

## **ANNEXURE 1.1**

### **OBJECTIVES OF THE DEPARTMENT**

- ❖ To promote environmental awareness among people (Environment Extension),
- ❖ To develop skilled human resource for solving environmental problems at global, national and regional level,
- ❖ To act as a resource centre for the neighboring institutions /organizations,
- ❖ To discover threats to the sustainability of environment and
- ❖ To develop technical solutions for present and future environmental problems and to achieve ecologically sustainable development in the region

### **PROGRAMME OUTCOMES (POs)**

- ❖ Master core concepts and methods from the multidisciplinary nature of the programme and their application in finding solutions to environmental problems.
- ❖ Understand the ethical, cross-cultural, and historical context of environmental issues and the global environmental linkages to assess the human-environment association.
- ❖ Apply perceptions about global environmental systems and suitable procedures to understand and evaluate the interactions between social and environmental processes and events.
- ❖ Recognize the trans-national character of critical environmental problems and apply translational research to find ways and means to address them.
- ❖ Understand their roles and identities as environmentally conscious citizens, consumers, and interdisciplinary environmental crusaders in a complex, interconnected world.
- ❖ Prove capability in quantitative and qualitative analysis, critical synthesis of existing information, and communication skills to conduct high-quality work and motivate common mass to adopt environmentally sustainable practices.

## **PROGRAMME SPECIFIC OUTCOMES (PSOs)**

- ❖ Understand the basic concepts about various components of the Environment and their interactions through the study of ecology, biodiversity, climatology, environmental chemistry, earth science, and environmental microbiology.
- ❖ Efficiently monitor, manage, and conserve diverse natural resources, by studying aquatic resources, remote sensing and GIS, and natural resources conservation and management.
- ❖ Understand different types of environmental pollutants, their sources, hazardous effects, treatment/abatement strategies, and associated legislations using knowledge acquired from courses related to environmental pollution, ecotoxicology, ecotechnologies, and environmental law.
- ❖ Analyse, determine, and interpret, the present level of contaminants in various environmental matrices using environmental analysis and instrumentation, biostatistics, and computer applications.
- ❖ Well-versed with the mitigation, preparedness, and management of natural and man-made disasters and the impact of various developmental activities/projects and measures to minimise these impacts by learning disaster management and environmental impact assessment.
- ❖ Through the dissertation, students will learn to identify a particular environmental problem, critically synthesize the existing literature for finding the knowledge gaps, standardize a scientific methodology, and collect, analyze and interpret the data to find an appropriate solution. They will also acquire the ability to transcribe the research findings in the form of a structured thesis and effectively communicate the research results through oral/poster presentations.

## SEMESTER- WISE COURSE OUTCOMES (COs)

| Course No.  | Course Learning Outcomes  |
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| <b>SEMESTER-I</b>                                     |   |
| Environmental Chemistry<br><b>PSESTC104</b>           | <b>Students shall be able to</b> <ul style="list-style-type: none"><li>• Understand the chemical composition of various components of the environment and interactions amongst them.</li><li>• Identify and explain the sources, pathways, and sinks of natural and anthropogenic pollutants.</li><li>• Understand the chemical and thermal stratification of earth's atmosphere and the processes governing tropospheric and stratospheric chemistry.</li><li>• Discern the various inorganic and organic pollutants in the terrestrial and aquatic.</li></ul> |
| Basics of Earth Sciences<br><b>PSESTC105</b>          | <b>Students shall be able to:</b> <ul style="list-style-type: none"><li>• Understand the internal structure of Earth, its elemental composition and evolution.</li><li>• Explain Earth's seismicity and volcanic activity</li><li>• Identify the types of rocks, and geomorphological governing their formation; explain weathering and its types.</li><li>• Discern the fluvial, aeolian and glacial geomorphological systems and identify the factors affecting their development.</li></ul>  |
| Concepts of Ecology and Ecosystem<br><b>PSESTC106</b> | <b>Student shall be able to:</b> <ul style="list-style-type: none"><li>• Understand various ecological principles and factors that determine the size and number of ecosystems that can co-exist within a specific area.</li><li>• Acquire knowledge for better development and management of natural resources and global environment</li></ul>  |
| Community and population ecology<br><b>PSESTC107</b>  | <b>Student shall be able to:</b> <ul style="list-style-type: none"><li>• Understand various principles and concepts of community and population and factors that determine the size and number of population that can co-exist within a specific area</li><li>• Acquire knowledge for better development and management of natural resources and global environment</li></ul>   |

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| Remote Sensing and GIS<br>PSESTC108   | <b>Students shall be able to:</b> <ul style="list-style-type: none"> <li>• Understand the basic principles of remote sensing and GIS; identify the tools used in remote sensing</li> <li>• Map &amp; monitor the natural as well as human induced changes using remote sensing tools in the forest and urban environments.</li> <li>• Explore the applications of remote Sensing tools for scientific management of natural resources.</li> </ul>   |
| Aquatic Environment(New)<br>PSESTC109 | <b>Students shall be able to:</b> <ul style="list-style-type: none"> <li>• Develop a conceptual understanding of structure, functions and types of aquatic ecosystems.</li> <li>• Recognize and enumerate the phytoplanktonic and zooplanktonic biota in the surface water as well as characterize its physico-chemical parameters.</li> <li>• Strategize and identify the practices for sustainable exploitation and management of aquatic resources.</li> <li>• Document the anthropogenic interferences affecting the aquatic habitats and their biota.</li> </ul> |

| <b>SEMESTER-II</b>  |  |
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| Principles of Climatology<br>PSESTC202                    | <b>Students shall be able to:</b> <ul style="list-style-type: none"> <li>• Understand the basic elements of climatology, climatic classification and different climatic regimes of the world.</li> <li>• Understand the concept of an atmospheric stability, atmospheric lapse rate, potential temperature, earth's radiative balance etc.</li> <li>• Discern atmospheric dynamics systems, such as Atmospheric General Circulation, Cloud Formation, Precipitation mechanisms etc.</li> </ul>   |
| Environmental Impact Assessment & Management<br>PSESTE206 | <b>Student shall be able to</b> <ul style="list-style-type: none"> <li>• Explain Environmental Impact Assessment: Basic Concepts and Principles of EIA, Need, Elements, Environmental Attributes, Overview of Impacts.</li> <li>• Understand EIA Procedure: Screening and Scoping in EIA, Methodologies of EIA, Checklist, Matrices, Overlays, Cost Benefit Analysis, Computer Aided EIA, Environmental Evaluation System-Impact Identification Networks</li> <li>• Interpret Environmental Audit and EMS: Concept, Types, Benefits, Scope and Objectives of EA, Pre-Audit, On-Site Audit and Post Audit Activities</li> </ul> |

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| <p>Environmental Pollution<br/><b>PSESTE207</b></p>                      | <p><b>Student shall be able to</b></p> <ul style="list-style-type: none"> <li>• Identify the air and water pollutants, their sources, effects and control measures.</li> <li>• Identify the sources and effects of Soil Pollutants.</li> <li>• Interpret different types of Wastes: their classification, identification, sources, and integrated approach for management of these wastes.</li> <li>• By the end of the course, students will have a broad, integrated understanding of the major problems associated with pollution of the atmosphere, water, the land surface and the food chain and how these can be managed in scientific manner.</li> </ul>   |
| <p>Environmental Microbiology<br/><b>PSESTC208</b></p>                   | <p><b>Students shall be able to:</b></p> <ul style="list-style-type: none"> <li>• to make the students familiar with micro organisms without which human could not survive as these microbes occur in large number in most natural environment and bring about many desirable and undesirable changes</li> <li>• apply the various techniques used in food and industrial microbiology.</li> <li>• Identify and explain the recent developments in microbiology and its application in environmental pollution abatement e.g. WRF technology, Bioremediation, Bioventing, Air sparging, Bioaugmentation etc.</li> <li>• develop the sustainable environment.</li> </ul>  |
| <p>Environmental Analysis &amp; Instrumentation<br/><b>PSESTE209</b></p> | <p><b>Students shall be able to:</b></p> <ul style="list-style-type: none"> <li>• Understand the classical and modern analytical methods; Quantitative and qualitative Analysis; Validation of a method and Environmental quality standards.</li> <li>• Learn about Sampling, Processing and Analysis of physico-chemical parameters of Air, water &amp; soil.</li> <li>• Understand the applications of Modern Instrumental Techniques: Atomic mass Spectrometry, Molecular Mass Spectrometry, Mass Spectrometric Applications, Radiochemical Analysis, ICP-MS in Environmental Analysis. Apply principle and working of UV-Visible Spectrophotometer, Infrared (IR) Spectrophotometer.</li> <li>• Identify the application of planer and columnar Chromatographic techniques, Paper and thin layer chromatography, HPLC, GC, and Ion Chromatography in Environmental Analysis</li> </ul> |

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| <b>SEMESTER-III</b>  |   |
| Ecotoxicology<br><b>PSESTE304</b>                                | <p><b>Student shall be able to:</b></p> <ul style="list-style-type: none"> <li>• learn various aspects of environmental toxicology from molecular to ecosystem level so as to equip students to evolve best ways of dealing chemical pollution.</li> <li>• Identify the environmental toxicology of fertilizers and heavy metals</li> </ul>   |
| Climate Change: Science and Policies<br><b>*PSESTO305</b>        | <p><b>Student shall be able to:</b></p> <ul style="list-style-type: none"> <li>• Understand the components of Climate System and natural and anthropogenic drivers of climate change.</li> <li>• Identify the vulnerabilities and impacts associated with climate change.</li> <li>• Explain various Governmental and Intergovernmental Actions to Combat Climate Change.</li> <li>• Explain India's Action Plan on Climate Change and Discern India's concerns regarding climate change</li> </ul>   |
| Natural Resources: Conservation & Management<br><b>PSESTC306</b> | <p><b>Students shall be able to:</b></p> <ul style="list-style-type: none"> <li>• Understand the importance of Natural Resources and their Conservation and Management practices: Afforestation and Joint Forest Management – Social Forestry, Agro Forestry</li> <li>• Identify the anthropogenic impacts and apply control measures and conservation practices:</li> <li>• Understand the importance of wildlife, identify the threats to wildlife, assess the status of wildlife in India, and learn the in situ and ex situ conservation practices in India</li> <li>• Discern the renewable energy sources in India and identify their contribution to energy scenario.</li> </ul> |
| Ecotechnologies for Contaminant Remediation<br><b>PSESTE307</b>  | <p><b>Student shall be able to</b></p> <ul style="list-style-type: none"> <li>• well versed with the concept of bioremediation, applicability of various ecotechnologies for contaminant remediation, the processes and factors affecting remediation capabilities of various ecotechnologies and creation of green infrastructures for contaminant remediation with pertinent case studies.</li> <li>• utilize the self-designing and self-healing capabilities in devising contaminant-/site-specific ecotechnologies.</li> </ul>   |

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| Basic course in Environmental Economics<br><b>PSESTE308</b> | <p><b>Student shall be able to</b></p> <ul style="list-style-type: none"> <li>• Understand environmental issues in relation to the theory of externalities, goods and welfare.</li> <li>• Examine economic principles concerning the choice of instruments for controlling pollution and the relative strength and weaknesses of environmental policies based on command-</li> </ul> |
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|  | <p>and-control vis-à-vis market-based instruments.</p> <ul style="list-style-type: none"> <li>Identify various approaches and methods developed for valuing environmental goods and services.</li> </ul>   |
| <p>Biological Statistics<br/><b>PSESTC309</b></p>                | <p><b>Students shall be able to:</b></p> <ul style="list-style-type: none"> <li>Understand the principal concepts and applications of biostatistics and its relation to other sciences.</li> <li>Identify and apply statistical methods for describing and analyzing biological data Explain the central tendency and variability in the environmental data.</li> <li>Interpret data via normal distribution, correlation analysis, T-test, etc. to present meaningful results.</li> <li>Apply hypothesis testing. Chi-square goodness of fit, Analysis of variance (one- and two-factor) and Simple and multiple regression and correlation and nonparametric statistical methods.</li> </ul> |
| <p>Fundamentals of Soil Science<br/><b>PSESTE310</b></p>         | <p><b>Student shall be able to:</b></p> <ul style="list-style-type: none"> <li>Understand the Genesis and evolution of soils, its physical and chemical properties and the plant-soil relations w.r.t. the availability of macro and micro-nutrients.</li> <li>Explain inorganic and organic components of the soil, mineral composition, cation exchange capacity etc.</li> <li>Discern the soil contaminants such as Pesticides, Heavy metals, Hazardous wastes and various soil testing methods.</li> </ul>   |
| <p>Wildlife Conservation and Management<br/><b>PSESTE311</b></p> | <p>Students shall be able to:</p> <ul style="list-style-type: none"> <li>Understand the ecological, scientific, economic and cultural value of wildlife and wildlife habitats.</li> <li>Identify the impacts of environmental degradation, changed land-use and pollutants on wildlife depletion.</li> <li>Explain the status and distribution of wildlife in India, and identify the protected area networks: National Parks, Wildlife Sanctuaries &amp; Biosphere Reserves for wildlife protection.</li> </ul>   |

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| <p>Forest Ecology<br/><b>PSESTE312</b></p> | <p>Students shall be able to:</p> <ul style="list-style-type: none"> <li>Understand the importance of forests and their Conservation and Management practices: Afforestation and Joint Forest Management – Social Forestry, Agro Forestry</li> <li>Explain the Forest: Types, ecological characteristics &amp; distribution pattern in India, their status and biotic and abiotic conditions for forest regeneration, growth and dynamics.</li> <li>Understanding of the functional relationships between soil, climate, flora and fauna in forest ecosystems and to identify the effects of soil quality, precipitation, climate and human interferences on forest ecosystems.</li> </ul> |
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| Computer Applications<br><b>PSESTC313</b> | <p><b>Students shall be able to:</b></p> <ul style="list-style-type: none"> <li>• Identify the various computer hardware components, Understand computer terms, , number systems, algorithms and flowcharts</li> <li>• Understand Unix and windows operating systems; internal and external DOS commands; Language types, types of networks, Internet, World Wide Web.</li> <li>• Learn the basics of C language, datatypes, operators, conditional and controlled statements, strings and functions.</li> </ul> |
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#### **SEMESTER-IV**

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| Environmental Law<br><b>PSESTE401</b>           | <p><b>Student shall be able to</b></p> <ul style="list-style-type: none"> <li>• Learn about the legislative measures for protection of environment and spirit of Indian Constitution for environmental protection.</li> <li>• Understand the elementary principles of environmental Laws</li> <li>• Discern various laws for environmental protection in India.</li> <li>• Familiarize with the overall environmental legal regime of country and international obligations.</li> </ul>                        |
| Environmental Biotechnology<br><b>PSESTE404</b> | <p><b>Student shall be able to</b></p> <ul style="list-style-type: none"> <li>• Evaluate the potential of environment biotechnology for biodegradation of organic pollutants</li> <li>• protect the environment from pollution and to conserve natural resources because the rapid industrialization , urbanisation and other developments are constant threat to the clean environment and to the depleting natural resources.</li> <li>• develop cleaner &amp; sustainable environment in future.</li> </ul> |

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| Man and Environment: Issues and Policies<br><b>*PSESTO405</b> | <p><b>Student shall be able to</b></p> <ul style="list-style-type: none"> <li>• Understand the concept of Sustainable development and Common future goals</li> <li>• Identify the role of UNEP, UNFCC and IPCC in environmental Protection</li> <li>• Understand the energy scenario in India and contribution of renewable energy sector towards abatement of environmental pollution.</li> <li>• Understand the importance of wildlife, reasons for its depletions and various conservation measures for wildlife protection in India</li> <li>• Explain various environmental movements in India, Bishnoi tradition, Chipko movement, Tehri dam movement, Narmada dam movement, Almatti dam movement, Silent Valley movement.</li> </ul> |
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| Atmospheric Processes<br><b>PSESTE406</b>  | <b>Student shall be able to:</b> <ul style="list-style-type: none"> <li>• Understand the Concept of an Air Parcel, Lapse Rate, Potential Temperature. Water Vapor in Air: Moisture Parameters, Latent Heats, The Saturated Adiabatic Lapse Rate, Normand’s Rule</li> <li>• Explain the atmospheric radiative transfer mechanisms</li> <li>• Discern atmospheric dynamics systems, such as Atmospheric General Circulation, Cloud Formation, Precipitation mechanisms etc.</li> </ul>  |
| Energy and Environment<br><b>PSESTE407</b> | <b>Student shall be able to:</b> <ul style="list-style-type: none"> <li>• World energy use and Indian scenario in India. Trends in energy use of oil, coal and gas.</li> <li>• Energy and carbon emissions, Environmental problems associated with fossil fuels.</li> <li>• Identify the alternative energy resources and green technologies for abatement of environmental pollution.</li> </ul>   |
| Disaster Management<br><b>PSESTE408</b>    | <b>Student shall be able to</b> <ul style="list-style-type: none"> <li>• Understand and interpret the Disaster: Disaster management cycle, general effects and concerns.</li> <li>• Discern the natural disasters: Earthquake, Volcanic eruptions, Snow avalanches, landslides, cyclone, Floods, drought, Heat and cold waves and tsunami and its characteristics, causes, impacts and mitigation.</li> <li>• Analyze the disaster response, risk and vulnerability assessment, disaster preparedness, disaster mitigation and Recovery.</li> </ul> |

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| Environmental Health Hazards and Sanitation<br><b>PSESTE409</b> | <b>Student shall be able to:</b> <ul style="list-style-type: none"> <li>•Apply the basic concepts of environmental health sciences and key environmental health issues.</li> <li>•Develop skills in analysing, sensitizing, and managing the community about environmental health issues including communicable diseases.</li> <li>•Understand the potential consequences of exposure to hazardous environmental/occupational agents.</li> </ul> |
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