assess Biological Resources and benefits arises from its
3. Identification of threats to biodiversity
4. To understand the importance of natural resources and Sustainable Management of Bio-resources

5. To conserve Biological Resources by implementing Policies, Programs and Acts

Course Outcomes (CO):

Course Outcome (CO)	Description
CO1	Articulate the goals of conservation biology, that is, to maintain biological diversity in all its expressions
CO2	Able to understand concept of biodiversity and its key component, concepts of taxonomy, ecology, genetics, geography, and evolution.
CO3	Explain why biological diversity is important, that is, nature's intrinsic and instrumental values
CO4	Highlight the threats to biological diversity, that is, direct harvesting, habitat destruction, and introduction of non-native species, among others, and their interactions.
CO5	Able to specify context appropriate actions needed to protect and restore biological diversity, that is, endangered species recovery, methods, quantitative assessment and data analysis, familiarity with relevant policy, law and government at local, regional, national and international levels.

CO-PO mapping for a course of " PG program"								
S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Articulate the goals of conservation biology, that is, to maintain biological diversity in all its expressions. Able to specify context appropriate actions needed to protect and restore biological diversity.	2	1	1	2	3	1	1
CO2	Able to understand concept of biodiversity and its key component, concepts of taxonomy, ecology, genetics, geography, and evolution.	3	1	2	1	1	1	2
CO3	Explain why biological diversity is important, that is, nature's intrinsic and instrumental values.	2	1	2	3	3	2	2
CO4	Highlight the threats to biological diversity, that is, direct harvesting, habitat destruction, and introduction of non-native species, among others, and their interactions.	2	2	2	2	3	2	1
CO5	Specify management strategies for conservation of biodiversity. Able to specify context appropriate actions needed to protect and restore biological diversity, that is,	2	2	2	2	2	3	3

endangered species recovery, designating ecological reserves, ecosystem restoration, invasive species management, interfacing with in the policy-making process, educating others, and combinations thereof.								
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Course: Environmental laws

Course Code: ES502

Course Objectives:

- To study Environmental laws in India.
- To study the guidelines and rules for Environmental Protection.
- To study the importance of Environmental planning.
- To study major initiatives and policies from Ministry of Environment and Forests

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Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	To understand how to protect the environment as it provides a guideline so that we can take care of the environment in an effective manner.
CO2	To understand how people can use natural resources on what terms.
CO3	Environmental laws are also in the front line to make sure that the law is followed when it comes to taking care of an environment.
CO4	This subject provides a platform to understand main function is the protection of human health as well as the environment.
CO5	To understand that the process of waste management does not interfere with the environment or human health.
CO6	To understand that industries meet all the legal obligations that is required to run them.

CO-PO mapping for a course of “UG program”

S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1		3	2	2		2	1	
CO2		3	1	1		2	1	
CO3		3	2	1		2	1	
CO4		3	2	1		1	2	
CO5		3	1	1		2	1	

Course: Waste Resource Management
Course Code: ES503
Course Objectives:

Course: Remote Sensing and GIS
Course Code: ES504
Course Objectives:

- To develop the scientific knowledge about Remote Sensing and its application.
- To develop attitude towards the fundamental education of Satellite Remote Sensing.
- To develop clear thinking about the application of GIS in forest and environment among students.
- To develop attitude towards fundamental concept of GIS in environment management.
- To provide the rational and scientific thinking about the basics of Maps, Scales and Cartography.

Course Outcomes (CO):

Course Outcome(Co)	Description
CO1	The mapping and development of a database using GPS and GIS technologies in experimental studies.
CO2	Be able the students to develop attitude towards the fundamental education of Satellite Remote Sensing.
CO3	The development of state-of-the-art methodologies for optimizing the water supply networks, both in the design and in the operation phase, using multiple variables and criteria.
CO4	The detailed experimental verification of the computational results and the development of know-how for self-regulation of pumps and valves in order to satisfy the supply needs in conjunction with the uniform pressure distribution in the water supply network.
CO5	The development of guidelines which could form the basis for Snow modeling.

CO-PO mapping for a course of “ PG program”								
S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	The mapping and development of a database using GPS and GIS technologies in experimental studies.	2	2	2	1	2	1	2
CO2	The students develop attitude towards the fundamental education of advanced and modern Satellite Remote Sensing.	3	1	1	1	2	1	3
CO3	The development of state-of-the-art methodologies for optimizing the water supply networks, both in the design and in the operation phase, using multiple variables and criteria.	3	2	1	1	2	1	2
CO4	The detailed experimental verification of the computational results and the development of know-how for self-	3	2	1	1	1	2	2

	regulation of pumps and valves in order to satisfy the supply needs in conjunction with the uniform pressure distribution in the water supply network.							
CO5	The development of guidelines which could form the basis for Snow modeling.	3	1	1	2	2	1	2

COURSE: ENVIRONMENTAL IMPACT ASSESSMENT

COURSE CODE: ES 506

COURSE OBJECTIVES:

- The purpose of this undergraduate course is to impart basic and key knowledge of Environmental Impact Assessment.
- This will help in enhancing knowledge of Environmental Impact Assessment legislations , Environmental clearance procedure for Projects, Environmental Impact Assessment methodologies, Environmental Auditing, monitoring and ISO standards and its certification process.
- After successfully completion of course, the student will able to explore subject into their respective dimensions.

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOME (CO)	ATTRIBUTES
CO1	Students will be able to Analyse role of Environmental Impact Assessment legislations in making decisions and getting Environmental clearance for Projects.
CO2	Students will be able to Evaluate the role of Environmental Impact Assessment methodologies in Environmental Impact Assessment Process.
CO3	Students will be able to Evaluate the Importance of ISO standards and its certification process in relation to environmental protection mechanism.
CO4	Students will be able to Analyse role of Environmental Auditing and monitoring in Environmental Impact Assessment Process.

CO-PO mapping

Cos	Attributes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	Students will be able to Analyse role of Environmental Impact Assessment legislations in making decisions and getting Environmental clearance for Projects.	3	1	2	1	1	2	2	3
CO2	Students will be able to Evaluate the role of Environmental Impact Assessment methodologies in Environmental Impact Assessment Process.	3	1	1	1	1	2	2	3
CO3	Students will be able to Evaluate the Importance of ISO standards and its certification process in relation to environmental protection mechanism.	3	1	1	1	1	2	2	3
CO4	Students will be able to Analyse role of Environmental Auditing and monitoring in Environmental Impact Assessment Process.	3	1	2	2	1	2	2	3

Course: Environmental Studies

COURSE CODE: ES101

COURSE OBJECTIVES:

- To study the multidisciplinary nature of environmental science.
- To study the structure and function of ecosystem.

- Knowledge and concept of biodiversity and its conservation.
- Basic knowledge and concept of causes, effect and control of different type of environmental pollution.
- To study different types of Disasters and effect on Human and environment.

COURSE OUTCOMES (CO):

After completion of the course, a student will be able to

COURSE OUTCOME (CO)	DESCRIPTION
CO1	Know about the concept of multidisciplinary nature of environmental science.
CO2	Know about the role of individual and importance of components of ecosystem.
CO3	Know about the conservation of biodiversity and its importance.
CO4	Aware the environmental pollution and its impact on human and ecosystem.
CO5	Know about natural disasters and its administration.

CO-PO mapping for a course of “UG program”

S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Know about the concept of multidisciplinary nature of environmental science.	3	3	2	3	2	3	2
CO2	Know about the role of individual and importance of components of ecosystem.	3	2	2	3	1	3	2
CO3	Know about the conservation of biodiversity and its importance.	3	2	2	3	1	3	2
CO4	Aware the environmental pollution and its impact on human and ecosystem.	3	2	2	3	1	3	2
CO5	Know about natural disasters and its administration.	3	2	2	3	1	3	2

COURSE: DISASTER ANAGEMENT COURSE

CODE: ES202

COURSE OBJECTIVES:

- To Study the types of Disasters and its profile in India.
- Knowledge of causes and impacts of Disasters, and Case studies of National and Global Disasters.
- To learn about risk reduction approaches of Disasters with safety issues in mitigating Industrial disasters.
- Basic concepts of Disaster Management Cycle and its Risk Reduction Measures.
- To know the National Acts and policies for mitigating disasters. Role of Army, Police, Community, Corporate, Media etc. for post Disaster Management.

COURSE OUTCOMES (CO):

After the successful course completion, learners will develop following attributes:

COURSE OUTCOM (CO)	DESCRIPTION
CO1	Students are able to learn types of disasters and its profile in India
CO2	Students are able to understand the causes and impacts of disasters on environment and related case studies of Global and National disasters
CO3	Students are able to learn about risk reduction approaches of disasters with safety issues in mitigating industrial disasters.
CO4	To understand the concept of Disaster Management Cycle and its Risk Reduction Measures
CO5	Students to learn the National Acts and policies for mitigating disasters, Role of Army, Police, Community, Corporate, Media etc. for post Disaster Management.

CO-PO mapping for a course of “ UG program”								
S.No.	CO description	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	Students are able to learn types of disasters and its profile in India	3	3	2	3	2	3	2
CO2	Students are able to understand the causes and impacts of disasters on environment and related case studies of Global and National disasters.	3	2	2	3	1	3	2
CO3	Students are able to learn about risk reduction approaches of disasters with safety issues in mitigating industrial disasters.	3	2	2	3	1	3	2
CO4	To understand the concept of Disaster Management Cycle and its Risk Reduction Measures.	3	3	2	3	1	3	2
CO5	Students to learn the National Acts and policies for mitigating disasters, Role of Army, Police, Community, Corporate, Media etc. for post Disaster Management.	3	2	2	3	2	3	2