

Kerala University of Digital Sciences, Innovation and Technology



MSc Environmental Science

Specializations

1. Environmental Data Science
2. Ecological Informatics
3. Sustainability Studies
4. Environmental Communication
5. Ocean and Climate Informatics

Curating a responsible digital world

Curriculum and Syllabus -2025 admission

School of Informatics

MSc Environmental Science

1. About the Program

The MSc Environmental Science (with specialization in Environmental Data Science, Ecological Informatics, Sustainability Studies, Environmental Communication, and Ocean and Climate Informatics) is a multidisciplinary 2-year postgraduate program designed to equip students with a comprehensive understanding of environmental systems and the analytical skills needed to address contemporary environmental challenges. The program integrates concepts from natural sciences, data science, technology, and social sciences to examine issues such as climate change, biodiversity conservation, sustainable resource management, and environmental governance. Through a combination of theoretical learning, field-based experiences, data analysis, and research projects, students develop the ability to analyse environmental problems and design evidence-based solutions. The five specialization pathways enable students to build expertise in emerging areas of environmental science and sustainability.

2. Program Educational Objectives (PEOs)

1. Prepare the program graduates to have successful careers as academicians, researchers, professionals, and entrepreneurs developing innovative and sustainable solutions for the industry, government, and society by leveraging digital technologies.
2. Train in healthy negotiations, societal amelioration, progressive professional development, and become exceptional leaders.
3. Inculcate sensitivity towards environmental and social welfare as ethical and responsible citizens and contribute towards sustainable development.

3. Program Outcomes (POs)

PO1: Disciplinary knowledge

Demonstrate advanced and integrated knowledge of environmental science, including ecological, climatic, geospatial, socio-environmental, and quantitative domains, and apply interdisciplinary principles to address complex environmental challenges.

PO2: Problem analysis:

Critically identify, formulate, and analyze complex environmental problems through systematic review of literature and application of scientific, mathematical, and socio-ecological principles to derive substantiated and evidence-based conclusions.

PO3: Design/development of solutions:

Design, evaluate, and recommend sustainable environmental solutions, policies, technological interventions, and management strategies that incorporate ecological integrity, public health, societal equity, and environmental sustainability considerations.

PO4: Conduct investigations of complex problems:

Apply advanced research methodologies, including experimental design, environmental monitoring, data analytics, modelling, and synthesis of interdisciplinary evidence, to investigate environmental phenomena and generate valid scientific outcomes.

PO5: Modern tool usage:

Select and apply appropriate contemporary analytical tools, including statistical software, GIS, remote sensing, computational models, and environmental informatics platforms, for prediction, assessment, and decision support, while acknowledging methodological limitations.

PO6: Social responsibility:

Evaluate environmental issues within social, legal, cultural, and policy frameworks and demonstrate professional responsibility toward environmental justice, community engagement, and public welfare.

PO7: Environment and sustainability:

Assess the environmental, economic, and social impacts of developmental activities and demonstrate competence in advancing sustainable development, climate resilience, biodiversity conservation, and responsible resource management.

PO8: Ethics:

Apply ethical principles in environmental research, governance, policy analysis, and professional practice, ensuring integrity, transparency, accountability, and respect for ecological and societal systems.

PO9: Individual and team work:

Demonstrate the ability to function effectively as an individual and as a member or leader of multidisciplinary teams in research, policy, industry, or community-based environmental initiatives.

PO10: Communication:

Communicate complex environmental information effectively to scientific, policy, and public audiences through technical reports, policy briefs, academic publications, presentations, and digital media platforms.

PO11: Project management and finance:

Demonstrate knowledge of environmental governance structures, regulatory frameworks, sustainability financing, and project management principles to plan, implement, and manage environmental programmes in multidisciplinary contexts.

PO12: Life-long learning:

Recognize the need for and demonstrate the ability to engage in independent and lifelong learning to respond to evolving environmental challenges, emerging technologies, and global sustainability transitions.

4. Program Specific Outcomes (PSO)

After the completion of the MSc Environmental Science with the following specializations, the graduates will be able to

PSO 1: Analyse complex environmental systems by integrating ecological, climatic, socio-economic, and technological dimensions using interdisciplinary scientific frameworks.

PSO 2: Apply quantitative, computational, and analytical tools to interpret environmental data and support evidence-based environmental policy, planning, and management decisions.

PSO 3: Evaluate environmental challenges within ethical, governance, and sustainability frameworks, and propose context-sensitive, scalable solutions aligned with SDGs and national priorities

Environmental Data Science

PSO 4: Develop and implement statistical, machine learning, and geospatial models for environmental prediction, risk assessment, and resource optimisation.

PSO5: Integrate heterogeneous environmental datasets (remote sensing, sensor networks, climate records, biodiversity data) into unified analytical platforms for decision support systems.

Ecological Informatics

PSO 4: Design and simulate ecological processes and biodiversity dynamics using computational and informatics-based approaches.

PSO 5: Develop AI- and sensor-driven ecological monitoring and conservation frameworks integrating traditional ecological knowledge and digital technologies.

Sustainability Studies

PSO 4: Evaluate environmental, social, and economic sustainability indicators and design integrated sustainability transition strategies.

PSO 5: Assess sustainability policies, ESG frameworks, and regulatory instruments, and design governance mechanisms for climate resilience and circular economy transitions.

Environmental Communication

PSO 4: Translate complex environmental data and research into accessible communication formats using digital media, storytelling, and visual analytics.

PSO 5: Design evidence-based environmental communication strategies that influence public behaviour, community participation, and policy dialogue.

Ocean and Climate Informatics

PSO 4: Analyze oceanographic and climate datasets using modeling tools to understand variability, extreme events, and long-term climate trends.

PSO 5: Develop predictive and decision-support models for coastal resilience, climate adaptation, and disaster risk reduction.

5. Types and levels of courses

Course Type	Course Level
University Courses	500 Level

University Core- Digital Access for Community Empowerment (DACE)	
University Elective - Holistic Development- HD	
Program Core/Elective	400/500 Level
Open Elective	400/500 Level
Capstone Project/Thesis	500 Level

The course levels are defined as detailed below

400 Level courses: Advanced courses, including lecture courses with practicum, seminar-based courses, term papers, research methodology, advanced laboratory experiments/software training, research projects, hands-on training, internship/apprenticeship projects at the undergraduate level, or First-year Postgraduate theoretical and practical courses.

500 Level Courses: These courses provide an opportunity for original study or investigation in the major or field of specialization on an individual and more autonomous basis at the postgraduate level. All 500-level courses should have a course project with a mandatory report submission and evaluation.

The various types of courses allowable are as detailed below

University Courses: Every master's program will have two categories of university courses, as detailed below.

University Core courses: Digital Access for Community Empowerment - DACE (Level 500) implemented as DACE I and DACE II.

University Elective courses: Holistic Development (Level 500) implemented as HD-1, HD-2 & HD-3.

Program Core Courses: These are the courses imparting the core concepts in the subjects relevant to the master's program

Program Elective Courses: These courses provide specific learning pathways to specialize in the subject areas of the master's program.

Open Electives: These are the courses providing broader, interdisciplinary, and specialized learning pathways in the master's program.

Capstone Project/Thesis: This course involves comprehensive research explorations/practical implementations/industry practice in a specialized subject area relevant to the specialization in the master's program.

6. The credit distribution across various types of courses

Program courses (45 credits)			University courses (15 credits)		Final year Projects (20 credits)	Additional credits beyond mandatory coursework and project
Program Core	Program Electives	Open Electives	University Core DACE-I&II	University Elective Holistic Development	Capstone Project/ Thesis)	Additional courses
(Mandatory)						(Optional)
18 credits	15 credits	12 credits	6 credits	9 credits	20 credits	10 credits

7. The semester-wise breakup of credit requirements across various types of courses

Year-wise course levels & Credit distribution	Se me ste r	University Core (500 level)	Program Core/Progr am Elective/Op en Elective 400/500 level	Capstone Project/ Thesis 500 level	Holistic Develop ment 500 level	Minimum credits required	Maximum allowable credits
1 st year: 400 level courses- 24 credits + 500 level courses- 16 credits	S1	3 credits	15- 19 credits	0 credit	2 credits	20 credits	24 credits
	S2	3 credits	15- 19 credits	0 credit	2 credits	20 credits	24 credits
2 nd year: 500 level courses/proj ect/thesis- 40 credits	S3	0	15- 19 credits	0-4 credits	5 credits	20 credits	24 credits
	S4	0	0 - 4 credits	20 credits	0 credits	20 credits	24 credits

- The students are allowed to take a maximum of 24 Credits (inclusive of both audit & credits courses) in a semester. However, this credit limit restriction may be exempted for accommodating the repeat attempt of the failed courses.
- The minimum aggregate of attendance during a semester shall be 75%. This is not applicable to project-based courses, fieldwork-based courses, and research works done outside the university. Any exemptions shall be defined by the course lecturers in the course description document.
- The students are allowed to take a maximum of 12 Credits through audit courses. These credits do not count toward the total credits for the program.
- The students are allowed to obtain a maximum of 12 Credits through challenge exams. These credits count towards the total credits for the program.
- At least 35 credits (program electives + project/thesis) are required for a major specialization and 9 credits (defined streams of specialization as specified through open electives in program outline) for minor specialization (equivalent to three 3 credit courses or equivalent). The specialization credits consist of projects, courses, activities etc.

Pass Criteria

As stipulated in the University Examination Manual.

Examinations

Each course level would have a different type of examination, as stipulated in the University Examination Manual

8. Specializations at a Glance

Environmental Data Science

Harness the power of data to drive environmental solutions! In this specialization, you'll learn to analyze complex environmental datasets, develop predictive models, and use advanced computational tools to inform decision-making. Whether it's tracking deforestation, predicting air quality, or optimizing resource management, you'll gain the skills to turn data into actionable insights. Join this program to become a leader in the growing field of environmental analytics and make data-driven impacts on sustainability.

Ecological Informatics

Ecological Informatics integrates ecology, computational science, informatics, and social sciences to improve our understanding of ecological processes. This pioneering academic program offers a unique blend of ecology and information technology and imparts computational and informatics skills to students with backgrounds in the natural and physical sciences.

Sustainability Studies

Are you passionate about creating a more sustainable world? Our Sustainability Studies specialization within the MSc Environmental Science program is designed for forward-thinking individuals who want to take charge of addressing global environmental, social, and economic challenges. This interdisciplinary track equips you with the knowledge, tools, and strategies to design and implement sustainable solutions for communities, businesses, and ecosystems

Environmental Communication

Become a voice for the planet! Environmental Communication focuses on effectively conveying complex environmental issues to diverse audiences, from policymakers to the public. You'll learn to craft compelling narratives, design impactful campaigns, and use digital media to inspire action and drive change. This specialization is ideal for those who want to bridge the gap between science and society, ensuring that critical environmental messages are heard and acted upon.

Ocean and Climate Informatics

Dive into the interconnected worlds of oceanography and climate science! This specialization equips you with the knowledge to study ocean ecosystems, monitor climate change impacts, and develop strategies for mitigation and adaptation. Using advanced informatics tools, you'll analyze oceanic and atmospheric data to understand trends, predict future scenarios, and contribute to global efforts in combating climate change. If you're passionate about preserving our oceans and addressing climate challenges, this is the path for you.

Program Structure

SNo	Course Name	Course type (Specialization)	Credits	Level
Semester 1				
1	Environmental Physics	PC	3	400
2	Ecology and Biodiversity	PC	3	400
3	Quantitative Methods for Environmental Science - I	PC	3	400
4	Environmental Chemistry	PC	3	400
5	Experiential Learning	PC	3	400
6	Digital Access for Community Development DACE-1	UC	3	500
7	Holistic Development-1	UE	2	500
Semester 2				
8	Environmental Engineering	PC	3	400
9	Remote Sensing and GIS	PE	3	400
10	Python for Environmental Science	PE (ED,SS,EI,OCI)	3	400

11	Socio-Environmental Systems and Technological Change	PE (SS)	3	400
12	Quantitative Methods for Environmental Science-II	PE (ED,EI)	3	400
13	Ocean and Climate Dynamics	PE (OCI)	3	400
14	Designing Intelligent Land Parcels: Data-Driven Measurement of Biophysical Processes	OE	3	500
15	Principles and Practices of Environmental Communication	PE (EC)	3	500
16	Environmental Problem Solving	OE	3	500
17	Digital Access for Community Development DACE-II	UC	3	500
18	Holistic Development-II	UE	2	500
Semester 3				
19	AI Applications in Environmental Science	PE (ED)	3	500
20	Geospatial Modelling for Environmental Science	PE (ED, EI)	3	500
21	Machine Learning for Environmental Science	PE (ED,EI)	3	500
22	Cloud Computing for Climate Change	PE (ED,EI)	3	500
23	Drone Analytics for Environmental Sciences	PE (ED)	3	500
24	Ecological Modelling	PE(EI)	3	500
25	Collaborative Environmental Studies	PE (EI)	3	500
26	Sustainability Transitions and Development Strategies	PE (SS)	3	500
27	Life Cycle Assessment and Circular Economy	PE (SS)	3	500
28	ESG and Corporate Sustainability	PE (SS)	3	500
29	Carbon Accounting and Net Zero Pathways	PE (SS)	3	500
30	Strategic and Crisis Communication	PE (EC)	3	500
31	Digital Storytelling for Environmental Communication	PE (EC)	3	500
32	Environmental Journalism	PE(EC)	3	500
33	Environmental Policy and Legislation	PE (EC)	3	500
34	Numerical Modelling of Oceans and Climate	PE (OCI)	3	500
35	AI for Ocean and Climate Science	PE (OCI)	3	500
36	Ocean and Climate Data Analytics	PE (OCI)	3	500
37	Remote Sensing for Oceanic and Climatic Applications	PE (OCI)	3	500
38	Environmental Impact Assessment	OE	3	500
39	Nature-based Solutions for Ecosystem Restoration and Climate Resilience	OE	3	500

40	Indian Knowledge Systems and Sustainable Development	OE	3	500
41	Global Change Studies	PE	3	500
42	Mini Project	PE	4	500
Semester 4				
42	Capstone Project/Thesis	PE	20	500
<p>UC- University Core; UE- University Elective; PC- Program Core; PE- Program Elective; OE- Open Elective ED-Environmental Data Science EI-Ecological Informatics EC-Environmental Communication SS-Sustainable Studies OCI-Ocean and Climate Informatics</p>				

