UNIVERSITY OF JAMMU

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

Academic Section
Email: academicsectionju14@gmail.com

NOTIFICATION
(24/May/Adp./91)

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 **IVth and Vth** for **Four Year Under Graduate Programme (FYUGP)** 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-IV	May 2025, 2026 and 2027
	Semester-V	Dec. 2025, 2026 and 2027

The Syllabi of the courses is also available on the University website: www.jammuuniversity.ac.in.

Sd/-
DEAN ACADEMIC AFFAIRS

No. F. Acd/II/24/ 2721-2770
Dated: 20/5/24
Copy for information and necessary action to:

1. Dean, Faculty of Life Science
2. HOD/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

Sumita Sharma 17/5/24.
Deputy Registrar (Academic)

17/5/24 17/5/24 17/5/24

UNIVERSITY OF JAMMU
Syllabus for FYUGP 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
4th and 5th Semesters
FYUGP Program in the subject of ENVIRONMENTAL SCIENCES

SEMESTER-4

S.NO.	TYPE OF THE COURSE	TITLE OF THE COURSE	COURSE NO.	CREDITS T-Teaching P-Practical
1.	MAJOR COURSE	ENVIRONMENT AND TRADITIONAL KNOWLEDGE SYSTEM	UMJEST-401	4-Credits T-3/P-1
2.	MAJOR COURSE	AIR POLLUTION AND ATMOSPHERIC CHEMISTRY	UMJEST-402	4-Credits T-3/P-1
3.	MAJOR COURSE	AQUATIC RESOURCES AND WATER POLLUTION	UMJEST-403	4-Credits T-3/P-1
4.	MAJOR COURSE	ENVIRONMENTAL TOXICOLOGY	UMJEST-404	4-Credits T-3/P-1
5.	MINOR COURSE	ENVIRONMENT AND TRADITIONAL KNOWLEDGE SYSTEM	UMIEST-405	4-Credits T-3/P-1

SEMESTER-5

S.NO.	TYPE OF THE COURSE	TITLE OF THE COURSE	COURSE NO.	CREDITS T-Teaching P-Practical
1.	MAJOR COURSE	ENVIRONMENTAL MANAGEMENT AND GREEN MARKETING	UMJEST-501	4-Credits T-3/P-1
2.	MAJOR COURSE	URBAN AND HAZARDOUS WASTE MANAGEMENT	UMJEST-502	4-Credits T-3/P-1
3.	MAJOR COURSE	LAND AND SOIL RESOURCES MANAGEMENT	UMJEST-503	4-Credits T-3/P-1
4.	MAJOR COURSE	ENVIRONMENTAL ETHICS AND SOCIETAL RESPONSIBILITIES	UMJEST-504	2-Credits T-1/P-1
5.	MINOR COURSE	URBAN AND HAZARDOUS WASTE MANAGEMENT	UMIEST-505	4-Credits T-3/P-1
6.	SKILL ENHANCEMENT	SUMMER INTERNSHIP	USEESI-506	2-Credits P-2

UG SEMESTER–4
(For the examinations to be held in the years May 2025, 2026, 2027)
ENVIRONMENT AND TRADITIONAL KNOWLEDGE SYSTEM
(MAJOR COURSE)

Course Code: UMJEST-401 **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 understand traditional knowledge systems and to explore the relationship between traditional knowledge and the environment.
- To promote cultural sensitivity and respect, sustainability, and conservation.
- To foster critical thinking, encourage interdisciplinary learning and empower students as environmental stewards.

Learning Outcomes:

Students shall be able to

- develop understanding of traditional knowledge and appreciation of cultural diversity.
- develop knowledge of sustainable practices, interdisciplinary understanding, critical thinking, and analysis.

UNIT 1: INDIGENOUS/TRIBAL COMMUNITIES AND THEIR ROLE IN PROTECTION OF ENVIRONMENT

1.1 Indigenous knowledge and wisdom
1.2 Overview of Indigenous Communities in India
1.3 Indigenous knowledge on combating climate change and disaster risk reduction
1.4 Role of tribes/communities of J&K in environmental protection

UNIT 2: TRADITIONAL ECOLOGICAL KNOWLEDGE (TEK) IN INDIA

2.1 Importance and characteristics of TEK in Indian context
2.2 Traditional Ecological Knowledge (TEK) in indigenous communities
2.3 Traditional agricultural practices and crop diversity: Zero Budget Natural Farming (ZBNF)
2.4 Medicinal plants and indigenous healing practices

UNIT 3: INDIGENOUS RESOURCE MANAGEMENT PRACTICES IN INDIA-I

3.1 Indigenous forest management practices
3.2 Indigenous perspectives on land ownership and rights
3.3 Traditional water harvesting and irrigation systems: stepwells (Chand Bawdi, Rajasthan), Zing Canals (Uttarakhand and Himachal Pradesh), Zaboors (Ladakh)
3.4 Traditional water harvesting practices of J&K

UNIT 4: INDIGENOUS RESOURCE MANAGEMENT PRACTICES IN INDIA-II

4.1 Sacred groves and community-based conservation initiatives
4.2 Role of indigenous communities in ecosystem restoration
4.3 Indigenous practices for the protection of endangered species
4.4 Conservation success stories in India: Olive Ridley Sea Turtle conservation, Black Buck conservation

UG SEMESTER–4
(For the examinations to be held in the years May 2025, 2026, 2027)
ENVIRONMENT AND TRADITIONAL KNOWLEDGE SYSTEM
(MAJOR COURSE)

Course Code: UMJEST-401 **Max. Marks: 100 (Theory-75, Practical-25)**

PRACTICALS (P)

1. Visit to nearby forests or rural areas for interaction with local communities and learn about traditional plant uses.
2. To document indigenous knowledge about plants, their medicinal uses, and cultural significance.
3. Field trips to local ecosystems such as wetlands, forests, or grasslands.
4. Students can identify and document the flora and fauna they encounter and understand the ecological balance.
5. Visit traditional farms to observe age-old farming methods, seed-saving practices, and sustainable agriculture techniques.
6. To document indigenous knowledge about farming practices and its relevance in modern agriculture.
7. To document various medicinal plants and understand their role in traditional healing practices.
8. To learn traditional methods of waste management.

SUGGESTED READINGS

1. Joshi, C., & Purohit, G. C. (2008). Traditional Ecological Knowledge and Natural Resource Management, TERI Press.
2. Negi, S. S. (2011). Indian Environmental Ecology, International Book Distributing Co.
3. Prasad, G. (2006). The Encyclopaedia of Indian Ethnography, Anmol Publications Pvt. Ltd.
4. Rajagopalan, R. (2013). Environmental Studies: From Crisis to Cure, Oxford University Press.
5. Sharma, M. C. (2011). Sacred Waters: A Cross-Cultural Compendium of Hallowed Springs and Holy Wells, Aryan Books International.
6. Singh, R. B. (2001). Ecology and Traditional Knowledge: A Case of Sacred Groves in India, Indus Publishing Company.
7. Swaminathan, M. S. (2008). Biodiversity Conservation and Utilization of Traditional Knowledge: Principles, Practices, and Prospects, New India Publishing Agency.
8. Vijayan, V. S., & Jain, S. K. (2004). Traditional Wisdom and Biodiversity Conservation in India, Ashish Publishing House.
9. Leal Filho, W., Modesto, F., Nagy, G. J., Saroar, M., Yannick Toamukum, N., & Ha'apio, M. (2018). Indigenous Knowledge for Climate Change Assessment and Adaptation, Springer.
10. Reid, D. (2013). Sustainable development: An introductory guide. Routledge.

SCHEME OF EXAMINATION

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The break up 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. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

UG SEMESTER–4
(For the examinations to be held in the years May 2025, 2026, 2027)
ENVIRONMENT AND TRADITIONAL KNOWLEDGE SYSTEM
(MAJOR COURSE)

Course Code: UMJEST-401 **Max. Marks: 100 (Theory-75, Practical-25)**

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) 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 done	3
II. External Assessment (Total Marks: 15)	
1. External practical examination	10
2. Viva-voce	5

UG SEMESTER–4
(For the examinations to be held in the years May 2025, 2026, 2027)
AIR POLLUTION AND ATMOSPHERIC CHEMISTRY
(MAJOR COURSE)

Course Code: UMJEST-402 **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:

- The course aims to provide students a deeper understanding of Earth's atmosphere and its crucial role in sustaining life on this planet.
- It seeks to delve into the subjects of air pollution and climate change, their impacts on human health and ecosystems, and the urgent need for mitigation strategies.

Learning Outcomes:

Students shall be able to

- identify different sources of air pollution and understand the scientific principle behind climate change, evaluate their impacts on human health and the environment, and propose effective strategies for prevention and control.
- these objectives will empower them to make informed decisions, adopt sustainable practices, and contribute to a healthier and more resilient planet.

UNIT 1: INTRODUCTION TO AIR POLLUTION

1.1 Definition and classification of air pollutants
1.2 Effects of air pollution on aquatic and terrestrial ecosystems
1.3 Effects of air pollution on human health
1.4 Greenhouse gases and radiative forcing

UNIT 2: AIR POLLUTION MONITORING AND CONTROL

2.1 Air pollution monitoring techniques: passive, active, and remote sensing;
2.2 National Ambient Air Quality Standards (NAAQS); Air quality Index; Criteria air pollutants
2.3 Principles of air pollution control: prevention, control, and treatment
2.4 Air pollution control devices: electrostatic precipitators, fabric filters, wet scrubbers, cyclone separators

UNIT 3: ATMOSPHERIC CHEMISTRY-I

3.1 Gas-phase reactions in the atmosphere (e.g., oxidation, photolysis)
3.2 Role of radicals in atmospheric chemistry
3.3 Stratospheric ozone formation and depletion mechanisms
3.4 Ozone depleting substances (ODS); Montreal protocol and ozone recovery

UNIT 4: ATMOSPHERIC CHEMISTRY-II

4.1 Smog formation: Photochemical and thermochemical mechanisms
4.2 Acid rain chemistry (NO_X and SO_X reactions)
4.3 Aerosol and their formation mechanisms (e.g., nucleation, condensation)
4.4 Global climate change: Natural and anthropogenic drivers

UG SEMESTER–4
(For the examinations to be held in the years May 2025, 2026, 2027)
AIR POLLUTION AND ATMOSPHERIC CHEMISTRY
(MAJOR COURSE)

Course Code: UMJEST-402 **Max. Marks: 100 (Theory-75, Practical-25)**

PRACTICALS (P)

1. Visit to various areas for listing the sources of air pollution.
2. To study the principle, construction and working of (high volume) air sampler.
3. To determine the temperature of air at a given point of time.
4. To determine the suspended particulate matter (SPM) load in air.
5. To measure the SO_2 concentration in air.
6. To measure the NO_2 concentration in air.
7. To document common air borne diseases in your area.

SUGGESTED READINGS

1. Beard, J. M., & Murphy, R. A. (2021). Environmental chemistry in society. CRC Press.
2. De, A.K. (2009). Environmental Chemistry. New Age International (P) Limited.
3. De, A.K., & De, A.K. (2009). Environmental and Ecology. New Age International (P) Limited.
4. Girard, J. (2013). Principles of environmental chemistry. Jones & Bartlett Publishers.
5. Gurjar, B. R., Molina, L. T., & Ojha, C. S. P. (Eds.). (2010). Air pollution: health and environmental impacts. CRC press.
6. Hester, R.E., & Harrison, R.M. (1998). Air Pollution and Health. The Royal Society of Chemistry, UK.
7. Mitra, A.P., Sharma, S., Bhattacharya, S., Garg, A., Devotta, S., & Sen, K. (2004). Climate Change and India. Universities Press, India.
8. Philander, S.G. (2012). Encyclopaedia of Global Warming and Climate Change (2nd edition). Sage Publications.

SCHEME OF EXAMINATION

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The break up 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. 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 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) 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 done	3
II. External Assessment (Total Marks: 15)	
1. External practical examination	10
2. Viva-voce	5

UNIVERSITY OF JAMMU
Syllabus for FYUGP Program in ENVIRONMENTAL SCIENCES
(Under CBCS as per NEP–2020)

UG SEMESTER–4
(For the examinations to be held in the years May 2025, 2026, 2027)
AQUATIC RESOURCES AND WATER POLLUTION
(MAJOR COURSE)

Course Code: UMJEST-403 **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 provide comprehensive understanding about various water properties.
- To introduce the students the concept of water pollution and various water pollutants.
- To provide awareness about detrimental effects on human health and ecosystem.

Learning outcomes:

Students shall be able to

- understand and evaluate consequences of different types of water pollution on terrestrial and aquatic ecosystem.
- demonstrate the ability to carry out water quality analysis in the laboratory and interpret the results.

UNIT 1: WATER RESOURCES

1.1 Water resources: definition, types and distribution
1.2 Surface water resources: concept, importance and distribution
1.3 Ground water resources: concept, importance and distribution
1.4 Marine water resources: concept, importance and distribution

UNIT 2: INTRODUCTION TO WATER POLLUTION

2.1 Water Pollution: definition, sources and types
2.2 Surface water pollution: sources, effects and control
2.3 Ground water pollution: sources, effects and control
2.4 Marine pollution: sources and ocean acidification

UNIT 3: EFFECTS OF WATER POLLUTION

3.1 Effect of water contaminants on terrestrial and aquatic ecosystem
3.2 Effect of heavy metals (arsenic, mercury, lead, chromium) on human health
3.3 Eutrophication: concept, causes, effects and control
3.4 Pesticide pollution of water bodies: ecological and human health impacts

UNIT 4: WATER QUALITY MONITORING AND ASSESSMENT CRITERIA

4.1 Water quality monitoring: concept and guidelines
4.2 Water quality monitoring techniques
4.3 Introduction to water quality criteria and standards: International and National
4.4 Drinking water quality standards (WHO and BIS)

UG SEMESTER- 4
(For the examinations to be held in the years May 2025, 2026, 2027)
AQUATIC RESOURCES AND WATER POLLUTION
(MAJOR COURSE)

Course Code: UMJEST-403 **Max. Marks: 100 (Theory-75, Practical-25)**

PRACTICALS (P)

1. Demonstration of laboratory glassware and equipment used in water analysis.
2. Water sampling: collection, handling, and preservation
3. Estimation of temperature of different ecosystems.
4. To determine pH of different water bodies.
5. To determine EC of different water bodies
6. To determine TDS of different water bodies
7. To determine Turbidity of any aquatic body.
8. Perception of stakeholders regarding drinking water quality available in the institution/college.
9. Visit any ETP/ Drinking water treatment plant/Wastewater treatment Plant
10. Visit any water body and prepare field report.

SUGGESTED READINGS

1. Carson, R. (2002). Silent Spring. Houghton Mifflin Harcourt.
2. De Anil, K. (2003). Environmental chemistry. New Age International.
3. Girard, J. (2013). Principles of Environmental Chemistry. Jones & Bartlett Publishers.
4. Kaushik, A., & Kaushik, C. P. (2006). Perspectives in environmental studies. New Age International.
5. Manahan, S. E. (2011). Fundamentals of Environmental Chemistry. CRC press.
6. Mark, L.B., Ian., P., & Gerba, C. (2019) Environmental and Pollution Science. Academic Press
7. Masters, G. M., & W. P. Ela (2020). Introduction to Environmental Engineering and Science, Pearson Education.
8. Miller, G. T., & Spoolman, S. (2015). Environmental Science. Cengage Learning
9. Peirce, J. J., Vesilind, P. A., & Weiner, R. (1998). Environmental Pollution and Control. Butterworth-Heinemann.
10. Schwartz, F. W., & Zhang, H. (2003). Fundamentals of Ground Water. Wiley.
11. Sharma, B. K. (2014). Environmental chemistry. Krishna Prakashan Media.
12. Vickers, A. (2001). Handbook of Water Use and Conservation. Water Plow Press.

SCHEME OF EXAMINATION

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The break up 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. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

UG SEMESTER–4

(For the examinations to be held in the years May 2025, 2026, 2027)

AQUATIC RESOURCES AND WATER POLLUTION

(MAJOR COURSE)

Course Code: UMJEST-403 **Max. Marks: 100 (Theory-75, Practical-25)**

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) 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 done	3
II. External Assessment (Total Marks: 15)	
1. External practical examination	10
2. Viva-voce	5

UG SEMESTER–4

(For the examinations to be held in the years May 2025, 2026, 2027)

ENVIRONMENTAL TOXICOLOGY

(MAJOR COURSE)

COURSE NO: UMJEST-404 **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:

- This course will give an overview of sources and effects of environmental toxins on environment and human health to the students.

Learning Outcomes:

Students shall be able to

- understand the different concepts in ecotoxicology and identify different types of toxicants in environment.
- recognize various health risks caused by toxic substances in the environment.
- acquire skills for conducting risk assessments for various environmental toxicants in the environment.

UNIT 1: FUNDAMENTALS OF ENVIRONMENTAL TOXICOLOGY-I

1.1. Toxicology: concept, scope and principles
1.2 Classification of toxic substances
1.3 Factors affecting toxicity
1.4 Toxicity testing methods

UNIT 2: FUNDAMENTALS OF ENVIRONMENTAL TOXICOLOGY-II

2.1 Bioassay in environmental toxicology
2.2 Dose-response relationship
2.3 Classes of toxicants (Exposure and Use class) and types of toxicity
2.4 Statistical concept of environmental toxicology

UNIT 3: TOXICOKINETICS

3.1 Xenobiotics and recalcitrant: concept and classification
3.2 Absorption of xenobiotics, membrane barriers, binding and storage
3.3 Movement of toxicants in environment (Plants and Animals)
3.4 Bioaccumulation, bio magnification, biotransformation

UNIT 4: ENVIRONMENTAL TOXICOLOGY AND HUMAN HEALTH

4.1 Impact of heavy metals on human health
4.2 Impact of pesticides on human health
4.3 Effects of toxicants on aquatic and terrestrial environment
4.4 Case studies: Bhopal gas tragedy, Minamata disease, Chernobyl nuclear disaster, Love canal tragedy

UG SEMESTER–4
(For the examinations to be held in the years May 2025, 2026, 2027)
ENVIRONMENTAL TOXICOLOGY
(MAJOR COURSE)

COURSE NO: UMJEST-404 **MAX. MARKS: 100 (THEORY-75, Practical-25)**

PRACTICALS (P)

1. Calculate LC_{50} by probit analysis with provided data.
2. From given data of percentage mortality at different concentrations of toxicant, calculate LC_{50}.
3. Calculate the LC_{50} of mixture to conclude additive effect from given toxicity data of chemical A & B.
4. Calculate the LC_{50} of mixture to conclude antagonistic effect from given toxicity data of chemical A & B.
5. Calculate the LC_{50} of mixture to conclude simple additive effect from given toxicity data of chemical A & B.
6. Demonstrate practically Dose-response relationship in same and different size entities.
7. Collect secondary data on AQI/WQI from different areas and correlate with health indices of that area
8. Collect and analyze public health data in your area using statistical tools/methods.
9. Study and document rate of air borne disease over past few month or years by visiting health centre.
10. Study and document Water borne disease over past few month or years by visiting health centre.
11. Study and document Food borne disease over past few month or years by visiting health centre.

SUGGESTED READINGS

1. Alcamo, I. E. (1994). Fundamentals of Microbiology. The Benjamin / Cummings Pub. Co., USA.
2. Banerjii, S. K. (2001). Environmental Chemistry. Prentice Hall of India Pvt. Ltd., New Delhi.
3. De, A. K. (2003). Environmental Chemistry. New Age Int. Ltd., New Delhi.
4. Kumar, R. (1987). Environmental Pollution and Health Hazards in India. Ashish Publication House, New Delhi.
5. Newman, M. C. (2020). Fundamentals of Ecotoxicology. CRC Press, USA.
6. Park, K. (2021). Textbook of preventive and social medicine. M/s Banarsi Das Bhanot, Jabalpur. (26th Ed.)
7. Prescott, L. M., Harley, J. P., & Klein, D. A. (1993). Microbiology. WCB Pub., USA.
8. Satake, M., Mido, Y., Ysuhisa, H., Taguchi, S., Sethi, M. S., & Iqbal, S. A. (1997). Environmental Toxicology. Discovery Publication House, New Delhi.
9. Shukla, S. K., & Srivastava, P. R. (1992). Characterization of Health hazards in man and Environment. Commonwealth Pub., New Delhi.
10. Shukla, S. K., & Srivastava, P. R. (1992). Environmental Pollution and chronic diseases. Commonwealth Pub., New Delhi.
11. Sood, A. (1999). Toxicology. Sampand Songs, New Delhi.
12. Tortora, G. J., Funke, B. R., & Case, C. L. (1995). Microbiology - An Introduction. The Benjamin / Cummings Pub. Co., USA.
13. Upton, A. C., & Graber, E. (1993). Staying Healthy in a risky Environment. Simon and Schuster Pub., USA.
14. Wright, D. A., & Welbowin, P. (2002). Environmental Toxicology. Cambridge Univ. Press, U.K.

UG SEMESTER–4
(For the examinations to be held in the years May 2025, 2026, 2027)
ENVIRONMENTAL TOXICOLOGY
(MAJOR COURSE)

COURSE NO: UMJEST-404 **MAX. MARKS: 100 (THEORY-75, Practical-25)**

SCHEME OF EXAMINATION

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The break up 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. 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) 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 done	3
II. External Assessment (Total Marks: 15)	
1. External practical examination	10
2. Viva-voce	5

UG SEMESTER–4
(For the examinations to be held in the years May 2025, 2026, 2027)
ENVIRONMENT AND TRADITIONAL KNOWLEDGE SYSTEM
(MINOR COURSE)

Course Code: UMIEST-405 **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 understand traditional knowledge systems and to explore the relationship between traditional knowledge and the environment.
- To promote cultural sensitivity and respect, sustainability, and conservation.
- To foster critical thinking, encourage interdisciplinary learning and empower students as environmental stewards.

Learning Outcomes:

Students shall be able to

- develop understanding of traditional knowledge and appreciation of cultural diversity.
- develop knowledge of sustainable practices, interdisciplinary understanding, critical thinking, and analysis.

UNIT 1: INDIGENOUS/TRIBAL COMMUNITIES AND THEIR ROLE IN PROTECTION OF ENVIRONMENT

1.1 Indigenous knowledge and wisdom
1.2 Overview of Indigenous Communities in India
1.3 Indigenous knowledge on combating climate change and disaster risk reduction
1.4 Role of tribes/communities of J&K in environmental protection

UNIT 2: TRADITIONAL ECOLOGICAL KNOWLEDGE (TEK) IN INDIA

2.1 Importance and characteristics of TEK in Indian context
2.2 Traditional Ecological Knowledge (TEK) in indigenous communities
2.3 Traditional agricultural practices and crop diversity: Zero Budget Natural Farming (ZBNF)
2.4 Medicinal plants and indigenous healing practices

UNIT 3: INDIGENOUS RESOURCE MANAGEMENT PRACTICES IN INDIA-I

3.1 Indigenous Forest management practices
3.2 Indigenous perspectives on land ownership and rights
3.3 Traditional water harvesting and irrigation systems: stepwells (Chand Bawdi, Rajasthan), Zing Canals (Uttarakhand and Himachal Pradesh), Zaboors (Ladakh)
3.4 Traditional water harvesting practices of J&K

UNIT 4: INDIGENOUS RESOURCE MANAGEMENT PRACTICES IN INDIA-II

4.1 Sacred groves and community-based conservation initiatives
4.2 Role of indigenous communities in ecosystem restoration
4.3 Indigenous practices for the protection of endangered species
4.4 Conservation success stories in India: Olive Ridley Sea Turtle Conservation, Black Buck Conservation.

UG SEMESTER–4

(For the examinations to be held in the years May 2025, 2026, 2027)

ENVIRONMENT AND TRADITIONAL KNOWLEDGE SYSTEM

(MINOR COURSE)

Course Code: UMIEST-405 **Max. Marks: 100 (Theory-75, Practical-25)**

PRACTICALS (P)

1. Visit to nearby forests or rural areas for interaction with local communities and learn about traditional plant uses.
2. To document indigenous knowledge about plants, their medicinal uses, and cultural significance.
3. Field trips to local ecosystems such as wetlands, forests, or grasslands.
4. Students can identify and document the flora and fauna they encounter and understand the ecological balance.
5. Visit traditional farms to observe age-old farming methods, seed-saving practices, and sustainable agriculture techniques.
6. To document indigenous knowledge about farming practices and its relevance in modern agriculture.
7. To document various medicinal plants and understand their role in traditional healing practices.
8. To learn traditional methods of waste management.

SUGGESTED READINGS

1. Joshi, C., & Purohit, G. C. (2008). Traditional Ecological Knowledge and Natural Resource Management, TERI Press.
2. Negi, S. S. (2011). Indian Environmental Ecology, International Book Distributing Co.
3. Prasad, G. (2006). The Encyclopaedia of Indian Ethnography, Anmol Publications Pvt. Ltd.
4. Rajagopalan, R. (2013). Environmental Studies: From Crisis to Cure, Oxford University Press.
5. Sharma, M. C. (2011). Sacred Waters: A Cross-Cultural Compendium of Hallowed Springs and Holy Wells, Aryan Books International.
6. Singh, R. B. (2001). Ecology and Traditional Knowledge: A Case of Sacred Groves in India, Indus Publishing Company.
7. Swaminathan, M. S. (2008). Biodiversity Conservation and Utilization of Traditional Knowledge: Principles, Practices, and Prospects, New India Publishing Agency.
8. Vijayan, V. S., & Jain, S. K. (2004). Traditional Wisdom and Biodiversity Conservation in India, Ashish Publishing House.
9. Leal Filho, W., Modesto, F., Nagy, G. J., Saroar, M., Yannick Toamukum, N., & Ha'apio, M. (2018). Indigenous Knowledge for Climate Change Assessment and Adaptation, Springer.
10. Reid, D. (2013). Sustainable development: An introductory guide. Routledge.

SCHEME OF EXAMINATION

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The break up 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. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

UG SEMESTER–4

(For the examinations to be held in the years May 2025, 2026, 2027)

ENVIRONMENT AND TRADITIONAL KNOWLEDGE SYSTEM

(MINOR COURSE)

Course Code: UMIEST-405 **Max. Marks: 100 (Theory-75, Practical-25)**

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) 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 done	3
II. External Assessment (Total Marks: 15)	
1. External practical examination	10
2. Viva-voce	5

UG SEMESTER–5
(For the examinations to be held in the years December 2025, 2026, 2027)
ENVIRONMENTAL MANAGEMENT AND GREEN MARKETING
(MAJOR COURSE)

Course Code: UMJEST-501 **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 provide an overview of the key concepts and principles in environmental management, strategies and tools for effective environmental management.
- To understand the importance of green marketing and its impact on environmental safety and consumer satisfaction.
- To develop an understanding of the concept of green products and marketing, and consumer behaviour

Learning outcomes:

Students shall be able to:

- get a comprehensive understanding of environmental issues, sustainable practices, and the management strategies required to address the complex challenges of our changing world.
- explain green marketing and its importance for the environment from the perspective of consumers and businesses.
- understand the opportunities, challenges, and issues in designing and implementing green marketing strategies.

UNIT 1: INTRODUCTION TO ENVIRONMENTAL MANAGEMENT

1.1 Overview of Environmental Management (EM) concept and framework
1.2 Corporate environmental responsibilities
1.3 Environment policy and regulations
1.4 Sustainable Development Goals (SDGs)

UNIT 2: ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

2.1 Introduction to Environmental Management System (EMS): ISO 14000 series
2.2 Environmental Auditing: concept and components
2.3 Life cycle assessment as EM tool
2.4 Environment Management Plan (EMP)

UNIT 3: FUNDAMENTALS OF GREEN MARKETING

3.1 Meaning, concept and evolution of green marketing
3.2 Concept of green procurement and supplier management
3.3 Consumer attitude and perceptions towards eco-friendly products
3.4 Role of educating consumers and ethical considerations in green marketing

UNIT 4: GREEN MARKETING STRATEGIES

4.1 Strategies to green marketing, from cradle to grave to cradle to cradle
4.2 Eco labelling and certification schemes
4.3 Sustainable packaging and material selection
4.4 Green washing: characteristics and examples

UG SEMESTER–5

(For the examinations to be held in the years December 2025, 2026, 2027)

ENVIRONMENTAL MANAGEMENT AND GREEN MARKETING

(MAJOR COURSE)

Course Code: UMJEST-501 **Max. Marks: 100 (Theory-75, Practical-25)**

PRACTICALS (P)

1. To study and analyse any ecosystem restoration project in India/world.
2. To study EMP of any developmental project
3. To study and write a short report on environmental sensitive places of respective area.
4. Identify and analyse examples of green products and green marketing in real world advertisements.
5. Create a green product concept, considering materials, design, and marketing strategies (Individual/Group).
6. Filed visit to sustainable businesses or green product manufacturers.
7. To study and document case study on Green washing.
8. Design eco-friendly packaging for a fictional product, considering both aesthetics and environmental impact.
9. Group/Individual presentation on any of the topics from theory.

SUGGESTED READINGS

1. Asolekar, S. R., & Gopichandran, R. (2005). Preventive Environmental Management. Foundation Books.
2. Esakki, T. (Ed.). (2017). Green marketing and environmental responsibility in modern corporations. IGI global.
3. Ottman, J. (2017). The new rules of green marketing: Strategies, tools, and inspiration for sustainable branding. Routledge.
4. Rajagopalan, R. (2013). Environmental Studies: From Crisis to Cure, Oxford University Press.
5. Reid, D. (2013). Sustainable development: An introductory guide. Routledge.
6. Welford, R. (2016). Corporate environmental management 1: systems and strategies. Routledge.
7. Miller, G. T., & Spoolman, S. (2015). Environmental Science. Cengage Learning

SCHEME OF EXAMINATION

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The break up 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. 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.

UG SEMESTER–5

(For the examinations to be held in the years December 2025, 2026, 2027)

ENVIRONMENTAL MANAGEMENT AND GREEN MARKETING

(MAJOR COURSE)

Course Code: UMJEST-501 **Max. Marks: 100 (Theory-75, Practical-25)**

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 long answer type questions, two (2) 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 done	3
II. External Assessment (Total Marks: 15)	
1. External practical examination	10
2. Viva-voce	5

UG SEMESTER–5
(For the examinations to be held in the years December 2025, 2026, 2027)
URBAN AND HAZARDOUS WASTE MANAGEMENT
(MAJOR COURSE)

Course Code: UMJEST-502 **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 problems associated with the generation of wastes and their impact on environment and public health
- To be able to analyse the technical solutions available for the management and treatment of wastes
- To develop understanding regarding hazardous waste related health and environmental problems and necessity of hazardous waste management

Learning outcomes:

Students shall be able to

- understand the nature and characteristics of solid wastes
- plan waste minimization and design the waste management systems in a context of sustainability
- select the appropriate method for disposal of solid waste

UNIT 1: WASTE CLASSIFICATION AND REGULATORY REQUIREMENTS

1.1 Definition of solid wastes: municipal, biomedical, hazardous, industrial and e-waste
1.2 Sources and types of solid and hazardous wastes
1.3 Health and environmental issues related to solid and hazardous waste
1.4 Salient features of solid waste management rules 2016 and Hazardous waste (management and trans boundary movement) rules 2016

UNIT 2: WASTE HANDLING AND PROCESSING

2.1 Handling and segregation of waste at source and methods of segregation
2.2 Solid waste reduction techniques and waste processing methods
2.3 Solid waste treatment methods (Thermal, mechanical, and biological)
2.4 Waste management hierarchy

UNIT-3: WASTE DISPOSAL

3.1 Landfilling of municipal solid waste: sanitary landfills vs open dumps
3.2 Design and operation of sanitary landfills
3.3 Landfill leachate and gas: effects and management
3.4 Landfill closure and environmental monitoring

UNIT 4: HAZARDOUS WASTE MANAGEMENT

4.1 Hazardous waste: classification and characteristics
4.2 Hazardous waste minimization and recycling: environmental and other benefits
4.3 Treatment of hazardous waste: physical, chemical and biological
4.4 Hazardous waste disposal methods

UG SEMESTER–5
(For the examinations to be held in the years December 2025, 2026, 2027)
URBAN AND HAZARDOUS WASTE MANAGEMENT
(MAJOR COURSE)

Course Code: UMJEST-502 **Max. Marks: 100 (Theory-75, Practical-25)**

PRACTICALS (P)

1. Survey the municipal solid waste of your locality, identify and write its sources & composition.
2. Analyse and document case studies of successful waste management projects from India/world to learn best practices.
3. Laboratory demonstration of composting and vermicomposting.
4. Study and document case study on remediation of landfill site after closure in India.
5. Report writing on smart solid waste management in smart cities.
6. Analyse case study on Life cycle of any product.
7. Field visit to landfill site/dumping/disposal site.
8. Field visit to biomedical waste management facility.
9. Visit to e-waste handling facility centre
10. Field visit to plastic recycling unit or any other recycling unit

SUGGESTED READINGS

1. Asnani, P. U. (2006). Solid waste management. India infrastructure report, 570.
2. Asnani, P. U., & Zurbrugg, C. (2007). Improving municipal solid waste management in India: A sourcebook for policymakers and practitioners. World Bank Publications.
3. Bagchi, A. (2004). Design of landfills and integrated solid waste management. John Wiley & Sons.
4. Blackman Jr, W. C. (2016). Basic hazardous waste management. CRC press.
5. Central Public Health, & Environmental Engineering Organisation (India). (2000). Manual on municipal solid waste management. Central Public Health and Environmental Engineering Orgnisation, Ministry of Urban Development, Government of India.
6. McDougall, F. R., White, P. R., Franke, M., & Hindle, P. (2008). Integrated solid waste management: a life cycle inventory. John Wiley & Sons.
7. Tchodanoglous, G., Theisen, H., & Vigil, S. (1993). Integrated solid waste management: engineering principles and management issues. McGraw-Hill.
8. Vanatta, B. (2000). Guide for industrial waste management. Diane Publishing.

SCHEME OF EXAMINATION

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The break up 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. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

UG SEMESTER–5
(For the examinations to be held in the years December 2025, 2026, 2027)
URBAN AND HAZARDOUS WASTE MANAGEMENT
(MAJOR COURSE)

Course Code: UMJEST-502 **Max. Marks: 100 (Theory-75, Practical-25)**

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 long answer type questions, two (2) 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 done	3
II. External Assessment (Total Marks: 15)	
1. External practical examination	10
2. Viva-voce	5

UG SEMESTER–5
(For the examinations to be held in the years December 2025, 2026, 2027)
LAND AND SOIL RESOURCES MANAGEMENT
(MAJOR COURSE)

Course Code: UMJEST-503 **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	-	-

Course Objectives:

- To introduce students to the fundamental concepts and principles of land resources and land use planning in the Indian context.
- To provide students with knowledge of the diverse types of land resources and their sustainable management practices in India.
- To familiarize students with the regulatory framework and policies governing land use in India.

Learning Outcomes:

Students shall be able to

- develop practical skills in soil analysis and land evaluation for land development projects in India.
- to design sustainable land use plans for different scenarios, taking into account environmental, economic, and social factors.

UNIT 1: INTRODUCTION TO SOIL AND LAND RESOURCES

1.1 Land as a resource and its importance
1.2 Nine-fold classification of land resources
1.3 Soil type, classification and its distribution in India
1.4 Soil functions (nutrient cycling, water regulation, habitat support)

UNIT 2. LAND DEGRADATION AND RESTORATION

2.1. Land degradation: types (physical, chemical, and biological) and indicators
2.2 Soil conservation practices (contour ploughing, terracing, cover cropping)
2.3 Soil nutrient cycling and management
2.4 Rehabilitation and restoration techniques to prevent land degradation

UNIT 3: LAND USE CHANGE

3.1 Concept of Land Use and Cover Change (LULC)
3.2. Land use land cover change in India: Causes and effects
3.3 Land suitability assessment and zoning
3.4 Mitigation strategies to combat land use change

UNIT 4: LAND USE PLANNING AND MANAGEMENT

4.1. Concept of land use planning and management
4.2 Participatory Land Use Planning (PLUP)
4.3 Application of remote sensing and GIS in land use planning
4.4 Sustainable and climate smart land management practices

UG SEMESTER–5
(For the examinations to be held in the years December 2025, 2026, 2027)
LAND AND SOIL RESOURCES MANAGEMENT
(MAJOR COURSE)

Course Code: UMJEST-503 **Max. Marks: 100 (Theory-75, Practical-25)**

PRACTICALS (P)

1. Visit various types of lands (urban, rural, agricultural, forested etc.) to document and assess land suitability for different purposes.
2. Visit a local farm or agricultural area to assess the soil, crop selection, and agricultural practices being used.
3. Identify type and cause of land degradation by visiting local area and develop recommendations for its conservation and management.
4. Identify/locate/label different types of soil on an outline map of India.
5. Identify and examine different horizons in soil profile with help of photograph.
6. Study/identify the land use land cover changes in particular area by using past data or map.
7. Identify soil type using soil texture triangle.
8. To study the procedure of collection and preservation of soil sample

SUGGESTED READINGS

1. Govinda R.M., & Prabhakar, V.R. (2005). "Land Use Planning and Urban Development in India". Academic Foundation.
2. Kulshrestha, S. K. (2012). Urban and regional planning in India: a handbook for professional practice. India: Sage Publications.
3. National Bureau of Soil Survey and Land Use Planning (NBSS&LUP) (2011). "Soil Resource Atlas of India". National Bureau of Soil Survey and Land Use Planning.
4. Hirani, P. (2019). "Geographical Information Systems (GIS) and Modeling for Sustainable Land Use Planning in India". Springer
5. Rajasekaran, R. (2016). Watershed Management in India: Principles and Practices". PHI Learning Pvt. Ltd.
6. Rathi, S. S. (2008). "Land Valuation in India". Oxford University Press.
7. Roy, P.S., & Joshi, P.C. (2012). "Land Resources: Monitoring, Modeling, and Management". CRC Press.
8. Tilotia, A. (2016). "Land Use, Land Cover and Soil Sciences: Basic and Applied Concepts" New India Publishing Agency.

SCHEME OF EXAMINATION

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The break up 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. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

UG SEMESTER–5
(For the examinations to be held in the years December 2025, 2026, 2027)
LAND AND SOIL RESOURCES MANAGEMENT
(MAJOR COURSE)

Course Code: UMJEST-503 **Max. Marks: 100 (Theory-75, Practical-25)**

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 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) 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 done	3
II. External Assessment (Total Marks: 15)	
1. External practical examination	10
2. Viva-voce	5

UG SEMESTER–5

(For the examinations to be held in the years Dec 2025, 2026, 2027

ENVIRONMENTAL ETHICS AND SOCIETAL RESPONSIBILITIES

(MAJOR COURSE)

Course Code: UMJEST-504 **Max. Marks: 50 (Theory-40, Practical-10)**

	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 students to the fundamental principles of environmental ethics.
- To encourage critical thinking and ethical reasoning related to environmental challenges.
- To promote awareness of societal responsibilities in environmental conservation.

Learning Outcomes:

Students shall be able to

- summarize the historical development of environmental ethics.
- describe the key ethical principles related to environmental conservation.
- evaluate the environmental ethics within the Indian cultural and societal context.
- demonstrate a heightened sense of ethical responsibility towards the environment and society.

UNIT 1: INTRODUCTION TO ENVIRONMENTAL ETHICS

1.1 Understanding ethics and environmental ethics
1.2 Historical development of environmental ethics
1.3 Environmental ethics in Indian context
1.4 Intrinsic vs. instrumental value of nature

UNIT 2: ETHICAL ISSUES AND ENVIRONMENTAL CONSERVATION

2.1 Anthropocentrism vs. Biocentrism vs. Ecocentrism
2.2 Environmental justice and environmental racism
2.3 Animal Rights and Environmental Ethics
2.4 Sustainable Development, Tragedy of the Commons

UNIT 3: PRACTICALS

3.1 Report writing on case study of any current environmental issue.
3.2 Field trip to environmentally significant sites to observe impacts of human activities and discuss ethical responsibilities.
3.3 Written assignment where students analyse their personal values and ethical considerations regarding environmental issues.
3.4 Student seminar/workshop on sustainable and ethical consumer choices and eco-friendly lifestyles.

UG SEMESTER–5

(For the examinations to be held in the years Dec 2025, 2026, 2027

ENVIRONMENTAL ETHICS AND SOCIETAL RESPONSIBILITIES

(MAJOR COURSE)

Course Code: UMJEST-504 **Max. Marks: 50 (Theory-40, Practical-10)**

SUGGESTED READINGS

1. David, W. (2004). Earth in Mind: On Education, Environment, and the Human Prospect, Island Press.
2. DesJardins, J.R. (2020). Environmental Ethics: An Introduction, Cengage Learning
3. Jamieson, D. (2008). Ethics and the Environment: An Introduction, Cambridge University Press.
4. Karen, J. (1997). Ecofeminism: Women, Culture, Nature, Indiana University Press
5. Kinderlerer, J., & Grune-Yanoff, T. (2017). Societal Responsibilities in Life Sciences, Springer.
6. Oelschlaeger, M. (1991). The Ethics of Environmental Concern, University of Georgia Press.
7. Rolston, H. (1988). Environmental Ethics: Duties to and Values in the Natural World, Temple University Press.
8. Wulf, T., & Rupp, J. (2019). Societal Responsibilities in the Business Sector, Springer.

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)

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

UG SEMESTER–5
(For the examinations to be held in the years December 2025, 2026, 2027)
URBAN AND HAZARDOUS WASTE MANAGEMENT
(MINOR COURSE)

Course Code: UMIEST-505 **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 problems associated with the generation of wastes and their impact on environment and public health
- To be able to analyse the technical solutions available for the management and treatment of wastes
- To develop understanding regarding hazardous waste related health and environmental problems and necessity of hazardous waste management

Learning outcomes:

Students shall be able to

- understand the nature and characteristics of solid wastes
- plan waste minimization and design the waste management systems in a context of sustainability
- Select the appropriate method for disposal of solid waste

UNIT 1: WASTE CLASSIFICATION AND REGULATORY REQUIREMENTS

1.1 Definition of solid wastes: municipal, biomedical, hazardous, industrial and e-waste

1.2 Sources and types of solid and hazardous wastes

1.3 Health and environmental issues related to solid and hazardous waste and need for their management

1.4 Salient features of solid waste management rules 2016 and Hazardous waste (management) and trans-boundary movement) rules 2016

UNIT 2: WASTE HANDLING AND PROCESSING

2.1 Handling and segregation of waste at source and methods of separation

2.2 Solid waste reduction techniques and waste processing methods

2.3 Solid waste treatment methods (Thermal, mechanical, and biological)

2.4 Waste management hierarchy

UNIT-3: WASTE DISPOSAL

3.1 Landfilling of municipal solid waste: sanitary landfills vs open dumps

3.2 Design and operation of sanitary landfills

3.3 Landfill leachate and gas: effects and management

3.4 Landfill closure and environmental monitoring

UNIT 4: HAZARDOUS WASTE MANAGEMENT

4.1 Hazardous waste: classification and characteristics

4.2 Hazardous waste minimization and recycling: environmental and other benefits

4.3 Treatment of hazardous waste: physical, chemical and biological

4.3 Hazardous waste disposal methods

UG SEMESTER–5
(For the examinations to be held in the years December 2025, 2026, 2027)
URBAN AND HAZARDOUS WASTE MANAGEMENT
(MINOR COURSE)

Course Code: UMIEST-505 **Max. Marks: 100 (Theory-75, Practical-25)**

PRACTICALS (P)

1. Analyse and document case studies of successful waste management projects from India/world to learn best practices.
2. Laboratory demonstration of composting and vermicomposting.
3. Study and document case study on remediation of landfill site after closure in India.
4. Report writing on smart solid waste management in smart cities.
5. Analyse case study on Life cycle of any product.
6. Field visit to landfill site/dumping/disposal site.
7. Field visit to biomedical waste management facility.
8. Visit to e-waste handling facility centre
9. Field visit to plastic recycling unit or any other recycling unit
10. Survey the municipal solid waste of your locality, identify and write its sources & composition.

SUGGESTED READINGS

1. Asnani, P. U. (2006). Solid waste management. India infrastructure report, 570.
2. Asnani, P. U., & Zurbrugg, C. (2007). Improving municipal solid waste management in India: A sourcebook for policymakers and practitioners. World Bank Publications.
3. Bagchi, A. (2004). Design of landfills and integrated solid waste management. John Wiley & Sons.
4. Blackman Jr, W. C. (2016). Basic hazardous waste management. CRC press.
5. Central Public Health, & Environmental Engineering Organisation (India). (2000). Manual on municipal solid waste management. Central Public Health and Environmental Engineering Orgnisation, Ministry of Urban Development, Government of India.
6. McDougall, F. R., White, P. R., Franke, M., & Hindle, P. (2008). Integrated solid waste management: a life cycle inventory. John Wiley & Sons.
7. Tchodanoglous, G., Theisen, H., & Vigil, S. (1993). Integrated solid waste management: engineering principles and management issues. McGraw-Hill.
8. Vanatta, B. (2000). Guide for industrial waste management. Diane Publishing.

SCHEME OF EXAMINATION

The paper will have seventy-five (75) marks for theory and twenty-five (25) marks for practical. The break up 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. There will be continuous assessment of ten (10) marks and final examination of fifteen (15) marks for practical component.

UG SEMESTER–5

(For the examinations to be held in the years December 2025, 2026, 2027)

URBAN AND HAZARDOUS WASTE MANAGEMENT

(MINOR COURSE)

Course Code: UMIEST-505 **Max. Marks: 100 (Theory-75, Practical-25)**

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 long answer type questions, two (2) 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 done	3
II. External Assessment (Total Marks: 15)	
1. External practical examination	10
2. Viva-voce	5

UG SEMESTER–5
(For the examinations to be held in the years December 2025, 2026, 2027)
SUMMER INTERNSHIP
(SKILL ENHANCEMENT COURSE)

Course Code: USEESI-506 **Max. Marks: 50 (Practical-50)**

	Credits	Contact Hours	Units	Examination			
				Weightage (Marks)		Duration (hours)	
				Mid Semester Assessment	End Semester Examination	Mid Semester Assessment	End Semester Examination
Practical	02	45	-	-	-	-	-

Objectives:

- In order to obtain work experience, students will participate in a 15-day short-term internship during their fifth semester, for skill enhancement in any government or government-approved organisation.
- The summer internship will help students to acquire skills with regard to their future professional endeavours and societal needs.

Guidelines: Refer to Statute 22.vii of the statutes governing FYUG as per NEP 2020. Notified vide No. F. Acd/I/23/7769-7828 Dated: 03-08-2023

Learning outcomes:

Students shall be able

- to use their practical knowledge into non-formal settings to improve their ability to study outside the classroom.
- to collaborate with other students, acquire new methods and approaches, and get experience in the area.
- to increase their perspective on various facets of environmental sciences.

General Guidelines

Students may opt for internships with local industry, business organizations, health and allied sectors, government departments and bodies (forest, wildlife, panchayats, municipalities etc.), academic and research institutions, government-approved NGOs etc. so that they may actively engage with the practical side of their learning and, further improve their prospects for employability.

A) Report compilation and submission

All the students will compile their work and submit it to the Internship supervisor. The compilation should include the brief introduction and review, materials used for research, methodology employed for the same, observations recorded or results obtained, discussion and conclusions, all supported by relevant references. The chapter headings can be

1. Introduction
2. Materials and methods
3. Results\Observations
4. Discussion
5. Conclusion
6. References

UG SEMESTER–5
(For the examinations to be held in the years December 2025, 2026, 2027)
SUMMER INTERNSHIP
(SKILL ENHANCEMENT COURSE)

Course Code: USEESI-506 **Max. Marks: 50 (Practical-50)**

B) Monitoring and evaluation

The internship shall be carried out under the supervision of college teacher who will be designated as Internship Supervisor. The internship supervisor shall monitor the progress and evaluate students internship course at the end of semester on the basis of internship report and seminar presentation/viva-voce. The internship will be evaluated internally.

SCHEME OF EXAMINATION

The internship will be evaluated internally at the end of semester on the basis of internship report and seminar presentation/viva-voce. Minimum passing criteria for summer internship is 40%.