



# UNIVERSITY OF JAMMU

(NAAC ACCREDITED 'A' GRADE' UNIVERSITY)  
(Baba Sahib Ambedkar Road, Jammu-180006 (J&K))

Academic Section

Email: [academicsectionju14@gmail.com](mailto:academicsectionju14@gmail.com)

## NOTIFICATION (23/August/Adp./75)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Academic Council, is pleased to authorize the adoption of the Syllabi and Courses of Studies of the subject of **Environmental Science** of Semester Ist, IInd and IIIrd for **Four Year Under Graduate Programme (FYUGP)** under the **Choice Based Credit System** as per **NEP-2020 (as given in the annexure)** for the examinations to be held in the years as per the details given below:

Subject	Semester	For the examinations to be held in the year
Environmental Science	Semester- I	Dec. 2023, 2024 and 2025
	Semester-II	May 2024, 2025 and 2026
	Semester-III	Dec. 2024, 2025 and 2026

The Environmental Science as Multidisciplinary Course (Course Code UMDEST304) shall also be applicable for Semester-III of Batch 2022-23 for examination to be held on Dec.2023.

The Syllabi of the courses is also available on the University website: [www.jammuuniversity.ac.in](http://www.jammuuniversity.ac.in).

Sd/-  
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/23/8548-8607

Dated: 14.8.2023

Copy for information and necessary action to:

- 1 Dean, Faculty of Life Science
- 2 Convener, Board of Studies in **Environmental Science**
- 3 Sr. P.A.to the Controller of Examinations
- 4 All members of the Board of Studies
- 5 Confidential Assistant to the Controller of Examinations
- 6 I/C Director, Computer Centre, University of Jammu
- 7 Deputy Registrar/Asst. Registrar (Conf. /Exams. UG)
- ✓ 8 Incharge, University Website for Uploading of the notification.

*Sumilasharma*  
Deputy Registrar (Academic)  
14/8/23  
14/8/23  
14/8/23

**DEPARTMENT OF ENVIRONMENTAL SCIENCES  
UNIVERSITY OF JAMMU**



**CURRICULUM FRAMEWORK FOR  
FOUR –YEAR UNDER GRADUATE (FYUP) PROGRAM IN  
ENVIRONMENTAL SCIENCES**

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UNDER CBCS

AS PER

NATIONAL EDUCATION POLICY -2020

WITH EFFECT FROM THE ACADEMIC YEAR 2023

Approved By

**Board of Studies in Environmental sciences (BoS-ES)**

**UNIVERSITY OF JAMMU**  
**Syllabus for FYUP Program in ENVIRONMENTAL SCIENCES**  
**(Under CBCS as per NEP-2020)**

**DEPARTMENT OF ENVIRONMENTAL SCIENCES,**  
**UNIVERSITY OF JAMMU, JAMMU**  
**Following Courses of Study are prescribed for**  
**1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Semesters**  
**FYUP Program in the subject of ENVIRONMENTAL SCIENCES**

**SEMESTER-1**

S.NO.	TYPE OF THE COURSE	TITLE OF THE COURSE	COURSE NO.	CREDITS T-Teaching P-Practical
1.	MAJOR COURSE	BASICS OF ENVIRONMENTAL SCIENCES	UMJEST101	4-Credits T-3/P-1
2.	MINOR COURSE	BASICS OF ENVIRONMENTAL SCIENCES	UMIEST102	4-Credits T-3/P-1
3.	MULTIDISCIPLINARY COURSE	ENVIRONMENTAL ISSUES AND SUSTAINABILITY	UMDEST103	3-Credits T-3
4.	SKILL ENHANCEMENT COURSE	SOLID WASTE MANAGEMENT	USEEST104	2-Credits T-1/P-1

**SEMESTER-2**

S.NO.	TYPE OF THE COURSE	TITLE OF THE COURSE	COURSE NO.	CREDITS T-Teaching P-Practical
1.	MAJOR COURSE	UNDERSTANDING ECOLOGY AND ECOSYSTEMS	UMJEST201	4-Credits T-3/P-1
2.	MINOR COURSE	UNDERSTANDING ECOLOGY AND ECOSYSTEMS	UMIEST202	4-Credits T-3/P-1
3.	MULTIDISCIPLINARY COURSE	ENVIRONMENTAL ISSUES AND SUSTAINABILITY	UMDEST203	3-Credits T-3
4.	SKILL ENHANCEMENT COURSE	LIQUID WASTE MANAGEMENT	USEEST204	2-Credits T-1/P-1

**SEMESTER-3**

S.NO.	TYPE OF THE COURSE	TITLE OF THE COURSE	COURSE NO.	CREDITS T-Teaching P-Practical
1.	MAJOR COURSE	BIODIVERSITY AND CONSERVATION STRATEGIES	UMJEST301	4-Credits T-3/P-1
2.	MAJOR COURSE	NATURAL RESOURCE MANAGEMENT	UMJEST302	4-Credits T-3/P-1
3.	MINOR COURSE	BIODIVERSITY AND CONSERVATION STRATEGIES	UMIEST303	4-Credits T-3/P-1
4.	MULTIDISCIPLINARY COURSE	ENVIRONMENTAL ISSUES AND SUSTAINABILITY	UMDEST304	3-Credits T-3
5.	SKILL ENHANCEMENT COURSE	GREEN TECHNOLOGIES	USEEST305	2-Credits T-1/P-1

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**UNIVERSITY OF JAMMU**  
**Syllabus for FYUP Program in ENVIRONMENTAL SCIENCES**  
**(Under CBCS as per NEP-2020)**

**UG SEMESTER-1**  
**(For the examinations to be held in the years December 2023, 2024, 2025)**  
**BASICS OF ENVIRONMENTAL SCIENCES**  
**(MAJOR COURSE)**

Course Code: UMJEST101

Max. Marks: 100 (Theory-75, Practical-25)

	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	03	45	1 to 4	15	60	1.5	3.0
Practical	01	30	P	10	15	-	-

**Objectives:**

- To develop competency in understanding the interrelatedness of the divisions of the Environment and instill necessary analytical skills to characterize their variations.
- To inculcate creativity and innovative spirit in the domain of human- environment interface leading to vocation/entrepreneurial opportunities.

**Learning outcomes:**

**Students shall be able to**

- demonstrate an entry level competence in understanding the environmental divisions and associated processes.
- understand and appreciate the role of environmental parameters in specific day-to-day activities.
- understand the demands and function in work environment dealing with environmental systems.

**UNIT-1: INTRODUCTION**

- 1.1 Environmental Science: Definition, concept and Scope
- 1.2 Multi-disciplinary nature of Environmental Science
- 1.3 Approaches to study Environmental Science
- 1.4 Components of the Environment: interactions and significance

**UNIT-2: ATMOSPHERE AND CLIMATOLOGY**

- 2.1 Evolution of the atmosphere
- 2.2 Structure and composition of the atmosphere
- 2.3 Weather and climate: Earth's Albedo and Heat budget of the Earth
- 2.4 Weather forecasting and its importance

**UNIT-3: HYDROSPHERE**

- 3.1 Hydrosphere: Components and importance
- 3.2 Concept of Hydrological cycle
- 3.3 Groundwater Zonation: Concept of Aquifer, Aquitard, Aquiclude
- 3.4 Marine Environment: Zonation, ocean acidification and coral bleaching

**UNIT-4: LITHOSPHERE**

- 4.1 Lithosphere: Definition. Internal Structure of the Earth – Crust, Mantle, Core
- 4.2 Endogenic processes of Earth
- 4.3 Exogenic processes of Earth
- 4.4 Petrology: Definition, Rock Cycle, Classification and formation of rocks

**PRACTICALS (P)**

1. To visit and document abiotic and biotic components of any water body in your locality.
2. To identify and write the characteristic features of different types of rocks.
3. To study the various seismic zones in India with the help of a map.
4. To study various fault lines in Indian sub-continent using map.
5. To document the weather conditions of your area for one week.
6. To write the characteristic features of different types of water resources.



**UNIVERSITY OF JAMMU**  
**Syllabus for FYUP Program in ENVIRONMENTAL SCIENCES**  
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**UG SEMESTER-1**

(For the examinations to be held in the years December 2023, 2024, 2025)

**BASICS OF ENVIRONMENTAL SCIENCES**  
**(MAJOR COURSE)**

**Course Code: UMJEST101**

**Max. Marks: 100 (Theory-75, Practical-25)**

**SUGGESTED READINGS**

1. Allaby, M. (2002). Basics of Environmental Science. Routledge, London.
2. Barry, G.R. and Chorley, J.R. (2003). Atmosphere, Weather & Climate. Routledge, London.
3. Critchfield, H.J. (1995). General Climatology. Prentice Hall of India.
4. Horne, A.J. and Goldman, C.R. (1994). Limnology (Vol. 2). New York: McGraw- Hill.
5. Lutgens, F.K. and Tarbuck, E.J. (1982). Atmosphere – Introduction to Meteorology. Prentice Hall of India.
6. Manahan, S.E. (2011). Fundamentals of Environmental Chemistry. CRC press.
7. Miller, G.T. and Spoolman, S. (2015). Environmental Science. Cengage Learning.
8. Miller, G.T. (1994). Living in the Environment: Principles, Connections and Solutions. Wadsworth Publishing Co.
9. Miller, R.W. and Donahue, R.L. (1992). Soils – Introduction to Soils and Plant Growth. Prentice Hall of India.
10. Mitra, A. and Chaudhuri, T.R. (2020). Basics of Environmental Science. New Central Book Agency.
11. Wright, R.T. (2007). Environmental science: toward a sustainable future. Jones & Bartlett Publishers.

**SCHEME OF EXAMINATION**

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The breakup for seventy-five (75) marks for theory paper shall contain fifteen (15) marks for mid semester assessment test and sixty (60) marks for end semester examination. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%; Time: 1.5 hrs)**  
Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one (1) long answer type question of seven (7) marks and four (4) short answer type questions of two (2) marks each.

**End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%; Time 3 hrs)**  
The question paper will have two (2) sections. **Section 'A'** will be compulsory having four (4) questions of three (3) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 to 4 and the questions will be short answer type. **Section 'B'** will have eight (8) long answer type questions, two (2) questions from each unit. Each question will carry twelve (12) marks. The candidates will be required to answer one (1) question from each unit.

**Note for distribution of 25 marks in Practical Examination**

<b>I. Internal Assessment (Total Marks: 10)</b>	<b>Marks</b>
1. Attendance	2
2. Practical Test	5
3. Daily performance based on practical work	3
<b>II. External Assessment (Total Marks: 15)</b>	
1. External practical examination	10
2. Viva-voce	5

**UNIVERSITY OF JAMMU**  
**Syllabus for FYUP Program in ENVIRONMENTAL SCIENCES**  
**(Under CBCS as per NEP-2020)**

**UG SEMESTER-1**  
**(For the examinations to be held in the years December 2023, 2024, 2025)**

**BASICS OF ENVIRONMENTAL SCIENCES**  
**(MINOR COURSE)**

**Course Code: UMIEST102**

**Max. Marks: 100 (Theory-75, Practical-25)**

	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	03	45	1 to 4	15	60	1.5	3.0
Practical	01	30	P	10	15	-	-

**Objectives:**

- To develop competency in understanding the interrelatedness of the divisions of the Environment and instill necessary analytical skills to characterize their variations.
- To inculcate creativity and innovative spirit in the domain of human- environment interface leading to vocation/entrepreneurial opportunities.

**Learning outcomes:**

**Students shall be able to**

- demonstrate an entry level competence in understanding the environmental divisions and associated processes.
- understand and appreciate the role of environmental parameters in specific day-to-day activities.
- understand the demands and function in work environment dealing with environmental systems.

**UNIT-1: INTRODUCTION**

- 1.1 Environmental Science: Definition, concept and Scope
- 1.2 Multi-disciplinary nature of Environmental Science
- 1.3 Approaches to study Environmental Science
- 1.4 Components of the Environment: interactions and significance

**UNIT-2: ATMOSPHERE AND CLIMATOLOGY**

- 2.1 Evolution of the atmosphere
- 2.2 Structure and composition of the atmosphere
- 2.3 Weather and climate: Earth's Albedo and Heat budget of the Earth
- 2.4 Weather forecasting and its importance

**UNIT-3: HYDROSPHERE**

- 3.1 Hydrosphere: Components and importance
- 3.2 Concept of Hydrological cycle
- 3.3 Groundwater Zonation: Concept of Aquifer, Aquitard, Aquiclude
- 3.4 Marine Environment: Zonation, ocean acidification and coral bleaching

**UNIT-4: LITHOSPHERE**

- 4.1 Lithosphere: Definition. Internal Structure of the Earth – Crust, Mantle, Core
- 4.2 Endogenic processes of Earth
- 4.3 Exogenic processes of Earth
- 4.4 Petrology: Definition, Rock Cycle, Classification and formation of rocks

**PRACTICALS (P)**

1. To visit and document abiotic and biotic components of any water body in your locality.
2. To identify and write the characteristic features of different types of rocks.
3. To study the various seismic zones in India with the help of a map.
4. To study various fault lines in Indian sub-continent using map.
5. To document the weather conditions of your area for one week.
6. To write the characteristic features of different types of water resources.

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**UG SEMESTER-1**

(For the examinations to be held in the years December 2023, 2024, 2025)

**BASICS OF ENVIRONMENTAL SCIENCES**  
**(MINOR COURSE)**

Course Code: UMIEST102

Max. Marks: 100 (Theory-75, Practical-25)

**SUGGESTED READINGS**

1. Allaby, M. (2002). Basics of Environmental Science. Routledge, London.
2. Barry, G.R. and Chorley, J.R. (2003). Atmosphere, Weather & Climate. Routledge, London.
3. Critchfield, H.J. (1995). General Climatology. Prentice Hall of India.
4. Horne, A.J. and Goldman, C.R. (1994). Limnology (Vol. 2). New York: McGraw- Hill.
5. Lutgens, F.K. and Tarbuck, E.J. (1982). Atmosphere – Introduction to Meteorology. Prentice Hall of India.
6. Manahan, S.E. (2011). Fundamentals of environmental chemistry. CRC press.
7. Miller, G.T. and Spoolman, S. (2015). Environmental Science. Cengage Learning.
8. Miller, G.T. (1994). Living in the Environment: Principles, Connections and Solutions. Wadsworth Publishing Co.
9. Miller, R.W. and Donahue, R.L. (1992). Soils – Introduction to Soils and Plant Growth. Prentice Hall of India.
10. Mitra, A. and Chaudhuri, T.R. (2020). Basics of Environmental Science. New Central Book Agency.
11. Wright, R.T. (2007). Environmental science: toward a sustainable future. Jones & Bartlett Publishers.

**SCHEME OF EXAMINATION**

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The breakup for seventy-five (75) marks for theory paper shall contain fifteen (15) marks for mid semester assessment test and sixty (60) marks for end semester examination. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%; Time: 1.5 hrs)**  
Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one (1) long answer type question of seven (7) marks and four (4) short answer type questions of two (2) marks each.

**End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%; Time 3 hrs)**  
The question paper will have two (2) sections. **Section 'A'** will be compulsory having four (4) questions of three (3) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 to 4 and the questions will be short answer type. **Section 'B'** will have eight (8) long answer type questions, two (2) questions from each unit. Each question will carry twelve (12) marks. The candidates will be required to answer one (1) question from each unit.

**Note for distribution of 25 marks in Practical Examination**

<b>I. Internal Assessment (Total Marks: 10)</b>	<b>Marks</b>
1. Attendance	2
2. Practical Test	5
3. Daily performance based on practical work	3
<b>II. External Assessment (Total Marks: 15)</b>	
1. External practical examination	10
2. Viva-voce	5

**UNIVERSITY OF JAMMU**  
**Syllabus for FYUP Program in ENVIRONMENTAL SCIENCES**  
**(Under CBCS as per NEP-2020)**

**UG SEMESTER-1**

(For the examinations to be held in the years December 2023, 2024, 2025)

**ENVIRONMENTAL ISSUES AND SUSTAINABILITY**

**(MULTIDISCIPLINARY COURSE)**

Course Code: UMDEST103

Max. Marks: 75 (Theory)

	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	03	45	1 to 4	15	60	1.5	3.0

**Objectives:**

- To offer a comprehensive understanding of basic environmental issues, drivers of environmental change and management perspective.
- To highlight the role of citizens and eco-movements to achieve the objectives of sustainability.

**Learning outcomes:**

**Students shall be able to**

- understand key governance and policy interventions needed to improve the wellbeing of the environment.
- understand and appreciate the role of sustainability in environmental management and societal development.

**UNIT-1: ENVIRONMENTAL ISSUES: GLOBAL SCENARIO**

- 1.1 Global warming and climate change
- 1.2 Ozone Layer Depletion
- 1.3 Acid Rain
- 1.4 Desertification

**UNIT-2: ENVIRONMENTAL ISSUES: NATIONAL/REGIONAL SCENARIO**

- 2.1 Population Explosion
- 2.2 Deforestation
- 2.3 Environmental Pollution
- 2.4 Threats to wildlife

**UNIT-3: ENVIRONMENTAL GOVERNANCE AND POLICY**

- 3.1 Concept of environmental governance and environmental literacy
- 3.2 Environmental governance at International level
- 3.3 Environmental governance at National level
- 3.4 Role of NGOs and corporate in environmental decision making

**UNIT-4: SUSTAINABILITY**

- 4.1 Concept of Sustainability and Sustainable development, overview of Sustainable Development Goals (SDGs) and role of individuals in achieving SDGs
- 4.2 Role of individuals and society in achieving SDGs
- 4.3 Sustainable agriculture: Natural farming / Organic farming methods, Urban agriculture and hydroponics
- 4.4 Concept of Green buildings and GRIHA rating norms, Swachh Bharat Abhiyaan

**SUGGESTED READINGS**

1. Agarwal, K. C. (1999). Environmental Biology. Agro Botanica.
2. Chapman, J. L. and Reiss, M. J. (1995). Ecology – Principles and Applications, Cambridge University Press.
3. Dash, M. C. (2001). Fundamentals of Ecology. Tata McGraw-Hill Publishing Co.
4. Kormondy, E. J. (1996). Concepts of Ecology. Prentice Hall of India.
5. Odum, E. P. (1971). Fundamentals of Ecology. W.B. Saunders Co.
6. Ricklefs, R. E. and Miller, (1999). Ecology. W.H. Freeman and Co.



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**UG SEMESTER-1**

(For the examinations to be held in the years December 2023, 2024, 2025)

**ENVIRONMENTAL ISSUES AND SUSTAINABILITY**  
**(MULTIDISCIPLINARY COURSE)**

**Course Code: UMDEST103      Max. Marks: 75 (Theory)**

7. Smith, T. M. and Smith, R. L. (2007). Elements of Ecology. Pearson Education.
8. Singh, J.S., Singh, S.P. & Gupta, S.R. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications.
9. Sharma, P.D. (2012). Ecology and Environment. Rastogi Publications.
10. De, A. K. (2017). Environmental Chemistry.

**SCHEME OF EXAMINATION**

The paper will have seventy-five (75) marks. The breakup for seventy-five (75) marks for the theory paper shall contain fifteen (15) marks for mid semester assessment test and sixty (60) marks for end semester examination.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%; Time: 1.5 hrs)**

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one long answer type question of seven (7) marks and four (4) short answer type questions of 2 marks each.

**End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%; Time 3 hrs)**

The question paper will have two (2) sections. **Section 'A'** will be compulsory having four (4) questions of three (3) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 to 4) and the questions will be short answer type. **Section 'B'** will have eight (8) long answer type questions, two (2) questions from each unit. Each question will carry twelve (12) marks. The candidates will be required to answer one (1) question from each unit.

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**UNIVERSITY OF JAMMU**  
**Syllabus for FYUP Program in ENVIRONMENTAL SCIENCES**  
**(Under CBCS as per NEP-2020)**

**UG SEMESTER-1**

(For the examinations to be held in the years December 2023, 2024, 2025)

**SOLID WASTE MANAGEMENT**  
**(SKILL ENHANCEMENT COURSE)**

Course Code: USEEST104      Max. Marks: 50 (Theory-25, Practical-25)

	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	01	15	1 to 2	05	20	1	2.5
Practical	01	30	3	-	25	-	-

**Objectives:**

- To introduce the students to causes and associated problems of different types of solid wastes.
- To introduce the students about various methods of solid waste management.

**Learning outcomes:**

**Students shall be able to**

- differentiate between different types of solid wastes.
- understand various solid waste management strategies.

**UNIT 1: BASIC CONCEPTS AND MANAGEMENT PRACTICES**

- 1.1 Solid waste: Definition and concept, Sources and classification of Solid Waste
- 1.2 Factors affecting the generation of Solid Waste, Impact of solid waste on Environment, human and plant health
- 1.3 Management MSW-biodegradable waste: composting, vermicomposting, farmyard manure, biogas Production
- 1.4 Management of MSW-non-biodegradable waste: incineration, pyrolysis, gasification, sanitary landfills

**UNIT 2: SOLID WASTE COLLECTION AND PROCESSING TECHNIQUES**

- 2.1 Handling and segregation of solid waste at source and methods of separation, Solid waste reduction technique
- 2.2 Collection of solid waste and Transfer and transportation of solid waste, Solid waste processing methods (storage, conveying, compacting, shredding, pulping, granulating)
- 2.3 Sanitary landfill Selection Criteria
- 2.4 Solid Waste Management Rules, 2016: Salient Features

**UNIT 3: PRACTICALS**

- 3.1 Qualitative and Quantitative estimation of solid waste from Household/commercial /Institutional areas.
- 3.2 Cost estimation of recyclable waste generated from households /commercial /Institutional areas
- 3.3 Making recycled paper/paper items from used newspapers/paper
- 3.4 Preparation and collection of items from recycled/reused material
- 3.5 Laboratory demonstration of Vermicomposting
- 3.6 Laboratory demonstration of Aerobic Composting
- 3.7 Field visits to waste dumping/disposal site
- 3.8 Field visit to paper recycling unit or any other recycling unit.
- 3.9 Field visit to plastic recycling unit or any other recycling unit.

**UNIVERSITY OF JAMMU**  
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**(Under CBCS as per NEP-2020)**

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**UG SEMESTER-1**

(For the examinations to be held in the years December 2023, 2024, 2025)

**SOLID WASTE MANAGEMENT**  
**(SKILL ENHANCEMENT COURSE)**

Course Code: USEEST104      Max. Marks: 50 (Theory-25, Practical-25)

**SUGGESTED READINGS**

1. Anonymous (2014). Waste to resources- A waste management Handbook. The Energy and Resources Institute (TERI) New Delhi. [www.teriin.org](http://www.teriin.org).
2. Bhatia S.C. (2007). Solid and hazardous waste management, Atlantic Publishers and Distributions (P). New Delhi
3. Khan, I. H. and Ahsan, N. (2011). Textbook of Solid Waste Management. CBS Publishers, New Delhi
4. Mishra, S.G. and Mani D. (1993). Pollution through solid waste. Ashok Publishing House, New Delhi.
5. Tchobanoglous, G. and Kreith, F. (2002). Handbook of Solid Waste Management: McGraw Hill Handbooks, New York.
6. Zhu, D; Asnani, P.U.; Zurbrigg, C; Anapolsky, S and Mani, S. (2008). Improving solid waste management in India. The world Bank Washington D.C. [www.worldbank.org](http://www.worldbank.org).

**Note: II.**

**SCHEME OF EXAMINATION**

The total marks for the paper is fifty (50). The paper will have twenty-five (25) marks for theory and twenty-five (25) marks for practical examinations. The breakup for twenty-five (25) marks for theory paper shall contain five (5) marks for mid semester assessment test and twenty (20) marks for end semester examination. There will be continuous assessment of five (5) marks and final examination of twenty (20) marks for practical examination.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 5; syllabus to be covered: up to 50%; Time: 1 hr)**

Five (5) marks for theory paper in a subject reserved for internal assessment shall have ten (10) Multiple Choice Questions (MCQs) and each question carries half (½) mark.

**End Semester University Examination (Total Marks: 20; syllabus to be covered: 100%; Time 2.5 hrs)**

The question paper will have two (2) sections. Section 'A' will be compulsory having four (4) questions of two and half (2½) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 & 2) and the questions will be short answer type. Section 'B' will have four (4) long answer type questions, two (2) questions from each unit (i.e., Units 1 & 2). Each question will carry five (5) marks. The candidates will be required to answer one (1) question from each unit.

**Note for distribution of 25 marks in Practical Examination (based on Unit 3)**

<b>I. Internal Assessment (Total Marks: 5)</b>	<b>Marks</b>
1. Attendance	1
2. Practical Test	2
3. Daily performance based on practical work	2
<b>II. External Assessment (Total Marks: 20)</b>	
1. External practical examination	15
2. Viva-voce	5

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**UNIVERSITY OF JAMMU**  
**Syllabus for FYUP Program in ENVIRONMENTAL SCIENCES**  
**(Under CBCS as per NEP-2020)**

**UG SEMESTER-2**

(For the examinations to be held in the years May 2024, 2025, 2026)

**UNDERSTANDING ECOLOGY AND ECOSYSTEMS**

(MAJOR COURSE)

Course Code: UMJEST201

Max. Marks: 100 (Theory-75, Practical-25)

	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	03	45	1 to 4	15	60	1.5	3.0
Practical	01	30	P	10	15	-	-

**Objectives:**

- To develop competency in understanding the ecological principles governing the biosphere.
- To introduce to the students the basic understanding of ecosystem and its structural and functional aspects.
- To explore the dynamic nature of the ecological processes in maintaining equilibrium in nature.

**Learning Outcomes:**

**Students shall be able to**

- demonstrate an entry level competence in understanding the ecological dynamics and their influence on living beings.
- demonstrate the ability to carry out ecological analysis in field conditions.
- ability to understand and appreciate the role of ecology and ecosystem dynamics in specific habitats.

**UNIT 1: INTRODUCTION**

- 1.1 Ecology: Definition, Divisions and Scope
- 1.2 Concept of Habitat and Ecological Niche
- 1.3 Origin of life and speciation, mass extinctions
- 1.4 Biotic and Abiotic factors: Influence of temperature, wind, water, edaphic and topographic factors on flora and fauna

**UNIT 2: POPULATION ECOLOGY**

- 2.1 Concept of population, r- and k-selection
- 2.2 Characteristics of population: density, natality, mortality, life tables, survivorship curves, age structure
- 2.3 Biotic Potential and Carrying Capacity
- 2.4 Population regulation (biotic and abiotic factors) and mechanisms of dispersal

**UNIT 3: COMMUNITY ECOLOGY**

- 3.1 Community Ecology: Definition, characteristics of a community – species diversity, growth form and structure, dominance, relative abundance, trophic structure
- 3.2 Keystone species, ecotone and edge effect, ecological equivalents, ecotypes and ecophenes
- 3.3 Species interactions: mutualism, symbiotic relationships, commensalism, amensalism, proto-cooperation, predation, competition, parasitism, mimicry and herbivory
- 3.4 Ecological succession: Definition, primary and secondary successions, types and process of succession (Hydrarch and Xerarch)

**UNIT 4: ECOSYSTEM ECOLOGY**

- 4.1 Ecosystems: Definition, types of ecosystem - forest, grassland, lentic, lotic, estuarine, marine, desert, wetlands
- 4.2 Structure of the ecosystem: Abiotic and biotic components of ecosystem
- 4.3 Food chains, food webs and ecological pyramids
- 4.4 Functions of ecosystem: Energy flow, material cycling and productivity

**UNIVERSITY OF JAMMU**  
**Syllabus for FYUP Program in ENVIRONMENTAL SCIENCES**  
**(Under CBCS as per NEP-2020)**

**UG SEMESTER-2**

(For the examinations to be held in the years May 2024, 2025, 2026)

**UNDERSTANDING ECOLOGY AND ECOSYSTEMS**

(MAJOR COURSE)

Course Code: UMJEST201

Max. Marks: 100 (Theory-75, Practical-25)

**PRACTICALS (P)**

1. To study the biotic and abiotic components in any ecosystem.
2. To study the food chain/food web in any ecosystem.
3. To study soil horizons and draw soil profile diagram in an ecosystem.
4. To prepare thermal stratification profile of lake ecosystem.
5. To study of ecological adaptations in hydrophytes.
6. To study of ecological adaptations in xerophytes.

**SUGGESTED READINGS**

1. Barucha, E. (2005). Text book of Environmental Studies. University Press India.
2. Basu, M. and Xavier, S. (2016). Fundamentals of environmental studies. Cambridge University Press.
3. Bowman, W.D., Hacker, S.D. and Cain, M.L. (2020). Ecology (5<sup>th</sup>ed). Oxford University Press, Incorporated. ISBN: 160535922X, 9781605359229.
4. Chapman, J.L. and Reiss, M.J. (1995). Ecology – Principles and Applications, Cambridge University Press.
5. Dash, M.C. (2001). Fundamentals of Ecology. Tata McGraw-Hill Publishing Co.
6. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall of India.
7. Odum, E.P. and Barrett, G.W. (2004). Basic ecology: Fundamentals of ecology (5<sup>th</sup>ed). Oxford and IBH Publishing Co, Pvt.
8. Ricklefs, R.E. and Miller, G.L. (1999). Ecology. W.H. Freeman and Co.
9. Sharma, P.D. (2012). Ecology and Environment. Rastogi Publications.

**SCHEME OF EXAMINATION**

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The breakup for seventy-five (75) marks for theory paper shall contain fifteen (15) marks for mid semester assessment test and sixty (60) marks for end semester examination. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%; Time: 1.5 hrs)**  
Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one (1) long answer type question of seven (7) marks and four (4) short answer type questions of two (2) marks each.

**End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%; Time 3 hrs)**  
The question paper will have two (2) sections. **Section 'A'** will be compulsory having four (4) questions of three (3) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 to 4 and the questions will be short answer type. **Section 'B'** will have eight (8) long answer type questions, two (2) questions from each unit. Each question will carry twelve (12) marks. The candidates will be required to answer one (1) question from each unit.

**Note for distribution of 25 marks in Practical Examination**

	Marks
<b>I. Internal Assessment (Total Marks: 10)</b>	
1. Attendance	2
2. Practical Test	5
3. Daily performance based on practical work	3
<b>II. External Assessment (Total Marks: 15)</b>	
1. External practical examination	10
2. Viva-voce	5



**UNIVERSITY OF JAMMU**  
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**(Under CBCS as per NEP-2020)**

**UG SEMESTER-2**  
**(For the examinations to be held in the years May 2024, 2025, 2026)**  
**UNDERSTANDING ECOLOGY AND ECOSYSTEMS**  
**(MINOR COURSE)**

Course Code: UMIEST202

Max. Marks: 100 (Theory-75, Practical-25)

	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	03	45	1 to 4	15	60	1.5	3.0
Practical	01	30	P	10	15	-	-

**Objectives:**

- To develop competency in understanding the ecological principles governing the biosphere.
- To introduce to the students the basic understanding of ecosystem and its structural and functional aspects.
- To explore the dynamic nature of the ecological processes in maintaining equilibrium in nature.

**Learning Outcomes:**

**Students shall be able to**

- demonstrate an entry level competence in understanding the ecological dynamics and their influence on living beings.
- demonstrate the ability to carry out ecological analysis in field conditions.
- ability to understand and appreciate the role of ecology and ecosystem dynamics in specific habitats.

**UNIT 1: INTRODUCTION**

- 1.1 Ecology: Definition, Divisions and Scope
- 1.2 Concept of Habitat and Ecological Niche
- 1.3 Origin of life and speciation, mass extinctions
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**UNIT 2: POPULATION ECOLOGY**

- 2.1 Concept of population, r- and k-selection
- 2.2 Characteristics of population: density, natality, mortality, life tables, survivorship curves, age structure
- 2.3 Biotic Potential and Carrying Capacity
- 2.4 Population regulation (biotic and abiotic factors) and mechanisms of dispersal

**UNIT 3: COMMUNITY ECOLOGY**

- 3.1 Community Ecology: Definition, characteristics of a community – species diversity, growth form and structure, dominance, relative abundance, trophic structure
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- 3.4 Ecological succession: Definition, primary and secondary successions, types and process of succession (Hydrarch and Xerarch)

**UNIT 4: ECOSYSTEM ECOLOGY**

- 4.1 Ecosystems: Definition, types of ecosystem - forest, grassland, lentic, lotic, estuarine, marine, desert, wetlands
- 4.2 Structure of the ecosystem: Abiotic and biotic components of ecosystem
- 4.3 Food chains, food webs and ecological pyramids
- 4.4 Functions of ecosystem: Energy flow, material cycling and productivity



**UNIVERSITY OF JAMMU**  
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**UG SEMESTER-2**

(For the examinations to be held in the years May 2024, 2025, 2026)

**UNDERSTANDING ECOLOGY AND ECOSYSTEMS**

(MINOR COURSE)

Course Code: UMIEST202

Max. Marks: 100 (Theory-75, Practical-25)

**PRACTICALS (P)**

1. To study the biotic and abiotic components in any ecosystem.
2. To study the food chain/food web in any ecosystem.
3. To study soil horizons and draw soil profile diagram in an ecosystem.
4. To prepare thermal stratification profile of lake ecosystem.
5. To study of ecological adaptations in hydrophytes.
6. To study of ecological adaptations in xerophytes.

**SUGGESTED READINGS**

1. Barucha, E. (2005). Text book of Environmental Studies. University Press India.
2. Basu, M. and Xavier, S. (2016). Fundamentals of environmental studies. Cambridge University Press.
3. Bowman, W.D., Hacker, S.D. and Cain, M.L. (2020). Ecology (5<sup>th</sup>ed). Oxford University Press, Incorporated. ISBN: 160535922X, 9781605359229.
4. Chapman, J.L. and Reiss, M.J. (1995). Ecology – Principles and Applications, Cambridge University Press.
5. Dash, M.C. (2001). Fundamentals of Ecology. Tata McGraw-Hill Publishing Co.
6. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall of India.
7. Odum, E.P. and Barrett, G.W. (2004). Basic ecology: Fundamentals of ecology (5<sup>th</sup>ed). Oxford and IBH Publishing Co, Pvt.
8. Ricklefs, R.E. and Miller, G.L. (1999). Ecology. W.H. Freeman and Co.
9. Sharma, P.D. (2012). Ecology and Environment. Rastogi Publications.
10. Smith, T.M. and Smith, R.L. (2007). Elements of Ecology. Pearson Education.

**SCHEME OF EXAMINATION**

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The breakup for seventy-five (75) marks for theory paper shall contain fifteen (15) marks for mid semester assessment test and sixty (60) marks for end semester examination. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%; Time: 1.5 hrs)**

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one (1) long answer type question of seven (7) marks and four (4) short answer type questions of two (2) marks each.

**End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%; Time 3 hrs)**

The question paper will have two (2) sections. **Section 'A'** will be compulsory having four (4) questions of three (3) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 to 4 and the questions will be short answer type. **Section 'B'** will have eight (8) long answer type questions, two (2) questions from each unit. Each question will carry twelve (12) marks. The candidates will be required to answer one (1) question from each unit.

**Note for distribution of 25 marks in Practical Examination**

<b>I. Internal Assessment (Total Marks: 10)</b>		<b>Marks</b>
1. Attendance		2
2. Practical Test		5
3. Daily performance based on practical work		3
<b>II. External Assessment (Total Marks: 15)</b>		
1. External practical examination		10
2. Viva-voce		5

**UNIVERSITY OF JAMMU**  
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**(Under CBCS as per NEP-2020)**

**UG SEMESTER-2**

(For the examinations to be held in the years May 2024, 2025, 2026)

**ENVIRONMENTAL ISSUES AND SUSTAINABILITY**  
**(MULTIDISCIPLINARY COURSE)**

Course Code: UMDEST203

Max. Marks: 75 (Theory)

	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	03	45	1 to 4	15	60	1.5	3.0

**Objectives:**

- To offer a comprehensive understanding of basic environmental issues, drivers of environmental change and management perspective.
- To highlight the role of citizens and eco-movements to achieve the objectives of sustainability.

**Learning outcomes:**

**Students shall be able to**

- understand key governance and policy interventions needed to improve the wellbeing of the environment.
- understand and appreciate the role of sustainability in environmental management and societal development.

**UNIT-1: ENVIRONMENTAL ISSUES: GLOBAL SCENARIO**

- 1.1 Global warming and climate change
- 1.2 Ozone Layer Depletion
- 1.3 Acid Rain
- 1.4 Desertification

**UNIT-2: ENVIRONMENTAL ISSUES: NATIONAL/REGIONAL SCENARIO**

- 2.1 Population Explosion
- 2.2 Deforestation
- 2.3 Environmental Pollution
- 2.4 Threats to wildlife

**UNIT-3: ENVIRONMENTAL GOVERNANCE AND POLICY**

- 3.1 Concept of environmental governance and environmental literacy
- 3.2 Environmental governance at International level
- 3.3 Environmental governance at National level
- 3.4 Role of NGOs and corporate in environmental decision making

**UNIT-4: SUSTAINABILITY**

- 4.1 Concept of Sustainability and Sustainable development, overview of Sustainable Development Goals (SDGs) and role of individuals in achieving SDGs
- 4.2 Role of individuals and society in achieving SDGs
- 4.3 Sustainable agriculture: Natural farming / Organic farming methods, Urban agriculture and hydroponics
- 4.4 Concept of Green buildings and GRIHA rating norms, Swachh Bharat Abhiyaan

**SUGGESTED READINGS**

1. Agarwal, K. C. (1999). Environmental Biology. Agro Botanica.
2. Chapman, J. L. and Reiss, M. J. (1995). Ecology – Principles and Applications, Cambridge University Press.
3. Dash, M. C. (2001). Fundamentals of Ecology. Tata McGraw-Hill Publishing Co.
4. Kormondy, E. J. (1996). Concepts of Ecology. Prentice Hall of India.
5. Odum, E. P. (1971). Fundamentals of Ecology. W.B. Saunders Co.
6. Ricklefs, R. E. and Miller, (1999). Ecology. W.H. Freeman and Co.

**UNIVERSITY OF JAMMU**  
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**UG SEMESTER-2**

(For the examinations to be held in the years May 2024, 2025, 2026)

**ENVIRONMENTAL ISSUES AND SUSTAINABILITY**  
**(MULTIDISCIPLINARY COURSE)**

**Course Code: UMDEST203**

**Max. Marks: 75 (Theory)**

7. Smith, T. M. and Smith, R. L. (2007). Elements of Ecology. Pearson Education.
8. Singh, J.S., Singh, S.P. & Gupta, S.R. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications.
9. Sharma, P.D. (2012). Ecology and Environment. Rastogi Publications.
10. Barucha, E. (2005). Text book of Environmental Studies. University Press India.

**SCHEME OF EXAMINATION**

The paper will have seventy-five (75) marks. The breakup for seventy-five (75) marks for the theory paper shall contain fifteen (15) marks for mid semester assessment test and sixty (60) marks for end semester examination.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%; Time: 1.5 hrs)**

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one long answer type question of seven (7) marks and four (4) short answer type questions of 2 marks each.

**End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%; Time 3 hrs)**

The question paper will have two (2) sections. **Section 'A'** will be compulsory having four (4) questions of three (3) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 to 4) and the questions will be short answer type. **Section 'B'** will have eight (8) long answer type questions, two (2) questions from each unit. Each question will carry twelve (12) marks. The candidates will be required to answer one (1) question from each unit.

**UNIVERSITY OF JAMMU**  
**Syllabus for FYUP Program in ENVIRONMENTAL SCIENCES**  
**(Under CBCS as per NEP-2020)**

**UG SEMESTER-2**

(For the examinations to be held in the years May 2024, 2025, 2026)

**LIQUID WASTE MANAGEMENT**  
**(SKILL ENHANCEMENT COURSE)**

**Course Code: USEEST204**

**Max. Marks: 50 (Theory-25, Practical-25)**

	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	01	15	1 to 2	05	20	1	2.5
Practical	01	30	3	-	25	-	-

**Objectives:**

- To introduce the students to causes, associated problems and control of different types of liquid waste pollution.
- To make the students aware about various steps involved in wastewater treatment.

**Learning outcomes:**

**Students shall be able to**

- differentiate between different types of liquid wastes.
- understand working and applications of various wastewater treatment technologies.

**UNIT 1: INTRODUCTION TO LIQUID WASTES**

- 1.1 Water as a resource and its significance
- 1.2 Water pollution I: Types, sources and impacts, surface water and groundwater pollution
- 1.3 Water pollution II: Wastewater: Domestic black and grey water; agricultural wastewater
- 1.4 Characteristics of industrial wastewater, types of industrial pollutants

**UNIT 2: WASTEWATER TREATMENT**

- 2.1 Wastewater Treatment: Primary treatment, Pre-treatment: Screening, Grit removal, Flow equalization, Sedimentation.
- 2.2 Secondary Treatment: Chemical unit processes: Precipitation, Coagulation, Disinfection
- 2.3 Secondary Treatment: Biological unit processes: Aerobic process - activated sludge system, trickling filters, Anaerobic process - CSTR (Continuous stirred tank reactors), Anaerobic Filters, UASB (Upflow anaerobic sludge blanket technology)
- 2.4 Tertiary treatment, Concepts and treatment of wastewater with aquatic macrophytes, thin film techniques for wastewater treatment using aquatic plants, Algal treatment Systems

**UNIT 3: PRACTICALS**

- 3.1 To determine the Total Suspended Solids (TSS) in Water.
- 3.2 To determine the Total dissolved Solids (TDS) in Water.
- 3.3 To determine the turbidity difference between clean and turbid water.
- 3.4 To determine of Colour of Water.
- 3.5 To determine of pH of Water.
- 3.6 Visit to Sewage treatment plant (STP).
- 3.7 Visit to Drinking water treatment plant.
- 3.8 Visit to Effluent treatment plant (ETP) of nearby industry.

**SUGGESTED READINGS**

1. Tchobanoglous, G. and Burton, F.L. (1979). Waste water engineering: Treatment, Disposal, and Reuse. Tata McGraw Hill, New Delhi.
2. Garg, S. K. (2003) Sewage Disposal and Air Pollution Engineering, Khanna Publishers, Delhi.
3. Manual of Water Supply and Treatment (1999). Central Public Health and Environmental Engineering Organisation, Ministry of Urban Development, New Delhi.



**UNIVERSITY OF JAMMU**  
**Syllabus for FYUP Program in ENVIRONMENTAL SCIENCES**  
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**UG SEMESTER-2**

(For the examinations to be held in the years May 2024, 2025, 2026)

**LIQUID WASTE MANAGEMENT**  
**(SKILL ENHANCEMENT COURSE)**

**Course Code: USEEST204**

**Max. Marks: 50 (Theory-25, Practical-25)**

5. McGhee, T. J. (1991). Water Supply and Sewerage. McGraw-Hill, New York.
6. Metcalf & Eddy Inc. Revised by Tchobanoglous, G., Burton, F. L. and Stensel, H. D. (2002). Wastewater Engineering Treatment and Reuse 4/e. Tata McGraw-Hill Publishing Company Limited, New Delhi.
7. Eckenfelder, W. W. Jr. (1989). Industrial Water Pollution Control. McGraw-Hill Book Company, New York.
8. Nemerow, N. L. (1978). Industrial Water Pollution: Origin, Characteristics and Treatment. Addison- Wesley Publishing Company, New York.
9. Pollution Control Acts, Rules and Notifications Issued There under (2001) Pollution Control Law Series, PCLS/02/1002, 4th Edition, Central Pollution Control Board, Delhi.
10. Qasim, S. R. (1999). Wastewater Treatment Plant: Planning, Design and Operation. Lancaster Technomic, New York.
11. Willig, J. T. (Ed.) (1994). Environmental TQM. McGraw-Hill, Inc. New York.

**SCHEME OF EXAMINATION**

The total marks for the paper is fifty (50). The paper will have twenty-five (25) marks for theory and twenty-five (25) marks for practical examinations. The breakup for twenty-five (25) marks for theory paper shall contain five (5) marks for mid semester assessment test and twenty (20) marks for end semester examination. There will be continuous assessment of five (5) marks and final examination of twenty (20) marks for practical examination.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 5; syllabus to be covered: up to 50%; Time: 1 hr)**

Five (5) marks for theory paper in a subject reserved for internal assessment shall have ten (10) Multiple Choice Questions (MCQs) and each question carries half ( $\frac{1}{2}$ ) mark.

**End Semester University Examination (Total Marks: 20; syllabus to be covered: 100%; Time 2.5 hrs)**

The question paper will have two (2) sections. Section 'A' will be compulsory having four (4) questions of two and half ( $2\frac{1}{2}$ ) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 & 2) and the questions will be short answer type. Section 'B' will have four (4) long answer type questions, two (2) questions from each unit (i.e., Units 1 & 2). Each question will carry five (5) marks. The candidates will be required to answer one (1) question from each unit.

**Note for distribution of 25 marks in Practical Examination (based on Unit 3)**

<b>I. Internal Assessment (Total Marks: 5)</b>	<b>Marks</b>
1. Attendance	1
2. Practical Test	2
3. Daily performance based on practical work	2
<b>II. External Assessment (Total Marks: 20)</b>	
1. External practical examination	15
2. Viva-voce	5



**UNIVERSITY OF JAMMU**  
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**(Under CBCS as per NEP-2020)**

**UG SEMESTER-3**  
**(For the examinations to be held in the years December 2024, 2025, 2026)**  
**BIODIVERSITY AND CONSERVATION STRATEGIES**  
**(MAJOR COURSE)**

**Course Code: UMJEST301**

**Max. Marks: 100 (Theory-75, Practical-25)**

	Credits	Contact Hours	Units	Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	03	45	1 to 4	15	60	1.5	3.0
Practical	01	30	P	10	15	-	-

**Objectives:**

- To introduce the concept of biological diversity.
- To identify various threats to biological diversity.
- To help understand the strategies for biodiversity conservation.

**Learning Outcomes:**

**Students shall be able to**

- understand how and why biodiversity varies around the globe, at both small and large scales.
- identify the main factors (both natural and anthropogenic) that cause biodiversity loss.
- learn various conservation strategies, particularly protected areas, and compare their effectiveness.

**UNIT 1: BIODIVERSITY AND WILDLIFE**

- 1.1 Concept, types and levels of Biodiversity, Values of Biodiversity
- 1.2 Mega biodiversity zones, Biogeographic classification and biodiversity hotspots of India
- 1.3 Wildlife population estimations
- 1.4 Vegetation sampling techniques

**UNIT 2: BIODIVERSITY IN PERIL**

- 2.1 IUCN threat categories, Red data book
- 2.2 Threats to biodiversity- Indian context
- 2.3 Endangered and Endemic plant and animal species of Jammu and Kashmir
- 2.4 Consequences of loss of Biodiversity

**UNIT 3: BIODIVERSITY CONSERVATION I**

- 3.1 *In situ* conservation of biodiversity (National parks, wildlife sanctuaries, biosphere reserves, sacred grooves)
- 3.2 *Ex situ* conservation of biodiversity (Botanical gardens, zoo, gene banks, cryopreservation, captive breeding and release programs)
- 3.3 Protected area networks (PANs)
- 3.4 Case studies of Kishtwar National Park and Surinsar-Mansar wildlife sanctuary

**UNIT 4: BIODIVERSITY CONSERVATION II**

- 4.1 Concepts of gene pool and bio piracy, bioprospecting
- 4.2 Ecotourism: concept and benefits. Ecotourism potential in J&K
- 4.3 Conservation of biodiversity at national level
- 4.4 Conservation of biodiversity at international level

**PRACTICALS (P)**

1. Applications of GPS, Digital camera and Binoculars for biodiversity studies.
2. To study frequency of different plant species by quadrat method.
3. To study density of different plant species by quadrat method.
4. To find the abundance of plant species by quadrat method.
5. To visit the field for inventorization of plant species.
6. To study the avian diversity in a visited area.
7. To study the techniques for preparation of herbarium.

**UNIVERSITY OF JAMMU**  
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**(Under CBCS as per NEP-2020)**

**UG SEMESTER-3**

(For the examinations to be held in the years December 2024, 2025, 2026)

**BIODIVERSITY AND CONSERVATION STRATEGIES**

**(MAJOR COURSE)**

Course Code: UMJEST301

Max. Marks: 100 (Theory-75, Practical-25)

**SUGGESTED READINGS**

1. Adams, H.R. and Underkoffler, S.C. (2021). Wildlife Biodiversity Conservation - Multidisciplinary and Forensic Approaches, Springer publication.
2. Bindra, P.S. (2017). The Vanishing: India's Wildlife Crisis. Penguin Random House, India.
3. Brodie, J.F., Post, E.S. and Doak, D.F. (2012). Wildlife Conservation in a Changing Climate. The University of Chicago Press.
4. Gaston, K.J. and Spicer, J.I. (1998). Biodiversity: An Introduction. Blackwell Science, Oxford.
5. Kumar, H.D. (1995). Modern concepts of Ecology. Vikas Publisher House, Pvt. Ltd. New Delhi, India.
6. MaDicken, K.G. and Vergora, N.T. (1990). Agroforestry: Classification & Management, John Wiley & sons, New York.
7. Maiti, P.K. and Maiti, P. (2011). Biodiversity Perception, Peril and Preservation. PHI Learning Private Ltd. New Delhi, India.
8. Nautiyal, S. and Kaul, A.K. (1999). Forest Biodiversity & its Conservation Practices in India. Oriental Enterprises, Dehradun, India.
9. Negi, S.S. (1992). Himalayan Wildlife, Habitat & Conservation. Indus Publishing Company, New Delhi, India.
10. Prins, H.H.T., Grootenhuys, J.G. and Dolan, T.T. (2000). Wildlife Conservation by Sustainable Use. Springer publication.
11. Tiwari, P.C. (1995). Natural Resources & sustainable development in Himalaya. Shree Almora Book Depot., India.

**SCHEME OF EXAMINATION**

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The breakup for seventy-five (75) marks for theory paper shall contain fifteen (15) marks for mid semester assessment test and sixty (60) marks for end semester examination. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%; Time: 1.5 hrs)**  
Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one (1) long answer type question of seven (7) marks and four (4) short answer type questions of two (2) marks each.

**End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%; Time 3 hrs)**  
The question paper will have two (2) sections. **Section 'A'** will be compulsory having four (4) questions of three (3) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 to 4 and the questions will be short answer type. **Section 'B'** will have eight (8) long answer type questions, two (2) questions from each unit. Each question will carry twelve (12) marks. The candidates will be required to answer one (1) question from each unit.

**Note for distribution of 25 marks in Practical Examination)**

**I. Internal Assessment (Total Marks: 10)**

- |  | Marks |
|--|-------|
| 1. Attendance                                | 2     |
| 2. Practical Test                            | 5     |
| 3. Daily performance based on practical work | 3     |

**II. External Assessment (Total Marks: 15)**

- |                                   |    |
|-----------------------------------|----|
| 1. External practical examination | 10 |
| 2. Viva-voce                      | 5  |

**UNIVERSITY OF JAMMU**  
**Syllabus for FYUP Program in ENVIRONMENTAL SCIENCES**  
**(Under CBCS as per NEP-2020)**

**UG SEMESTER-3**  
**(For the examinations to be held in the years December 2024, 2025, 2026)**  
**NATURAL RESOURCE MANAGEMENT**  
**(MAJOR COURSE)**

Course Code: UMJEST302

Max. Marks: 100 (Theory-75, Practical-25)

	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	03	45	1 to 4	15	60	1.5	3.0
Practical	01	30	P	10	15	-	-

**Objectives:**

- To introduce about Earth's natural resources, their generation and extraction.
- To identify the impacts of human activities on natural resources.
- To help understand the strategies for management of natural resources.

**Learning Outcomes:**

**Students shall be able to**

- gain knowledge about the effective management and conservation strategies.
- identify the main factors (both natural and anthropogenic) that cause loss of natural resources.

**UNIT 1: UNDERSTANDING THE NATURAL RESOURCES**

- 1.1 Natural Resources: Concept & classification
- 1.2 Factors influencing Resource availability
- 1.3 Ecological, social and economic dimensions of Resource management
- 1.4 Global consumption pattern of natural resources.

**UNIT 2: ABIOTIC RESOURCES**

- 2.1. Land resources: Land as a resource, Land use pattern of India, Land degradation
- 2.2. Water resources: Distribution and uses of water resources, over-utilization of surface and ground water, water conflicts
- 2.3 Concept of watershed: its importance and management
- 2.4. Mineral resources: Important mineral reserves of India, environmental effects of extracting and using mineral resources

**UNIT 3: BIOTIC RESOURCES**

- 3.1 Forest resources: Timber-based forest products (TFP) and Non-timber forest products (NTFP), Deforestation
- 3.2 Agriculture and food resources: World food problems, Consumption pattern, effects of modern agriculture
- 3.3 Animal resources: domestic and wild animals of India
- 3.4 Fish and other marine resources: Production, dependence on fish resource, unsustainable harvesting, issues and challenges for resource supply

**UNIT 4: NATURAL RESOURCE MANAGEMENT STRATEGIES**

- 4.1 Approaches in Resource Management: Ecological approach; economic approach; ethnological approach;
- 4.2 Integrated resource management strategies.
- 4.3 Poverty and implications in Resource Management in developing countries – Poverty in developing countries, causes and link with resources scarcity and poverty
- 4.4 Case Studies on Resource management in mountain ecosystem and Dry-land ecosystem

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**UG SEMESTER-3**  
**(For the examinations to be held in the years December 2024, 2025, 2026)**  
**NATURAL RESOURCE MANAGEMENT**  
**(MAJOR COURSE)**

Course Code: UMJEST302

Max. Marks: 100 (Theory-75, Practical-25)

**PRACTICALS (P)**

1. Identification of fresh water fishes using specimen.
2. Identification of different mineral types
3. Collection of five (or more) different timber-based forest products
4. Collection of five (or more) different non-timber based forest products
5. Survey and enlisting of domestic animals of your locality
6. Enlisting of wild varieties of five (or more) staple food crops of India

**SUGGESTED READINGS**

1. Craig, J.R., Vaughan, D.J. and Skinner, B.J. (1996). Resources of the Earth: Origin, Use, and Environmental Impacts (2nd edition). Prentice Hall, New Jersey.
2. Freeman, A.M. (2001). Measures of value and Resources: Resources for the Future. Washington DC.
3. Freeman, A.M. (2003). Millennium Ecosystem Assessment: Conceptual Framework. Island, Press.
4. Ginley, D.S. and Cahen, D. (2011). Fundamentals of Materials for Energy and Environmental Sustainability. Cambridge University Press.
5. Klee, G.A. (1991). Conservation of Natural Resources. Prentice Hall Publication.
6. Miller, T.G. (2012). Environmental Science. Wadsworth Publishing Co.
7. Owen, O.S, Chiras, D.D. and Reganold, J.P. (1998). Natural Resource Conservation- Management for Sustainable Future (7th edition). Prentice Hall, USA.
8. Ramade, F. (1984). Ecology of Natural Resources. John Wiley & Sons Ltd.
9. Tiwari, G.N. and Ghosal. M.K. (2005). Renewable Energy Resources: Basic Principles and Application. Narosa Publishing House.

**SCHEME OF EXAMINATION**

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The breakup for seventy-five (75) marks for theory paper shall contain fifteen (15) marks for mid semester assessment test and sixty (60) marks for end semester examination. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%; Time: 1.5 hrs)**  
Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one (1) long answer type question of seven (7) marks and four (4) short answer type questions of two (2) marks each.

**End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%; Time 3 hrs)**  
The question paper will have two (2) sections. **Section 'A'** will be compulsory having four (4) questions of three (3) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 to 4 and the questions will be short answer type. **Section 'B'** will have eight (8) long answer type questions, two (2) questions from each unit. Each question will carry twelve (12) marks. The candidates will be required to answer one (1) question from each unit.



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**UG SEMESTER-3**

(For the examinations to be held in the years December 2024, 2025, 2026)

**NATURAL RESOURCE MANAGEMENT**

**(MAJOR COURSE)**

Course Code: UMJEST302      Max. Marks: 100 (Theory-75, Practical-25)

Note for distribution of 25 marks in Practical Examination

<b>I. Internal Assessment (Total Marks: 10)</b>	<b>Marks</b>
1. Attendance	2
2. Practical Test	5
3. Daily performance based on practical work	3
<b>II. External Assessment (Total Marks: 15)</b>	
1. External practical examination	10
2. Viva-voce	5

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**(Under CBCS as per NEP-2020)**

**UG SEMESTER-3**  
**(For the examinations to be held in the years December 2024, 2025, 2026)**  
**BIODIVERSITY AND CONSERVATION STRATEGIES**  
**(MINOR COURSE)**

Course Code: UMIEST303		Max. Marks: 100 (Theory-75, Practical-25)					
	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	03	45	1 to 4	15	60	1.5	3.0
Practical	01	30	P	10	15	-	-

**Objectives:**

- To introduce the concept of biological diversity.
- To identify various threats to biological diversity.
- To help understand the strategies for biodiversity conservation.

**Learning Outcomes:**

**Students shall be able to**

- understand how and why biodiversity varies around the globe, at both small and large scales.
- identify the main factors (both natural and anthropogenic) that cause biodiversity loss.
- learn various conservation strategies, particularly protected areas, and compare their effectiveness.

**UNIT 1: BIODIVERSITY AND WILDLIFE**

- 1.1 Concept, types and levels of Biodiversity, Values of Biodiversity
- 1.2 Mega biodiversity zones, Biogeographic classification and biodiversity hotspots of India
- 1.3 Wildlife population estimations
- 1.4 Vegetation sampling techniques

**UNIT 2: BIODIVERSITY IN PERIL**

- 2.1 IUCN threat categories, Red data book
- 2.2 Threats to biodiversity- Indian context
- 2.3 Endangered and Endemic plant and animal species of Jammu and Kashmir
- 2.4 Consequences of loss of Biodiversity

**UNIT 3: BIODIVERSITY CONSERVATION I**

- 3.1 *In situ* conservation of biodiversity (National parks, wildlife sanctuaries, biosphere reserves, sacred grooves)
- 3.2 *Ex situ* conservation of biodiversity (Botanical gardens, zoo, gene banks, cryopreservation, captive breeding and release programs)
- 3.3 Protected area networks (PANs)
- 3.4 Case studies of Kishtwar National Park and Surinsar-Mansar wildlife sanctuary

**UNIT 4: BIODIVERSITY CONSERVATION II**

- 4.1 Concepts of gene pool and bio piracy, bioprospecting
- 4.2 Ecotourism: concept and benefits. Ecotourism potential in J&K
- 4.3 Conservation of biodiversity at national level
- 4.4 Conservation of biodiversity at international level

**PRACTICALS (P)**

1. Applications of GPS, Digital camera and Binoculars for biodiversity studies.
2. To study frequency of different plant species by quadrat method.
3. To study density of different plant species by quadrat method.
4. To find the abundance of plant species by quadrat method.
5. To visit the field for inventorization of plant species.

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**UG SEMESTER-3**  
**(For the examinations to be held in the years December 2024, 2025, 2026)**  
**BIODIVERSITY AND CONSERVATION STRATEGIES**  
**(MINOR COURSE)**

Course Code: UMIEST303

Max. Marks: 100 (Theory-75, Practical-25)

6. To study the avian diversity in a visited area.
7. To study the techniques for preparation of herbarium.

**SUGGESTED READINGS**

1. Adams, H.R. and Underkoffler, S.C. (2021). Wildlife Biodiversity Conservation - Multidisciplinary and Forensic Approaches, Springer publication.
2. Bindra, P.S. (2017). The Vanishing: India's Wildlife Crisis. Penguin Random House, India.
3. Brodie, J.F., Post, E.S. and Doak, D.F. (2012). Wildlife Conservation in a Changing Climate. The University of Chicago Press.
4. Gaston, K.J. and Spicer, J.I. (1998). Biodiversity: An Introduction. Blackwell Science, Oxford.
5. Kumar, H.D. (1995). Modern concepts of Ecology. Vikas Publisher House, Pvt. Ltd. New Delhi, India.
6. MaDicken, K.G. and Vergora, N.T. (1990). Agroforestry: Classification & Management, John Wiley & sons, New York.
7. Maiti, P.K. and Maiti, P. (2011). Biodiversity Perception, Peril and Preservation. PHI Learning Private Ltd. New Delhi, India.
8. Nautiyal, S. and Kaul, A.K. (1999). Forest Biodiversity & its Conservation Practices in India. Oriental Enterprises, Dehradun, India.
9. Negi, S.S. (1992). Himalayan Wildlife, Habitat & Conservation. Indus Publishing Company, New Delhi, India.
10. Prins, H.H.T., Grootenhuis, J.G. and Dolan, T.T. (2000). Wildlife Conservation by Sustainable Use. Springer publication.
11. Tiwari, P.C. (1995). Natural Resources & sustainable development in Himalaya. Shree Almora Book Depot., India.

**SCHEME OF EXAMINATION**

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The breakup for seventy-five (75) marks for theory paper shall contain fifteen (15) marks for mid semester assessment test and sixty (60) marks for end semester examination. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%; Time: 1.5 hrs)**

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one (1) long answer type question of seven (7) marks and four (4) short answer type questions of two (2) marks each.

**End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%; Time 3 hrs)**

The question paper will have two (2) sections. Section 'A' will be compulsory having four (4) questions of three (3) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 to 4 and the questions will be short answer type. Section 'B' will have eight (8) long answer type questions, two (2) questions from each unit. Each question will carry twelve (12) marks. The candidates will be required to answer one (1) question from each unit.

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**UG SEMESTER-3**  
**(For the examinations to be held in the years December 2024, 2025, 2026)**  
**BIODIVERSITY AND CONSERVATION STRATEGIES**

**(MINOR COURSE)**

**Course Code: UMIEST303**

**Max. Marks: 100 (Theory-75, Practical-25)**

**Note for distribution of 25 marks in Practical Examination**

<b>I. Internal Assessment (Total Marks: 10)</b>	<b>Marks</b>
1. Attendance	2
2. Practical Test	5
3. Daily performance based on practical work	3
<b>II. External Assessment (Total Marks: 15)</b>	
1. External practical examination	10
2. Viva-voce	5

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*Dr. J. K. Datta*

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**UNIVERSITY OF JAMMU**  
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**UG SEMESTER-3**

(For the examinations to be held in the years December 2023, 2024, 2025, 2026)

**ENVIRONMENTAL ISSUES AND SUSTAINABILITY**  
**(MULTIDISCIPLINARY COURSE)**

Course Code: UMDEST304

Max. Marks: 75 (Theory)

	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	03	45	1 to 4	15	60	1.5	3.0

**Objectives:**

- To offer a comprehensive understanding of basic environmental issues, drivers of environmental change and management perspective.
- To highlight the role of citizens and eco-movements to achieve the objectives of sustainability.

**Learning outcomes:**

**Students shall be able to**

- understand key governance and policy interventions needed to improve the wellbeing of the environment.
- understand and appreciate the role of sustainability in environmental management and societal development.

**UNIT-1: ENVIRONMENTAL ISSUES: GLOBAL SCENARIO**

- 1.1 Global warming and climate change
- 1.2 Ozone Layer Depletion
- 1.3 Acid Rain
- 1.4 Desertification

**UNIT-2: ENVIRONMENTAL ISSUES: NATIONAL/REGIONAL SCENARIO**

- 2.1 Population Explosion
- 2.2 Deforestation
- 2.3 Environmental Pollution
- 2.4 Threats to wildlife

**UNIT-3: ENVIRONMENTAL GOVERNANCE AND POLICY**

- 3.1 Concept of environmental governance and environmental literacy
- 3.2 Environmental governance at International level
- 3.3 Environmental governance at National level
- 3.4 Role of NGOs and corporate in environmental decision making

**UNIT-4: SUSTAINABILITY**

- 4.1 Concept of Sustainability and Sustainable development, overview of Sustainable Development Goals (SDGs) and role of individuals in achieving SDGs
- 4.2 Role of individuals and society in achieving SDGs
- 4.3 Sustainable agriculture: Natural farming / Organic farming methods, Urban agriculture and hydroponics
- 4.4 Concept of Green buildings and GRIHA rating norms, Swachh Bharat Abhiyaan

**SUGGESTED READINGS**

1. Agarwal, K. C. (1999). Environmental Biology. Agro Botanica.
2. Chapman, J. L. and Reiss, M. J. (1995). Ecology – Principles and Applications, Cambridge University Press.
3. Dash, M. C. (2001). Fundamentals of Ecology. Tata McGraw-Hill Publishing Co.
4. Kormondy, E. J. (1996). Concepts of Ecology. Prentice Hall of India.

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**UG SEMESTER-3**

(For the examinations to be held in the years December 2023, 2024, 2025, 2026)

**ENVIRONMENTAL ISSUES AND SUSTAINABILITY**

**(MULTIDISCIPLINARY COURSE)**

Course Code: UMDEST304

Max. Marks: 75 (Theory)

5. Odum, E. P. (1971). Fundamentals of Ecology. W.B. Saunders Co.
6. Ricklefs, R. E. and Miller, (1999). Ecology. W.H. Freeman and Co.
7. Smith, T. M. and Smith, R. L. (2007). Elements of Ecology. Pearson Education.
8. Singh, J.S., Singh, S.P. & Gupta, S.R. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications.

**SCHEME OF EXAMINATION**

The paper will have seventy-five (75) marks. The breakup for seventy-five (75) marks for the theory paper shall contain fifteen (15) marks for mid semester assessment test and sixty (60) marks for end semester examination.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 15; syllabus to be covered: up to 50%; Time: 1.5 hrs)**

Fifteen (15) marks for theory paper in a subject reserved for internal assessment shall have one long answer type question of seven (7) marks and four (4) short answer type questions of 2 marks each.

**End Semester University Examination (Total Marks: 60; syllabus to be covered: 100%; Time 3 hrs)**

The question paper will have two (2) sections. **Section 'A'** will be compulsory having four (4) questions of three (3) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 to 4) and the questions will be short answer type. **Section 'B'** will have eight (8) long answer type questions, two (2) questions from each unit. Each question will carry twelve (12) marks. The candidates will be required to answer one (1) question from each unit.

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**UNIVERSITY OF JAMMU**  
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**UG SEMESTER-3**  
**(For the examinations to be held in the years December 2023, 2024, 2025, 2026)**  
**GREEN TECHNOLOGIES**  
**(SKILL ENHANCEMENT COURSE)**

**Course Code: USEEST305**

**50 (Theory-25, Practical-25)**

	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Theory	01	15	1 to 2	05	20	1	2.5
Practical	01	30	3	-	25	-	-

**Objectives:**

- To give an overview of importance of green technologies for sustainable development.
- To encourage the adoption of sustainable technologies in daily life.
- To highlight the use of green technology for creating environment friendly smart cities.

**Learning outcomes:**

**Students shall be able to**

- understand importance of green technologies for sustainable urban planning.
- To make micro-modifications in lifestyles to bring a long-term positive impact on the environment.

**UNIT 1: GREEN TECHNOLOGY AND GREEN INFRASTRUCTURE**

- 1.1 Definition and concept: Green Technology, Green infrastructure
- 1.2 Sustainable Consumption of Resources, R's approach for sustainable waste management
- 1.3 Concept of Green cities and Green buildings, Need and Relevance of green buildings over conventional buildings
- 1.4 Eco-Mark Certification: Importance and Implementation

**UNIT 2: GREEN TECHNOLOGY AND SUSTAINABLE FUTURE**

- 2.1 Introduction, Principles and Recognition of green criteria, Green Products: Biodegradable products and Bioaccumulative products
- 2.2 ISO 14000, Green Nanotechnology, UNEP's Green Economy Initiative
- 2.3 Major challenges in implementation of Green Technologies
- 2.4 Successful Green Technology initiatives in India

**UNIT 3: PRACTICALS**

- 3.1 To prepare a report on eco-friendly products being used in your area.
- 3.2 To visit buildings with rooftop solar paneling.
- 3.3 To prepare a model of an ideal green building.
- 3.4 To prepare a working model of Solar Panel or Windmill.
- 3.5 To enlist the products with eco-mark certification.

**SUGGESTED READINGS**

1. Sivasubramanian, V. (2016). Environmental sustainability using green technologies, CRC Press, Taylor and Francis group.
2. Adams, B. (2021). Green Development: Environment And Sustainability In A Developing World, Routledge Publication.
3. Dash, M.C. (2019). Concepts of Environmental Management for Sustainable Development, Dreamtech Press.
4. Singh, R. and Kumar S. (2018). Green Technologies and Environmental Sustainability, Springer Publication.



**UG SEMESTER-3**  
(For the examinations to be held in the years December 2023, 2024, 2025, 2026)  
**GREEN TECHNOLOGIES**  
(SKILL ENHANCEMENT COURSE)

Course Code: USEEST305

50 (Theory-25, Practical-25)

**SCHEME OF EXAMINATION**

The total marks for the paper is fifty (50). The paper will have twenty-five (25) marks for theory and twenty-five (25) marks for practical examinations. The breakup for twenty-five (25) marks for theory paper shall contain five (5) marks for mid semester assessment test and twenty (20) marks for end semester examination. There will be continuous assessment of five (5) marks and final examination of twenty (20) marks for practical examination.

**NOTE FOR PAPER SETTING**

**Mid Semester Assessment Test (Total Marks: 5; syllabus to be covered: up to 50%; Time: 1 hr)**

Five (5) marks for theory paper in a subject reserved for internal assessment shall have ten (10) Multiple Choice Questions (MCQs) and each question carries half ( $\frac{1}{2}$ ) mark.

**End Semester University Examination (Total Marks: 20; syllabus to be covered: 100%; Time 2.5 hrs)**

The question paper will have two (2) sections. **Section 'A'** will be compulsory having four (4) questions of two and half ( $2\frac{1}{2}$ ) marks each and spread over the entire theory syllabus (one from each unit i.e., Units 1 & 2) and the questions will be short answer type. **Section 'B'** will have four (4) long answer type questions, two (2) questions from each unit (i.e., Units 1 & 2). Each question will carry five (5) marks. The candidates will be required to answer one (1) question from each unit.

**Note for distribution of 25 marks in Practical Examination (based on Unit 3)**

**I. Internal Assessment (Total Marks: 5)**

- |  | Marks |
|--|-------|
| 1. Attendance                                | 1     |
| 2. Practical Test                            | 2     |
| 3. Daily performance based on practical work | 2     |

**II. External Assessment (Total Marks: 20)**

- |                                   |    |
|-----------------------------------|----|
| 1. External practical examination | 15 |
| 2. Viva-voce                      | 5  |

 