KANNUR UNIVERSITY

(Abstract)

Five Year Integrated Master's Programme (FYIMP) in University Teaching Departments / Schools w.e.f 2024 admission - Foundation Courses offered by the Dept of Environmental Studies for FYIMP - Defects in Syllabus -Rectified - Approved - orders issued

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ACADEMIC C SECTION

ACAD C/ACAD C1/3990/2025 Dated: 04.04.2025

Read:-1. U. O. No Acad C/Acad C3/12564/2023 dated 23.09.2024

2. Letter No. ACAD C/ACAD C3/7453/2024(I) dated 19.11.2024

3. E mail dated 08.02.2025 from the Head, Dept. of Environmental Studies.

4. Minutes of the meeting of Standing Committee of Academic Council held on 05.03.2025

5. The Orders of the Vice Chancellor in file of even No. dated 3.4.2025

ORDER

1. As per paper read (1) above, Foundation Courses offered by various Teaching Departments / Schools (other than the six Depts offering FYIMP) for FYIMP were approved and implemented w. e. f. 2024 admission.

2. As per the approved Regulation for FYIMP, the Mark distribution of End Semester Examination and Continuous Assessment shall be 50:50.

3. But, in the approved Syllabus of Foundation Courses offered by the Department of Environmental Studies, the Mark distribution was mentioned as 70:30.

4. Further, in order to bring uniformity for FYIMP Syllabus (including the Foundation Courses) it was directed to make the total digits of the Course Code of all the FYIMP Courses as 13 (ie, adding the Semester number as KU 01,02,03 etc)

5.Subsequently, the aforementioned matter was intimated to the Head, Department of Environmental Studies, vide paper read (2) above.

6. As per paper read (3) above, the Head, Department of Environmental Studies forwarded the defect rectified Syllabus of Foundation Courses, offered for FYIM Programmes, for approval.

7. Considering the matter, Vice Chancellor has ordered to place the defect rectified syllabus of the Foundation Courses offered by the Department of Environmental Studies for FYIM Programmes before the Standing Committee of Academic Council.

8. The Standing Committee of Academic Council considered the defect rectified syllabus of the Foundation Courses offered by the Department of Environmental Studies for FYIM Programme and recommended to approve the same.

9. The Vice Chancellor, after considering the recommendations of Standing Committee of the Academic Council and exercising the powers of the Academic Council conferred under Section 11(1) Chapter III of Kannur University Act, 1996 ***accorded sanction to rectify the defects in the approved Syllabus of the Foundation Courses offered by the Dept of Environmental Studies of the University for FYIM Programmes, w.e.f. 2024 admission subject to reporting the matter to the Academic Council.***

10) The Corrected Syllabus of the Foundation Courses for FYIM Programmes offered by the Dept

of Environmental Studies is appended with this U.O. and uploaded in the University Website (www.kannuruniversity.ac.in).

Orders are issued accordingly.

Sd/-
Bindu K P G
DEPUTY REGISTRAR (ACADEMIC)
For REGISTRAR

To:
1. The Controller of Examination (Through PA)
2. The Head, Dept of Environmental Studies , Kannur University
3. Nodal Officer, FYIMP Implementation Committee

Copy To:
1.Heads of all Teaching Departments
2.PS to VC/ PA to R
3. PA to CE (to circulate among the sections concerned under Examination Branch)
4. EP IV/ EXC I (Examinations)
5. J R (Examinations)
6. AR/DR (Academic)
7. Computer Programmer
8. Web Manager (to publish in the official website)
9. SF/DF/FC

Forwarded / By Order
SECTION OFFICER

KANNUR UNIVERSITY
CIVIL STATION P.O.
KANNUR
Pin-670 002
THAVAKKARA

COURSE CODE: KU01DSCEVS101- BASICS OF ENVIRONMENTALSCIENCE

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
1	DSC	100	KU01DSCEVS101	4	75

ASDLearning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
5	-	1	50	50	100	3

Course Description:

- This interdisciplinary course assess the concept of ecology, the interaction of matter, energy and material cycling, knowledge on the principles for balancing social, economic and environmental dimensions of human development. Students will be able to understand the basic facts of environmental science, gain knowledge on basics on natural resources, identify and analyze the types, features, structure and function of major ecosystems, describe the causes, effects and control measures of various environmental pollution, and aware of environmental ethics, issues and possible solutions.

Course Pre-requisite

1. Introduction to basics of Environmental Science
2. Study differentiates renewable and nonrenewable resources.
3. Principles of role of individuals in prevention and control of pollution
4. Identify the basics of disaster management
5. Expand knowledge on social issues and environment

Course Outcomes: At the end of the Course, the student will be able to -

CO No.	Expected Outcome	Learning Domains
1	Aware of conservation and sustainable utilization of natural resources.	Cognitive
2	Identify and analyze the types, features, structure and function of major ecosystems.	Cognitive
3	Analyze the role of individuals in prevention and control of pollution.	Cognitive
4	Categorize the basics resettlement and rehabilitation of people	Cognitive & Psychomotor
5	Knowledge on acts and policies related to environmental protection.	Cognitive

COURSE CONTENTS

Module 1: Introduction of Environmental Science (15 Hrs)

Definition, scope and importance. Need of Environmental awareness – Methods for Environmental awareness. Natural Resources - Renewable and non-renewable resources. Natural resources and associated problems and desertification**.**

Module 2: Ecosystems (15 Hrs)

Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flows in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 3: Environmental Pollution (15 Hrs)

Definition - Cause, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, and Nuclear hazards.

Module 4: Social Issues and the Environment (15 Hrs)

From unsustainable to sustainable development urban problems related to energy. Water conservation - rain water harvesting, watershed management. Resettlement and rehabilitation of people - its problems and concerns. Environmental ethics - issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion. Nuclear accidents and holocaust, Case Studies. Wasteland reclamation, Consumerism and waste products

Module 5: Teacher Specific Module (15 Hrs)

1. Seminar presentations
2. Field visits are encouraged to relevant places in Kerala and Western Ghats like Biodiversity park
3. Industrial plants, etc.
4. Industrial visit and report preparation

Core Compulsory Readings (Books, Journals, E-sources Websites/ weblinks)

1. K.C. Agarwal, 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India.
3. R.S.Clark, Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. A.K.De, Environmental Chemistry, Wiley Eastern Ltd.
6. Down to Earth, Centre for Science and Environment (R)
7. H.P. Gleick, 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
8. R.E. Hawkins, Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
9. V.H. Heywood & R.T. Waston, 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.

10. H. Jadhav & V. M. Bhosale, 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.

Core Suggested Readings (Books, Journals, E-sources Websites/ weblinks)

1. M.L. Mckinney & R.M. School, 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
2. A.K. Mhaskar, Matter Hazardous, Techno-Science Publication (TB)
3. T.G. Miller Jr., Environmental Science, Wadsworth Publishing Co. (TB)
4. E.P. Odum, 1971. Fundamentals of Ecology. W.B. Saunders Co. USA

TEACHING LEARNING STRATEGIES (Classroom activities / Lab activities / Field Activities)

- Direct instruction: Brain storming lecture, Explicit Teaching, E-learning (video)
- Interactive Instruction: Active co-operative learning, seminars, group assignments, library work and group discussion, presentation by individual student/group representative
- Fieldwork and field visits

MODE OF TRANSACTION

- Face to face: Lecture method & demonstration method
- Learner-centered technique: Computer-assisted learning & individual project teaching

ASSESSMENT RUBRICS

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**50**
a)	Test Paper- 1	10
b)	Test Paper-2	10
c)	Assignment	10
d)	Seminar	10
e)	Book/ Article Review	-
f)	Viva-Voce	-
g)	Field Report	-
h)	Add relevant mode	
Total		**100**

Sample Questions to test Outcomes.

1. Explain the importance and need of Environmental awareness.
2. Describe the role of fire in shaping an ecosystem.
3. What is the significance of climatic factors on shaping the ecosystems?
4. Discuss about the impact of human on ecosystem.
5. Write an essay on terrestrial ecosystems.
6. What are the major objectives of environmental pollution monitoring?
7. What are the main sources of air pollution?
8. Elaborate on various classifications and sources of water pollution.
9. What are the watershed management practices in Kerala?
10. Give a brief note on t ecological impacts of acid rain.

Employability for the Course / Programme

- **Environmental Consultant**
  - Work with industries Environmental Health and Safety Officer
  - Environmental Policy Analyst
  - Environmental Consultant
  - Environmental Engineer
  - Conservation Scientist
  - Environmental Educator
  - Environmental manager
  - Waste management officer
  - Nature conservation officer
- Environment Policy Analyst
  - Analyze and develop environment acts and policies
  - Estimate various ecology, and pollution studies and environmental impacts
  - Conduct research on recent technologies in ecosystem species distribution, and

pollution related studies in various aspects

- Advise governments and organizations on environmental related resolutions.

COURSE CODE: KU02MDCEVS101- GENDER AND ENVIRONMENT

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	MDC	100	KU02MDCEVS101	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
5	-	1	50	50	100	3

Course Description:

This interdisciplinary course explores the intricate relationships between gender and the environment, examining how social constructs of gender shape our understanding, experience, and management of natural resources. Through a critical lens, we will analyze how gender influences environmental access, control, and benefits, and how environmental issues impact men and women differently.

Course Pre-requisite

1. Introduction to Gender Studies or Women's Studies
2. Environmental Studies or Environmental Science
3. Sociology or Social Sciences

4. Human Geography or Development Studies

5. Any course that introduces students to social justice, inequality, or sustainability concepts

Course Outcomes: At the end of the Course, the student will be able to -

CO No.	Expected Outcome	Learning Domains
1	Analyze the intersectionality of gender and environment	Cognitive
2	Evaluate gendered environmental impacts and responses	Cognitive
3	Apply gender equity principles to environmental management	Cognitive
4	Critique gendered power dynamics in environmental contexts	Cognitive & Psychomotor
5	Design gender-responsive solutions for sustainable futures	Cognitive

COURSE CONTENTS

Module 1: Gender and Society (10 Hrs)

The socially constructed ‘gender’ concept; Gender existence in society; gender: matriarchy and patriarchy as means of social exclusion (case studies in an Indian context); gender equity issues in rural and urban settings.

Module 2: Gender and the environment (10Hrs)

Relevance of the concept in an environmental context; evolution of gender hierarchies in historical and contemporary perspective; gendered division of roles in cultural, social, and economic perspective; gender inequalities.

Module 3: Gender, resources, and the environment (15Hrs)

Knowledge about the environment among men and women; differential dependencies on environmental resources; implications of gendered responses to environmental degradation.

Module 4: Gender, environmental management and future (10 Hrs)

Women's participation in environmental movements and conservation; historical and contemporary case studies; the role of women in environmental education, awareness, and sustainable development.

Module 5: Teacher Specific Module (15 Hrs)

Mention broad areas of content, transaction, and evaluation.

5.1 Student Presentations

5.2 Group Discussions

5.3 Mini Group Projects for Students

Core Compulsory Readings (Books, Journals, E-sources Websites/ weblinks)

1. Agarwal, B. 2001. Participatory exclusions, community forestry, and gender: An analysisforSouth Asia and a conceptual framework. World Development 29: 1623-1648.
2. Agarwal, B., 2019. The gender and environment debate: Lessons from India. In Population and environment (pp. 87-124). Routledge.
3. Buckingham, S., 2005. Gender and Environment. Routledge.
4. Gaarder, E., 2011. Women and the animal rights movement. In Women and the Animal Rights Movement. Rutgers University Press.
5. Jackson, C. 1993. Doing what comes naturally? Women and environment in development.World Development 21: 1947-63.
6. Leach, M. 2007. Earth Mother myths and other ecofeminist fables: How a strategic notionrose and fell. Development and Change 38: 67-85.
7. MacGregor, S. ed., 2017. Routledge Handbook of Gender and Environment. Taylor &Francis.

Core Suggested Readings (Books, Journals, E-sources Websites/ weblinks)

1. Miller, B. 1993. Sex and Gender Hierarchies. Cambridge University Press
2. Oswald Spring, Ú., 2008. Gender and disasters: human, gender and environmental security.UNU-EHS.

3. Rodríguez-Labajos, B. and Ray, I., 2021. Six avenues for engendering creativeenvironmentalism. Global Environmental Change, 68, p.102269.
4. Stein, R. (ed.). 2004. New Perspectives on Environmental Justice: Gender, Sexuality, andActivism. Rutgers University Press.
5. Stephens, A., Lewis, E.D. and Reddy, S., 2018. Towards an inclusive systemic evaluation for the SDGs: Gender equality, environments and marginalized voices (GEMs). Evaluation,24(2), pp.220-236.

TEACHING LEARNING STRATEGIES (Classroom activities / Lab activities / Field Activities)

- Direct instruction: Brain storming lecture, Explicit Teaching, E-learning (video)
- Interactive Instruction: Active co-operative learning, seminars, group assignments, library work and group discussion, presentation by individual student/group representative
- Fieldwork and field visits

MODE OF TRANSACTION

- Face to face: Lecture method & demonstration method
- Learner-centered technique: Computer-assisted learning & individual project teaching

ASSESSMENT RUBRICS

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**50**
a)	Test Paper- 1	10
b)	Test Paper-2	10
c)	Assignment	10
d)	Seminar	10
e)	Book/ Article Review	-
f)	Viva-Voce	-
g)	Field Report	-
h)	Add relevant mode	
Total		**100**

Sample Questions to test Outcomes.

1. How do patriarchal and matriarchal societies differ in environmental impact?
2. How does climate change affect women and men differently in rural India?
3. Design a gender-inclusive conservation project. What strategies would you use?
4. How do gendered power relations contribute to environmental degradation?
5. Integrate gender perspectives into a sustainable development plan. What key elements would you include?

Employability for the Course / Programme

- Sustainability Consultant: Apply gender-sensitive approaches to environmental impact assessments, sustainability strategies, and policy development in government, NGOs, or private companies.
- Gender & Development Specialist: Design and implement gender-responsive projects, conduct research, and build capacity on gender-environment intersections in international development agencies, NGOs, or research institutions.

COURSE CODE: KU02DSCEVS102 - ENERGY AND ENVIRONMENT

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	DSC	100	KU02DSCEVS102	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
5	-	1	50	50	100	3

Course Description:

This interdisciplinary course explores the complex relationships between energy production, consumption, and environmental sustainability. Students will examine the social, economic, and political dimensions of energy systems, analyzing the impacts of energy choices on the environment and society.

Course Pre-requisite

1. Introduction to Environmental Science or Environmental Studies
2. Basic Physics or Energy Fundamentals
3. Principles of Sustainability or Sustainable Development
4. Social Science Research Methods or Environmental Policy
5. Introductory Economics or Energy Economics

Course Outcomes: At the end of the Course, the student will be able to -

CO No.	Expected Outcome	Learning Domains

1	Analyze energy systems	Cognitive
2	Evaluate energy-environment interactions	Cognitive
3	Explain energy demand and consumption patterns	Cognitive
4	Develop sustainable energy solutions	Cognitive & Psychomotor
5	Critique energy policy and governance	Cognitive

COURSE CONTENTS

Module 1: Energy resources (15 Hrs)

Defining energy; forms and importance; Global energy resources; renewable and non-renewable resources: distribution and availability; sources and sinks of energy

Module 2: Energy demand (15 Hrs)

Global energy demand: historical and current perspective; energy demand and use in domestic, industrial, agriculture, and transportation sector; generation and utilization in rural and urban environments

Module 3: Energy, environment and society (15 Hrs)

Energy production as a driver of environmental change; nature, scope, and analysis of local and global impacts of energy use on the environment; fossil fuel burning and related issues of air pollution

Module 4: Energy and related issues (15 Hrs)

Radioactive waste, spent fuel; energy production, transformation, and utilization associated environmental impacts (Chernobyl and Fukushima nuclear accidents, construction of dams, environmental pollution); energy over-consumption and its impact on the environment

Module 5: Teacher Specific Module (15 Hrs)

Mention broad areas of content, transaction, and evaluation.

5.1 Student Presentations

5.2 Group Discussions

5.3 Mini Group Projects for Students

Core Compulsory Readings (Books, Journals, E-sources Websites/ weblinks)

1. McKibben, B. 2012. Global Warming's Terrifying New Math, Rolling Stone
2. Magazine. Craig. J.R., Vaughan, D.J., Skinner. B.J. 1996. Resources of the Earth: Origin, use, and environmental impact (2nd edition). Prentice Hall, New Jersey.
3. Rowlands, I.H. 2009. Renewable Electricity: The Prospects for Innovation and Integration in Provincial Policies in Debora L. Van Nijnatten and Robert Boardman(eds), Canadian Environmental Policy and Politics: Prospects for Leadership and Innovation, Third Edition. Oxford University Press, pp. 167-82.

Core Suggested Readings (Books, Journals, E-sources Websites/ weblinks)

1. Oliver, J. 2013. Dispelling the Myths about Canada's Energy Future, Policy: Canadian Politics and Public Policy, June-July.
2. Mallon, K. 2006. Myths, Pitfalls and Oversights, Renewable Energy Policy and Politics: A Handbook for Decision-Making. EarthScan.

TEACHING LEARNING STRATEGIES (Classroom activities / Lab activities / Field Activities)

- Direct instruction: Brain storming lecture, Explicit Teaching, E-learning (video)
- Interactive Instruction: Active co-operative learning, seminars, group assignments, library work and group discussion, presentation by individual student/group representative
- Fieldwork and field visits

MODE OF TRANSACTION

- Face to face: Lecture method & demonstration method
- Learner-centered technique: Computer-assisted learning & individual project teaching

ASSESSMENT RUBRICS

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**50**
a)	Test Paper- 1	10

b)	Test Paper-2	10
c)	Assignment	10
d)	Seminar	10
e)	Book/ Article Review	-
f)	Viva-Voce	-
g)	Field Report	-
h)	Add relevant mode	
Total		**100**

Sample Questions to test Outcomes.

1. Compare renewable and non-renewable energy sources
2. How does fossil fuel combustion impact air quality and climate?
3. What factors drive energy demand in transportation?
4. Design a community-scale renewable energy project.
5. Evaluate a national energy policy's effectiveness in promoting sustainability.

Employability for the Course / Programme

- Sustainability Consultant
    - Work with organizations to develop sustainable energy strategies
    - Conduct environmental impact assessments
    - Implement energy-efficient solutions
    - Collaborate with stakeholders to promote sustainability
- Energy Policy Analyst
    - Analyze and develop energy policies
    - Evaluate energy projects' environmental impacts
    - Conduct research on energy trends and technologies

- Advise governments and organizations on energy-related decisions

COURSE CODE: KU03SECEVS101 - ECO-INFORMATICS, ENVIRONMENTAL DATA ANALYSIS & SUSTAINABILITY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	SEC	100	KU03SECEVS101	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
5	-	1	50	50	100	3

Course Description

This course explores the intersection of environmental science and data analysis, focusing on the application of informatics tools and techniques to understand and manage ecological systems.It opens up into the role of digital technologies in achieving sustainable development goals, including data analysis, visualization, as well as digital solutions for environmental monitoring, conservation, and community engagement.

Course Pre-requisite

Introduction to Environmental Science, Data Analysis, or Equivalent

Course Outcomes: At the end of the Course, the Student will be able to -

CO No.	Expected Outcome	Learning Domains
1	Understand the principles of eco-informatics and its role in environmental decision-making.	Cognitive
2	Apply programming languages (e.g., R) to ecological data analysis.	Cognitive
3	Examine the potential of digital tools for sustainable development	Cognitive
4	Explore digital solutions for environmental monitoring and conservation	Cognitive & Psychomotor
5	Analyze and interpret ecological data using statistical and machine learning techniques.	Cognitive

COURSE CONTENTS

Module 1: Introduction to Eco-Informatics (10 Hrs)

1.1 Eco-Informatics

Definition, History and Evolution of the Field, Key Concepts and Applications

1.2 Ecological Data Management

Introduction to Databases and Data Repositories, Data Storage and Retrieval Techniques, Data Sharing and Collaboration Tools

Module II: Data Analysis (20 Hrs)

2.1 Exploratory Data Analysis for Ecological Data

Importance of EDA in Ecological Research, Types of Ecological Data (Field Data, Remote Sensing, Etc.), Methods of Data Collection in Ecology, Public Ecological Datasets and Repositories, Introduction to Data Formats and Standards.

2.2 Population Dynamics and Ecosystem Modeling

Mathematical Modeling of Population Dynamics, Ecosystem Modeling and Simulation

2.3 Programming Languages & Software's

Introduction to R Programming and SPSS Software, Introduction to Data Visualization, Principles of Effective Data Visualization, Plotting Ecological Data Using R, Basic Plots (Scatter Plots, Histograms, and Box Plots). Introduction to Statistical Analysis for Ecological Data, Regression, Classification, and Clustering Techniques.

Module III: Digital Tools for Sustainable Development (10 Hrs)

3.1 Sustainable Development Goals and Digital Technologies: Overview, Key Concepts and Frameworks, Sustainable Development Data Sets, Sustainable Development Goals (SDGs, Importance of Digital Tools in Achieving Sustainability, Introduction to the Digital Transformation and its Implications for Sustainability.

3.2 Environmental Monitoring and Conservation: Digital Solutions for Environmental Monitoring (e.g., Sensor Technologies, Drones), Digital Tools for Conservation Efforts (e.g., Citizen Science Platforms, Conservation Apps), Tools for Digital Communication and Collaboration (Slack, Zoom, Microsoft Teams), Digital Tools for Urban Planning and Management, Role of Digital Tools in Sustainability Education, E-Learning Platforms and Resources.

Module IV: Block chain Technology and AI **(10 Hrs)**

Block chain Technology and Sustainability: Basics of Block chain Technology, Applications of Block chain In Sustainable Supply Chains and Energy Management.

Artificial Intelligence and Sustainability: Introduction to AI, Applications of AI in Predicting and Solving Sustainability Challenges.

Module V: Teacher Specific Module (10 Hrs)

5.1 Student Presentations

5.2 Group Discussions

5.3 Discussions on Advanced Topics

Suggested Readings

1. Michener, W.K., & Brunt, J.W. (Eds.). (2000). Ecological Data: Design, Management, and Processing. Blackwell Science.

2. Jones, M.B., & Crawley, M.J. (2015). Informatics for Biodiversity and Ecology: Data Management, Information Systems, and Models. Springer.
3. Wilkinson, M.D., et al. (2016). "The FAIR Guiding Principles for Scientific Data Management and Stewardship." Scientific Data, 3, 160018.
4. Borer, E.T., Seabloom, E.W., Jones, M.B., &Schildhauer, M. (2009). "Some Simple Guidelines for Effective Data Management." Bulletin of the Ecological Society of America, 90(2), 205-214.
5. Bolker, B.M. (2008). Ecological Models and Data in R. Princeton University Press.
6. Gotelli, N.J., & Ellison, A.M. (2013). A Primer of Ecological Statistics. Sinauer Associates.
7. Brunsdon, C., & Comber, L. (2015). An Introduction to R for Spatial Analysis and Mapping. Sage.
8. Beckerman, A.P., Childs, D.Z., &Petchey, O.L. (2017). Getting Started with R: An Introduction for Biologists. Oxford University Press.
9. R Documentation: https://www.rdocumentation.org/

TEACHING LEARNING STRATEGIES (Classroom activities / Lab activities / Field Activities)

Interactive Instruction: Active co-operative learning, Seminars, Group Assignments, Library work and Group discussion, Presentation by individual student/ Group representative.

Mode of Transaction Face to face: Lecture method & Demonstration method

Learner centered technique: Computer assisted learning & individual project teaching

ASSESSMENT RUBRICS

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**50**
a)	Test Paper- 1	10
b)	Test Paper-2	10
c)	Assignment	10
d)	Seminar	10

e)	Book/ Article Review	-
f)	Viva-Voce	-
g)	Field Report	-
h)	Add relevant mode	
Total		**100**

Sample Questions to test Outcomes.

1. Describe the concepts and applications of eco informatics.
2. Write a note on exploratory data analysis.
3. Write an essay on how digital technologies help in achieving SDGs.
4. What is blockchain technology? Explain with their applications in sustainability.
5. Elaborate the concept of digital tools and environmental monitoring.

Employability for the Course / Programme

- Sustainability Consultant
    - Work with organizations to develop new technology strategies
    - Conduct environmental impact assessments with modelling
    - Implement energy-efficient solutions
    - Collaborate with stakeholders to promote sustainability
- Energy Policy Analyst
    - Analyze and develop internal policies
    - Evaluate sustainable new projects' environmental impacts

- Conduct research on sustainable trends and technologies
- Advise governments and organizations on energy-related decisions

COURSE CODE: KU03DSCEVS103 - GREEN TECHNOLOGY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	100	KU03DSCEVS103	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
5	-	1	50	50	100	3

Course Description

This course provides an introduction to green technology, focusing on sustainable innovations and practices that reduce environmental impact. Students will learn about various green technologies, their applications, and the role they play in addressing global environmental challenges. The course covers renewable energy, sustainable materials, green building, water conservation, and waste management.

Course Pre-requisite

Introduction to Environmental Science, Physics, Mathematics, Engineering or Equivalent

Course Outcomes: At the end of the Course, the Student will be able to -

CO No.	Expected Outcome	Learning Domains
1	Understand the principles of green technology and sustainability.	Cognitive
2	Explore various green technologies and their applications.	Cognitive & Psychomotor
3	Analyze the environmental, economic, and social impacts of green technologies.	Cognitive
4	Develop skills to assess and implement sustainable solutions.	Cognitive & Affective
5	Evaluate case studies of green technology implementations.	Cognitive

COURSE CONTENTS

Module I: Green Technology& Renewable Energy Technology (15 Hrs)

1.1. Green Technology: Definition, Objectives and Principles of Green Technology, Importance of Sustainability and Environmental Impact.

1.2 Renewable Energy Technology: Renewable Energy Sources (Solar, Wind, Hydro, Geothermal, Biomass), Technologies for Harnessing Renewable Energy, Renewable Energy Projects – Case Studies

Module II: Energy Efficiency and Green Manufacturing (15 Hrs)

2.1 Energy Efficiency And Conservation: Principles of Energy Efficiency, Technologies for Energy Conservation in Residential, Commercial, and Industrial Settings, Case Studies on Energy Efficiency Improvements.

2.2 Sustainable Materials and Green Manufacturing: Introduction to Sustainable Materials Biodegradable, Recyclable, Non-Toxic), Green Manufacturing Processes and Practices.

Module III: Sustainability in Architecture, Water Management, Waste Management and Transportation (15 Hrs)

3.1 Green Building and Sustainable Architecture: Principles of Green Building and Sustainable Architecture, Technologies and Materials Used in Green Construction.

3.2 Water Conservation and Management: Importance of Water Conservation, Technologies for Water Conservation and Management (Rainwater Harvesting, Greywater Systems, Efficient Irrigation).

3.3 Waste Management and Recycling Technologies: Waste Management Principles, Technologies for Waste Reduction, Recycling, and Composting, Waste Management Systems – Case Studies

3.4 Sustainable Transportation: Sustainable Transportation Solutions (Electric Vehicles, Public Transport, Bike-Sharing Systems), Technologies for Reducing Transportation Emissions, Sustainable Transportation Initiatives.

Module IV: Policies and Innovations in Green Technology (15 Hrs)

4.1 Green Information and Communication Technology (ICT): Role of ICT in Promoting Sustainability, Green Data Centers, Energy-Efficient Computing, and Smart Grids.

4.2 Environmental Impact Assessment and Life Cycle Analysis: Introduction to Environmental Impact Assessment (EIA), Life Cycle Analysis (LCA) of Products and Technologies.

4.3 Policy and Regulation in Green Technology: Policies and Regulations Promoting Green Technology, Role of Government, Industry, and NGOs in Fostering Sustainable Practices, Policy-Driven Green Technology Initiatives.

4.4 Innovations in Green Technology: Emerging Technologies and Innovations in Sustainability, Challenges and Opportunities in the Adoption of Green Technology.

Module V: Teacher Specific Module (15 Hrs)

5.1: Student Presentations

5.2: Group Discussions

5.3: Mini Group Projects for Students

Suggested Readings

1. "Building Energy Efficiency: Why Green Buildings Are Key to Asia's Future" by the World Resources Institute.
2. "Green Building and Climate Resilience: Understanding Impacts and Preparing for Changing Conditions" by the U.S. Green Building Council.
3. "Green ICT: Energy Efficiency for a Sustainable Future" by the International Telecommunication Union (ITU).
4. "Innovative Waste Management Technologies for Sustainable Development" by the United Nations Environment Programme (UNEP).
5. "Sustainable Manufacturing and Eco-Innovation: Framework, Practices and Measurement" by OECD.
6. "The Environmental Benefits of Recycling and Its Contribution to the Reduction of Greenhouse Gas Emissions" by the European Environment Agency.
7. "The Environmental Benefits of Remanufacturing: Beyond Waste Reduction" by Nabil Nasr. International Journal of Environmental Technology and Management.
8. "The Role of Green Building in Climate Change Mitigation" by the World Green Building Council.
9. "The Role of Renewable Energy Technologies in Limiting Climate Change" by the International Energy Agency (IEA).
10. "Urban Water Sustainability: Practices and Issues" by the Environmental Protection Agency (EPA).
11. Black, W. R. (2010). Sustainable Transportation: Problems and Solutions. Guilford Press.
12. Boyle, G. (Ed.). (2012). Renewable Energy: Power for a Sustainable Future (3rd ed.). Oxford University Press.

13. Brown, M. A., & Sovacool, B. K. (2011). Climate Change and Global Energy Security: Technology and Policy Options. MIT Press.
14. Christensen, T. H. (Ed.). (2011). Solid Waste Technology and Management. Wiley-Blackwell.
15. Graedel, T. E., & Allenby, B. R. (2010). Industrial Ecology and Sustainable Engineering. Pearson.
16. MacKay, D. J. C. (2008). Sustainable Energy – Without the Hot Air. UIT Cambridge.
17. Tester, J. W., Drake, E. M., Driscoll, M. J., Golay, M. W., & Peters, W. A. (2012). Sustainable Energy: Choosing Among Options (2nd ed.). MIT Press.

Teaching Learning Strategies Direct Instruction: Brain storming lecture, Explicit Teaching, E-learning (Video)

Interactive Instruction: Active co-operative learning, Seminars, Group Assignments, Library work and Group discussion, Presentation by individual student/ Group representative, Group projects.

Mode of Transaction Face to face: Lecture method & Demonstration method. Learner centered technique: Computer assisted learning & individual project teaching, project presentation.

ASSESSMENT RUBRICS

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**50**
a)	Test Paper- 1	10
b)	Test Paper-2	10
c)	Assignment	10
d)	Seminar	10
e)	Book/ Article Review	-
f)	Viva-Voce	-
g)	Field Report	-

h)	Add relevant mode	
Total		**100**

Sample Questions to test Outcomes.

1. Write a note on emerging technologies in sustainability. Explain the challenges in the adoption of green technology.
2. Write an essay on waste management with the help of case studies.
3. What are the renewable energy sources? Explain the technologies used for harnessing renewable energy.
4. Elaborate the concept of green building and sustainable architecture.
5. What is energy efficiency and how it helps in achieving sustainability?

Employability for the Course / Programme

- Sustainability Consultant: Apply gender-sensitive approaches to environmental impact assessments, sustainability strategies, and policy development in government, NGOs, or private companies.
- Development Specialist: Design and implement gender-responsive projects, conduct research, and build capacity on gender-environment intersections in international development agencies, NGOs, or research institutions.