School of Informatics

MSc Ecology (Specialization in Ecological Informatics)

Revised Curriculum -2024

(In accordance with the Digital University Kerala Postgraduate Regulations 2024)

DIGITAL UNIVERSITY KERALA

Curating a responsible digital world

Kerala University of Digital Sciences, Innovation and Technology

(Digital University Kerala)

1. Contents

MSc Ecology (with Specialization in Ecological Informatics)

2. About the Program

In the Anthropocene, a time marked by climate change, biodiversity loss, and resource constraints, understanding our environment is not merely important—it is essential. Ecology serves as a vital lens, illuminating the interactions between living organisms and the broader ecosystem. By studying ecology, we acquire the insights needed to assess the environmental consequences of human actions, promote sustainable resource management, and make informed choices for a healthier and more sustainable future.

M.Sc. Ecology (with specialization in Ecological Informatics) is a two-year full-time program that teaches Ecology in tandem with technology. Today's ecological problems are increasingly complex and call for real-time analysis of vast amounts of data. Specializing in ecological informatics can help address these challenges by mastering the methods and developing the tools to translate complex data into usable information.

3. Program Educational Objectives (PEOs)

1. Prepare the program graduates to have successful careers as ecologists, 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 ecological and social welfare as ethical and responsible citizens and contribute towards sustainable development.

4. Program Outcomes (Pos)

Upon completing the Post Graduate Program, the student will be able to achieve the following program outcomes

1. **Disciplinary knowledge**: Understand complex ideas and apply the knowledge of science and mathematics to arrive at feasible, sustainable solutions with a research mindset through an interdisciplinary approach.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex problems, reaching substantiated conclusions using the first principles of mathematics, natural and social sciences.
3. **Design/development of solutions**: Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate public health and safety, cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods, including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling complex activities with an understanding of the limitations.
6. **Social responsibility**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional practice.
7. **Environment and sustainability**: Understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional, social, and environmental ethics and responsibilities
9. **Individual and team work**: Function effectively as an individual, member, or leader in diverse groups and multidisciplinary settings.
10. **Communication**: Communicate effectively on interdisciplinary activities with the peer community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of various scientific and management principles and apply these to one's work as a member and leader in a team to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

5. Program Specific Outcomes (PSOs)

Students will develop a comprehensive understanding of key concepts in ecological sciences, identify suitable computational approaches, and apply tools to analyze and address fundamental theoretical, methodological, and practical challenges related to information flow within the biosphere. They will acquire essential skills in analysis, decision-making, and data modeling, preparing them for careers in the job market and advancing research to tackle complex problems.

After the completion of the MSc Ecology (with Specialization in Ecological Informatics), the student will be able to

1. Build a comprehensive understanding of core disciplines and discuss contemporary topics in ecology and environmental science
2. Develop interdisciplinary approaches by integrating ecological studies with other fields, utilizing informatics skills as needed

3. Develop critical thinking and problem-solving skills and provide feasible, innovative, and sustainable solutions to address real-world environmental and societal problems utilizing computational and technical skills.
4. Build research competencies that empower students to conduct independent and innovative research and communicate scientific findings to various audiences.
5. Prioritize conservation principles to sustain environmental balance by catalyzing technological advances that promote societal welfare

6. Types of courses and their course levels

Course Type	Course Level
University Courses **University Core**- Digital Access for Community Empowerment (DACE) **University Elective** - Holistic Development- HD	500 Level
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.

7. 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

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

Year-wise course levels & Credit distribution	**Semester**	**University Core (500 level)**	**Program Core/Program Elective/Open Elective 400/500 level**	**Capstone Project/ Thesis 500 level**	**Holistic Development 500 level**	**Minimum credits required**	**Maximum allowable credits**
1st 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

2nd year: 500 level courses/project/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.

9. Program Outline

SNo.	Course Code	Course Name	Type	Level	Credit	Credits Split			
						Lecture-Lab-Seminar-Project			
Semester I									
1		Digital Access for Community Empowerment (DACE) -I	UC	500	3	-	-	-	
2		Holistic Development	UE	500	2				
3	M4321001	General Ecology	PC	400	3	2	0	1	0
4	M4321002	Biodiversity and Evolution	PC	400	3	2	0	1	0
5	M4321003	Quantitative Ecology	PC	400	3	2	1	0	0
6	M4321004	Ecological Informatics-1	PE	400	3	2	1	0	0
7	M4321005	Mathematical Thinking in Ecology	PC	400	3	2	0	1	0
8	M4321006	Ecology and Biodiversity Lab-1	PE	400	2	0	2	0	0
Semester II									
1		Digital Access for Community Empowerment (DACE) -II	UC	500	3	-	-	-	
2		Holistic Development	UE	500	2				
3	M4321007	Population, Community, and Ecosystem Ecology	PC	400	3	2	0	1	0
4	M4321008	Ecology and Society	PC	400	3	2	0	1	0
5	M4321009	Spatial Informatics	PE	400	3	1	1	0	1
6	M5321001	Ecological Informatics-2	PE	500	3	2	0	0	1
7	M5321002	Conservation and Sustainable Development	OE	500	3	2	0	1	0
8	M5321003	Ecology and Biodiversity Lab-2	PE	500	2	0	1	0	1
Semester III									
		Holistic Development	UE	500	4				
1	M5321004	Ecological Modelling	PE	500	3	1	1	1	0
2	M5321005	Global Change Ecology	PE	500	3	2	0	1	0
3	M5321006	Ecological Engineering and Ecosystem Restoration	PE	500	3	1	1	0	1
6	M5321007	Bioinspired Design	OE	500	3	1	0	1	1
5	M5321008	Environment Impact Assessment	OE	500	3	1	0	1	1
6	M5321009	Environmental Social Governance	OE	500	3	1	0	1	1
7	M5321010	Environmental Legislation and Policy	OE	500	3	2	0	1	0
8	M5321011	Advanced Topics in Ecology	PE	500	3	0	0	1	2
9	M5321012	Forest Ecology	PE	500	3	1	0	0	2
10	M5321013	Urban Ecology	PE	500	3	1	0	1	1
11	M5321014	Project (Optional)	PE	500	4	0	0	1	3
Semester IV									
1	M5321015	Master Project/Thesis		500	20	0	0	0	20

UC- University Core; UE- University Elective; PC- Program Core; PE- Program Elective; OE-Open Elective