

Scheme of MDC, VAC, SEC, AEC and VOC courses  
Offered in the University Pool  
by the  
Department of Environmental Sciences  
(Session 2026-27)

Scheme of MDC, VAC, SEC and VOC courses

| Semester | Course Type | Applicable Scheme  | Course Code           | Nomenclature of the Course       | Credits |            |               | Contact hours L: Lecture<br>T: Tutorial<br>P: Practical |   |   |       | Internal Assessment Marks |   | End term Examination Marks |    | Total Marks | Exam. Hours |   |
|----------|-------------|--------------------|-----------------------|----------------------------------|---------|------------|---------------|---------------------------------------------------------|---|---|-------|---------------------------|---|----------------------------|----|-------------|-------------|---|
|          |             |                    |                       |                                  | Total   | Theory (T) | Practical (P) | L                                                       | T | P | Total | T                         | P | T                          | P  |             | T           | P |
| 1        | MDC-1       | Scheme A, B, C & D | 26L4.5 -MDC- EVS- 101 | Basics of Environmental sciences | 3       | 2          | 1             | 2                                                       | 0 | 2 | 4     | 15                        | 5 | 35                         | 20 | 75          | 2           | 2 |
| 2        | MDC-2       | Scheme A, B, C & D | 26L4.5 -MDC- EVS- 201 | Environmental issues             | 3       | 2          | 1             | 2                                                       | 0 | 2 | 4     | 15                        | 5 | 35                         | 20 | 75          | 2           | 2 |
| 3        | MDC-3       | Scheme A, B, C & D | 26L5.0 -MDC- EVS- 301 | Environmental Conservation       | 3       | 2          | 1             | 2                                                       | 0 | 2 | 4     | 15                        | 5 | 35                         | 20 | 75          | 2           | 2 |



|     |                  |                       |                                |                                             |   |   |   |   |   |   |   |    |   |    |    |    |   |   |
|-----|------------------|-----------------------|--------------------------------|---------------------------------------------|---|---|---|---|---|---|---|----|---|----|----|----|---|---|
| 1&2 | VAC-1 &<br>VAC-2 | Scheme<br>A, B, C & D | 26L4.5<br>-VAC-<br>EVS-<br>101 | Environmental<br>Studies                    | 2 | 2 | 0 | 2 | 0 | 0 | 2 | 15 | 0 | 35 | 0  | 50 | 2 | 0 |
| 2   | SEC-2            | Scheme<br>A, B, C & D | 26L4.<br>5-SEC-<br>EVS-<br>201 | Food Waste and<br>By-Product<br>Utilization | 3 | 2 | 1 | 2 | 0 | 2 | 4 | 15 | 5 | 35 | 20 | 75 | 2 | 2 |
| 2   | SEC-2            | Scheme<br>A, B, C & D | 26L4.<br>5-SEC-<br>EVS-<br>202 | Environmental<br>Auditing                   | 3 | 2 | 1 | 2 | 0 | 2 | 4 | 15 | 5 | 35 | 20 | 75 | 2 | 2 |
| 3   | SEC-3            | Scheme<br>C only      | 26L5.<br>0-SEC-<br>EVS-<br>301 | Waste<br>Management<br>Techniques           | 3 | 2 | 1 | 2 | 0 | 2 | 4 | 15 | 5 | 35 | 20 | 75 | 2 | 2 |

## MDC

### Part A – Introduction

|                                                                                               |                                  |                                                                                                                                                                                                                                                                                                                               |       |
|-----------------------------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Name of the Programme                                                                         | B.Sc. Environmental Science      |                                                                                                                                                                                                                                                                                                                               |       |
| Semester                                                                                      | I                                |                                                                                                                                                                                                                                                                                                                               |       |
| Nature of Course/Course Composition                                                           | Theory + Practical               |                                                                                                                                                                                                                                                                                                                               |       |
| Nomenclature of the Course                                                                    | Basics of Environmental Sciences |                                                                                                                                                                                                                                                                                                                               |       |
| Course Code                                                                                   | 26L4.5-MDC-EVS-101               |                                                                                                                                                                                                                                                                                                                               |       |
| Course Type                                                                                   | MDC-1                            |                                                                                                                                                                                                                                                                                                                               |       |
| Course Level                                                                                  | 100-199                          |                                                                                                                                                                                                                                                                                                                               |       |
| Pre-requisite for the course (if any)                                                         | NA                               |                                                                                                                                                                                                                                                                                                                               |       |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to: | CLO <sub>1</sub>                 | Explain the fundamental concepts, components and interdisciplinary nature of environmental science and relate environmental processes to sustainability and the Sustainable Development Goals.                                                                                                                                |       |
|                                                                                               | CLO <sub>2</sub>                 | Describe the structure and functioning of the Earth system, including soil formation, weathering, soil types, soil profiles, soil degradation, desertification and methods of soil conservation.                                                                                                                              |       |
|                                                                                               | CLO <sub>3</sub>                 | Explain the structure and composition of the atmosphere and hydrosphere, including atmospheric processes, heat budget, temperature inversion, ozone depletion, acid rain, global water balance and the hydrological cycle, and apply basic practical methods for observing and assessing soil, water and atmospheric features |       |
|                                                                                               | Theory                           | Practical                                                                                                                                                                                                                                                                                                                     | Total |
| Credits                                                                                       | 2                                | 1                                                                                                                                                                                                                                                                                                                             | 3     |
| Teaching hours per week                                                                       | 2                                | 2                                                                                                                                                                                                                                                                                                                             | 4     |
| Internal Assessment Marks                                                                     | 15                               | 05                                                                                                                                                                                                                                                                                                                            | 20    |
| End Term Exam Marks                                                                           | 35                               | 20                                                                                                                                                                                                                                                                                                                            | 55    |
| Max. Marks                                                                                    | 50                               | 25                                                                                                                                                                                                                                                                                                                            | 75    |
| Examination Duration (in Hours)                                                               | 02                               | 02                                                                                                                                                                                                                                                                                                                            |       |

### Part B- Contents of the Course

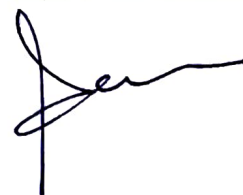
#### Instructions for Theory Paper-Setter

The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 7 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units.

#### Instructions for Practical Examiner

Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes.

|        | Topics                                                                                                                                                                       | CLO/s Attempt | Contact Hours |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
| Unit-I | Environmental Science and Sustainability:<br>Environmental science: basic concept of environmental science; components of environment; interactions of various components of | CLO1          | 15            |



|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |    |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----|
|                      | the environment; principles of environmental science; environment and sustainability; Sustainable Development Goals.<br><b>Earth System:</b> Structure and composition of Earth system; soil formation (pedogenesis); weathering and types of weathering; soil types; soil profiles; soil degradation and desertification; methodologies for soil conservation.                                                                                                    |      |    |
| Unit-II              | <b>Atmosphere and Hydrosphere: Atmosphere:</b> Structure and composition of the atmosphere; components of the atmosphere; distinction of temperature and pressure in the atmosphere; concept of heat budget of the atmosphere; temperature inversion; ozone depletion; water in the atmosphere; acid rain.<br><b>Hydrosphere:</b> Hydrosphere components; sources of water; global water balance; types of water; hydrological cycle; significance of hydrosphere. | CLO2 | 15 |
| Practical Components | 1. To study the soil profile and draw a labelled diagram.<br>2. To measure soil temperature and moisture.<br>3. To determine water-quality parameters with the help of an analysis kit.<br>4. To draw a pie diagram showing the global water balance.<br>5. To study the structure of the atmosphere with the help of a labelled diagram.<br>6. Any other relevant experiment.                                                                                     | CLO3 | 30 |

Total Contact Hours

60

#### Evaluation Methods

| Internal Assessment:20                                | TH-15 | PR-5 | End Term Examination: 55                | TH-35 | PR-20 |
|-------------------------------------------------------|-------|------|-----------------------------------------|-------|-------|
| Class Participation:                                  | 5     | 0    | Lab record                              | NA    | 05    |
| Seminar/presentation/assignment/quiz/class test etc.: | 5     | NA   | Viva-Voce                               | NA    | 05    |
| Seminar/Demonstration/Viva-voce/Lab records etc.:     | NA    | 5    | Written Examination                     | 35    | NA    |
| Mid-Term Exam:                                        | 5     | NA   | Write-up and execution of the practical | NA    | 10    |

#### Part C-Learning Resources

##### Recommended Books/Journals/ e-resources/ Learning Management Systems (LMS):

1. Singh, J. S., Singh, S. P., & Gupta, S. R. (2015). *Ecology, environment and resource conservation*. S. Chand Publishing, New Delhi.
2. Botkin, D. B., & Keller, E. A. (2000). *Environmental studies: The Earth as a living planet*. John Wiley & Sons.
3. Cunningham, W. P., & Cunningham, M. A. (2002). *Environmental science: Inquiry and applications—A global concern*. Tata McGraw-Hill Publishing Company, New Delhi.
4. Pierzynski, G. M., Sims, J. T., & Vance, G. F. (2000). *Soils and environmental quality* (2nd ed.). CRC Press.
5. Miller, G. T., & Spoolman, S. E. (2016). *Environmental science*. Cengage Learning.

6. Tyler Miller, G., & Spoolman, S. E. (2014). *Living in the environment: Principles, connections, and solutions*. Cengage Learning.
7. Cunningham, W. P., & Cunningham, M. A. (2017). *Principles of environmental science: Inquiry and applications*. McGraw-Hill Education.
8. Raven, P. H., Hassenzahl, D. M., Hager, M. C., Gift, N., & Berg, L. R. (2015). *Environment*. Wiley.

#### E-Resources / LMS

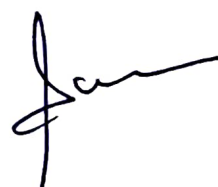
9. **e-PG Pathshala**, UGC/INFLIBNET – Environmental Sciences learning modules and digital educational resources.
10. **National Council of Educational Research and Training (NCERT)** – Environmental Studies and environmental education learning resources.
11. **United Nations Environment Programme (UNEP)** – Environmental education, sustainability and environmental awareness resources. UNEP's current education and environment programme includes resources on sustainability, youth education and environmental action.
12. **UNEP Environmental Education Resources Guide** – interdisciplinary environmental education and sustainability learning resource.

#### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes (PLOs) & Program Specific Outcomes (PSOs)

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 3                | 2                | 1                | 3                | 3                | 2                | 1                | 2                | 2                | 1                 | 2                 |
| CLO <sub>2</sub> | 3                | 1                | 1                | 3                | 2                | 2                | 2                | 3                | 3                | 2                 | 2                 |
| CLO <sub>3</sub> | 3                | 2                | 2                | 3                | 2                | 2                | 3                | 3                | 3                | 3                 | 3                 |

#### Content Mapping with NEP thrust areas

| Field                                                                | Hours devoted |
|----------------------------------------------------------------------|---------------|
| Employability                                                        | 5             |
| Entrepreneurship                                                     | 2             |
| Skill Enhancement                                                    | 10            |
| Communication Development                                            | 4             |
| Indian Knowledge System                                              | 3             |
| Environmental Awareness/SDGs                                         | 12            |
| Current Issues and Social Awareness                                  | 6             |
| Gender issues                                                        | 2             |
| Public policies                                                      | 4             |
| Any Other (Sustainability, Scientific Temper & Community Engagement) | 12            |



## MDC

### Part A – Introduction

|                                                                                               |                             |                                                                                                                                                                                                                                                                                                                                |       |
|-----------------------------------------------------------------------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Name of the Programme                                                                         | B.Sc. Environmental Science |                                                                                                                                                                                                                                                                                                                                |       |
| Semester                                                                                      | II                          |                                                                                                                                                                                                                                                                                                                                |       |
| Nature of Course/Course Composition                                                           | Theory + Practical          |                                                                                                                                                                                                                                                                                                                                |       |
| Nomenclature of the Course                                                                    | Environmental Issues        |                                                                                                                                                                                                                                                                                                                                |       |
| Course Code                                                                                   | 26L4.5-MDC-EVS-201          |                                                                                                                                                                                                                                                                                                                                |       |
| Course Type                                                                                   | MDC-2                       |                                                                                                                                                                                                                                                                                                                                |       |
| Course Level                                                                                  | 100-199                     |                                                                                                                                                                                                                                                                                                                                |       |
| Pre-requisite for the course (if any)                                                         | NA                          |                                                                                                                                                                                                                                                                                                                                |       |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to: | CLO <sub>1</sub>            | Explain major environmental issues associated with industrialization, technological development, production and consumption, urbanization, population growth, ecological degradation, deforestation, pollution, epidemics and development-induced displacement, and assess their environmental and socio-economic implications |       |
|                                                                                               | CLO <sub>2</sub>            | Analyze major global environmental issues including acid rain, climate change, biodiversity loss, ozone-layer depletion, resource depletion, energy and water-related challenges, and explain international efforts for environmental protection and sustainable development.                                                  |       |
|                                                                                               | CLO <sub>3</sub>            | Apply basic environmental assessment and documentation skills through local environmental case studies, forest-cover and climate-trend analysis, assessment of environmental impacts on cultural heritage, and study of international environmental protection initiatives.                                                    |       |
|                                                                                               | Theory                      | Practical                                                                                                                                                                                                                                                                                                                      | Total |
| Credits                                                                                       | 2                           | 1                                                                                                                                                                                                                                                                                                                              | 3     |
| Teaching hours per week                                                                       | 2                           | 2                                                                                                                                                                                                                                                                                                                              | 4     |
| Internal Assessment Marks                                                                     | 15                          | 05                                                                                                                                                                                                                                                                                                                             | 20    |
| End Term Exam Marks                                                                           | 35                          | 20                                                                                                                                                                                                                                                                                                                             | 55    |
| Max. Marks                                                                                    | 50                          | 25                                                                                                                                                                                                                                                                                                                             | 75    |
| Examination Duration (in Hours)                                                               | 02                          | 02                                                                                                                                                                                                                                                                                                                             |       |

### Part B- Contents of the Course

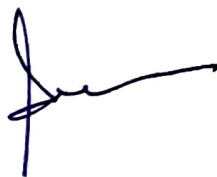
#### Instructions for Theory Paper-Setter

The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 7 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units.

#### Instructions for Practical Examiner

Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes.

|        | Topics                                                                                                                                  | CLO/s Attempt | Contact Hours |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
| Unit-I | Environment, Development and Socio-Ecological Issues: Environment and development; industrialization: impact of industry and technology | CLO1          | 15            |



|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |    |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----|
|                      | on environment; production and consumption-oriented approaches to environmental issues; urbanization; urban sprawl; traffic congestion and socio-economic problems. Population explosion and ecological degradation; deforestation; environmental pollution; epidemics; development-induced displacement, resettlement and rehabilitation; associated problems, concerns and compensative mechanisms.                                                                                                                                                                                        |      |    |
| Unit-II              | <b>Global Environmental Issues, Resources and International Environmental Protection:</b> Significant global environmental issues: acid rain, climate change, biodiversity loss, ozone-layer depletion, resource depletion and conservation; interface between environment and society; sustainable development. Nature, scope and analysis of local and global impacts of energy use on the environment; issues related to water use, distribution and scarcity; international concerns and efforts for environmental protection; role of the United Nations; Stockholm Summit; Rio Summit. | CLO2 | 15 |
| Practical Components | 1. To prepare a case study of local environmental issues in the surroundings.<br>2. To analyze the status of forest cover in the state of Haryana.<br>3. To study and analyze the trends of global climate change.<br>4. To analyze the impacts of acid rain on historic monuments: a case study of Taj Mahal.<br>5. To prepare a report on international efforts for environmental protection.<br>6. Any other relevant experiment.                                                                                                                                                         | CLO3 | 30 |
| Total Contact Hours  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      | 60 |

#### Evaluation Methods

| Internal Assessment:20                                | TH-15 | PR-5 | End Term Examination: 55                | TH-35 | PR-20 |
|-------------------------------------------------------|-------|------|-----------------------------------------|-------|-------|
| Class Participation:                                  | 5     | 0    | Lab record                              | NA    | 05    |
| Seminar/presentation/assignment/quiz/class test etc.: | 5     | NA   | Viva-Voce                               | NA    | 05    |
| Seminar/Demonstration/Viva-voce/Lab records etc.:     | NA    | 5    | Written Examination                     | 35    | NA    |
| Mid-Term Exam:                                        | 5     | NA   | Write-up and execution of the practical | NA    | 10    |

#### Part C-Learning Resources

##### Recommended Books/Journals/ e-resources/ Learning Management Systems (LMS):

1. Singh, J. S., Singh, S. P., & Gupta, S. R. (2017). *Ecology, environment and conservation*. S. Chand & Company Ltd.
2. Kumar, A., & Roy, P. K. (2008). *Environmental issues and solutions*. Daya Publishing House.

3. Vashishtha, A., & Johari, S. (2020). *Case studies: Contemporary environmental issues and challenges*. Bloomsbury Publishing.
4. Sudhir, M. A., & Masillamani, M. A. (2003). *Environmental issues*. Reliance Publishing House.
5. Gope, A., Sarkar, A., Sarkar, P., Majumdar, S., & Gosai, K. (2019). *Environmental issues & sustainable development*. Notion Press Media Pvt. Ltd.
6. Rangarajan, M. (2006). *Environmental issues in India: A reader*. Pearson Education India.
7. Cunningham, W. P., & Cunningham, M. A. (2017). *Principles of environmental science: Inquiry and applications*. McGraw-Hill Education.
8. Miller, G. T., & Spoolman, S. E. (2016). *Environmental science*. Cengage Learning.

#### E-Resources / LMS

9. **United Nations Environment Programme (UNEP)** – Resources on climate change, biodiversity, pollution and waste, and the triple planetary crisis. [UNEP – Environment Resources](#)
10. **Intergovernmental Panel on Climate Change (IPCC)** – Assessment reports and scientific resources on climate change, impacts, adaptation and mitigation. [IPCC – Reports](#)
11. **United Nations – Sustainable Development Goals (SDGs)** – Resources on sustainable development, climate action, water, cities, biodiversity and global environmental challenges. [UN Sustainable Development Goals](#)
12. **World Health Organization (WHO)** – **Environmental Health** – Current resources on environmental pollution, climate, water, sanitation and environmental determinants of health. [WHO Environmental Health](#)

#### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes (PLOs) & Program Specific Outcomes (PSOs)

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 3                | 2                | 2                | 3                | 2                | 2                | 2                | 3                | 3                | 1                 | 2                 |
| CLO <sub>2</sub> | 3                | 2                | 2                | 3                | 3                | 2                | 3                | 3                | 3                | 2                 | 3                 |
| CLO <sub>3</sub> | 3                | 2                | 2                | 2                | 2                | 2                | 3                | 3                | 3                | 3                 | 3                 |

#### Content Mapping with NEP thrust areas

| Field                               | Hours devoted |
|-------------------------------------|---------------|
| Employability                       | 5             |
| Entrepreneurship                    | 3             |
| Skill Enhancement                   | 10            |
| Communication Development           | 5             |
| Indian Knowledge System             | 3             |
| Environmental Awareness/SDGs        | 12            |
| Current Issues and Social Awareness | 8             |
| Gender issues                       | 2             |
| Public policies                     | 5             |
| Any Other                           | 7             |



## MDC

### Part A – Introduction

|                                                                                               |                             |                                                                                                                                                                                                                                                                                                                                                          |       |
|-----------------------------------------------------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Name of the Programme                                                                         | B.Sc. Environmental Science |                                                                                                                                                                                                                                                                                                                                                          |       |
| Semester                                                                                      | III                         |                                                                                                                                                                                                                                                                                                                                                          |       |
| Nature of Course/Course Composition                                                           | Theory + Practical          |                                                                                                                                                                                                                                                                                                                                                          |       |
| Nomenclature of the Course                                                                    | Environmental Conservation  |                                                                                                                                                                                                                                                                                                                                                          |       |
| Course Code                                                                                   | 26L5.0-MDC-EVS-301          |                                                                                                                                                                                                                                                                                                                                                          |       |
| Course Type                                                                                   | MDC-3                       |                                                                                                                                                                                                                                                                                                                                                          |       |
| Course Level                                                                                  | 200-299                     |                                                                                                                                                                                                                                                                                                                                                          |       |
| Pre-requisite for the course (if any)                                                         | NA                          |                                                                                                                                                                                                                                                                                                                                                          |       |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to: | CLO <sub>1</sub>            | Explain major problems associated with natural-resource degradation and evaluate the importance of environmental conservation, equitable resource use, sustainable lifestyles, environmentally friendly technologies, natural-resource accounting, market-based mechanisms, individual and NGO participation, and traditional knowledge in conservation. |       |
|                                                                                               | CLO <sub>2</sub>            | Analyze land degradation, deforestation, desertification, soil erosion, unsustainable agricultural practices, water conflicts and resource-use pressures, and explain appropriate approaches for sustainable land-use planning, soil conservation, afforestation, water conservation, watershed management and sustainable resource management.          |       |
|                                                                                               | CLO <sub>3</sub>            | Apply environmental conservation concepts through field-based case studies and practical investigations involving water-resource management, soil conservation, irrigation practices, renewable-energy installations and wastewater-treatment facilities.                                                                                                |       |
|                                                                                               | Theory                      | Practical                                                                                                                                                                                                                                                                                                                                                | Total |
| Credits                                                                                       | 2                           | 1                                                                                                                                                                                                                                                                                                                                                        | 3     |
| Teaching hours per week                                                                       | 2                           | 2                                                                                                                                                                                                                                                                                                                                                        | 4     |
| Internal Assessment Marks                                                                     | 15                          | 05                                                                                                                                                                                                                                                                                                                                                       | 20    |
| End Term Exam Marks                                                                           | 35                          | 20                                                                                                                                                                                                                                                                                                                                                       | 55    |
| Max. Marks                                                                                    | 50                          | 25                                                                                                                                                                                                                                                                                                                                                       | 75    |
| Examination Duration (in Hours)                                                               | 02                          | 02                                                                                                                                                                                                                                                                                                                                                       |       |

### Part B- Contents of the Course

#### Instructions for Theory Paper-Setter

The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 7 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units.

#### Instructions for Practical Examiner

Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes.

|        | Topics                                                                                          | CLO/s Attempt | Contact Hours |
|--------|-------------------------------------------------------------------------------------------------|---------------|---------------|
| Unit-I | Explain major problems associated with natural-resource degradation and evaluate the importance |               | 15            |



|                      |                                                                                                                                                                                                                                                                                                                                                 |      |    |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----|
|                      | of environmental conservation, equitable resource use, sustainable lifestyles, environmentally friendly technologies, natural-resource accounting, market-based mechanisms, individual and NGO participation, and traditional knowledge in conservation.                                                                                        | CLO1 |    |
| Unit-II              | Analyze land degradation, deforestation, desertification, soil erosion, unsustainable agricultural practices, water conflicts and resource-use pressures, and explain appropriate approaches for sustainable land-use planning, soil conservation, afforestation, water conservation, watershed management and sustainable resource management. | CLO2 | 15 |
| Practical Components | Apply environmental conservation concepts through field-based case studies and practical investigations involving water-resource management, soil conservation, irrigation practices, renewable-energy installations and wastewater-treatment facilities.                                                                                       | CLO3 | 30 |

Total Contact Hours

60

#### Evaluation Methods

| Internal Assessment:20                                 | TH-15 | PR-5 | End Term Examination: 55                | TH-35 | PR-20 |
|--------------------------------------------------------|-------|------|-----------------------------------------|-------|-------|
| Class Participation:                                   | 5     | 0    | Lab record                              | NA    | 05    |
| Seminar/presentation/assignment /quiz/class test etc.: | 5     | NA   | Viva-Voce                               | NA    | 05    |
| Seminar/Demonstration/Viva-voce/Lab records etc.:      | NA    | 5    | Written Examination                     | 35    | NA    |
| Mid-Term Exam:                                         | 5     | NA   | Write-up and execution of the practical | NA    | 10    |

#### Part C-Learning Resources

##### Recommended Books/Journals/ e-resources/ Learning Management Systems (LMS):

1. Singh, J. S., Singh, S. P., & Gupta, S. R. (2015). *Ecology, Environment and Resource Conservation*. S. Chand Publishing, New Delhi.
2. Owen, O. S., & Chiras, D. D. (1990). *Natural Resource Conservation: An Ecological Approach* (5th ed.). Macmillan Publishing Company.
3. Biswas, A. K. (2007). *Water Resources: Environmental Planning, Management, and Development*. McGraw-Hill, New Delhi.
4. Ladle, R., & Ladle, R. J. (2009). *Biodiversity and Conservation: Response to Biodiversity Loss*. Taylor & Francis.
5. Singh, J. S., et al. (1997). *Restoration of Degraded Lands: Concepts & Strategies*. Rastogi Publications.
6. Bansil, P. C. (2004). *Water Management in India*. Concept Publishing Company, India.
7. Cunningham, W. P., & Cunningham, M. A. (2017). *Principles of Environmental Science: Inquiry and Applications*. McGraw-Hill Education.
8. Miller, G. T., & Spoolman, S. E. (2016). *Environmental Science*. Cengage Learning.

#### E-Resources / LMS

9. United Nations Environment Programme (UNEP) – Environmental conservation, biodiversity, ecosystem and sustainability resources.
10. United Nations Sustainable Development Goals (UN SDGs) – particularly SDG 6, SDG 7, SDG 12, SDG 13, SDG 14 and SDG 15.
11. Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India – environmental policies, conservation programmes, biodiversity and forest-related resources.
12. Central Pollution Control Board (CPCB), Government of India – environmental standards, pollution-control and environmental-management resources.
13. e-PG Pathshala, UGC/INFLIBNET Centre – Environmental Sciences and allied learning modules.
14. SWAYAM, Ministry of Education, Government of India – MOOCs on environmental science, sustainability and natural-resource management.
15. National Digital Library of India (NDLI), Ministry of Education – digital books, articles and educational resources related to environmental conservation and sustainability.

**Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes (PLOs)  
& Program Specific Outcomes (PSOs)**

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> | PSO <sub>1</sub> | PSO <sub>2</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|------------------|------------------|
| CLO <sub>1</sub> | 3                | 2                | 1                | 3                | 2                | 2                | 1                | 2                | 2                | 1                 | 2                 | 3                | 1                |
| CLO <sub>2</sub> | 3                | 2                | 1                | 3                | 3                | 2                | 2                | 3                | 3                | 2                 | 2                 | 3                | 2                |
| CLO <sub>3</sub> | 3                | 2                | 2                | 3                | 2                | 3                | 3                | 3                | 3                | 3                 | 3                 | 3                | 2                |

**Content Mapping with NEP thrust areas**

| Field                                                                                   | Hours devoted |
|-----------------------------------------------------------------------------------------|---------------|
| Employability                                                                           | 5             |
| Entrepreneurship                                                                        | 3             |
| Skill Enhancement                                                                       | 10            |
| Communication Development                                                               | 5             |
| Indian Knowledge System                                                                 | 3             |
| Environmental Awareness/SDGs                                                            | 12            |
| Current Issues and Social Awareness                                                     | 8             |
| Gender issues                                                                           | 2             |
| Public policies                                                                         | 5             |
| Any Other(Sustainable Resource Management, Community Conservation & Climate Resilience) | 7             |



| <b>VAC</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                  |               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Part A - Introduction</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                  |               |
| Name of Programme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | B.Sc. Environmental Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                  |               |
| Semester                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | I/II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                  |               |
| Nature of Course/Course Composition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Theory (Lecture + Tutorial)                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                  |               |
| Nomenclature of the Course                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Environmental Studies</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                  |               |
| Course Code                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>26L.4.5-VAC-EVS-101 &amp; 26L.4.5-VAC-EVS-201</b><br>(I-SEM) (II-SEM)                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                  |               |
| Course Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>VAC-1/VAC-2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                  |               |
| Course Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 100-199                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                  |               |
| Pre-requisite for the course (if any)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | N.A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                  |               |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | CLO <sub>1</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Explain the multidisciplinary nature of environmental studies and describe the structure and functions of ecosystems, natural resources, biodiversity, and ecosystem services, including their conservation and sustainable use. |               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CLO <sub>2</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Explain major environmental pollution problems, climate-related issues, environmental policies, disaster management approaches, population-environment interactions, and ethical practices for environmental protection.         |               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Theory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Practical</b>                                                                                                                                                                                                                 | <b>Total</b>  |
| Credits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0                                                                                                                                                                                                                                | 2             |
| Teaching Hours per week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0                                                                                                                                                                                                                                | 2             |
| Internal Assessment Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0                                                                                                                                                                                                                                | 15            |
| End Term Exam Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0                                                                                                                                                                                                                                | 35            |
| Max. Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0                                                                                                                                                                                                                                | 50            |
| Examination Duration (in Hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0                                                                                                                                                                                                                                |               |
| <b>Part B- Contents of the Course</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                  |               |
| <b>Instructions for Paper- Setter:</b><br>The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 07 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                  |               |
| Unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Topics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | CLO Attempt                                                                                                                                                                                                                      | Contact Hours |
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Introduction to environmental studies:</b><br>Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development.<br><b>Ecosystems:</b> Definition, types, structure and function of ecosystem; Energy flow in an ecosystem<br><b>Natural resources:</b> Renewable and Non-renewable resources Land, Forest, Water resources. Use and over-exploitation.<br><b>Energy resources:</b> Renewable and non-renewable energy sources. | CLO 1                                                                                                                                                                                                                            | 15            |

|                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----|
|                                                                                                                                                                                                                                            | <b>Biodiversity and Conservation:</b><br>Definition and its types, Endangered and endemic species of India. Threats to biodiversity: Habitat loss, poaching of wildlife, Man-wildlife conflicts, biological invasions;<br>Conservation biodiversity: <i>In-situ</i> and <i>Ex-situ</i> conservation of biodiversity.<br>Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and informational values.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                |    |
| II                                                                                                                                                                                                                                         | <b>Environmental pollution</b><br>Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution. Solid waste management: Sources, methods of disposal: Landfill, incineration and composting.<br>Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.<br><b>Environmental Policies &amp; Practices</b><br>Environmental laws: Environment (Protection) Act, 1986, Air (Prevention & Control of Pollution) Act, 1981, Water (Prevention and control of Pollution) Act, 1974.<br><b>Human Communities and the Environment:</b><br>Human population growth: Impacts on environment, human health and welfare.<br><b>Disaster management:</b> floods, earth quake, cyclones, landslides and drought.<br><b>Environmental ethics:</b> Role of Indian and other religions and cultures in environmental conservation. | CLO 2                          | 15 |
| Total Contact hours                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                | 30 |
| Evaluation Methods                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |    |
| Internal Assessment: 15 Marks                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | End Term Examination: 35 Marks |    |
| • Class Participation:                                                                                                                                                                                                                     | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Written Examination: 35        |    |
| • Seminar/presentation/assignment/quiz/ class test etc.:                                                                                                                                                                                   | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                |    |
| • Mid-Term Exam:                                                                                                                                                                                                                           | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                |    |
| Part C-Learning Resources                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |    |
| Recommended Books/Journals/ e-resources/ Learning Management Systems (LMS):                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |    |
| 1. Kaushik, A., & Kaushik, C. P. (2022). <i>Perspectives in Environmental Studies</i> (7th ed.). New Age International Publishers, New Delhi.                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |    |
| 2. Bharucha, E. (2021). <i>A Textbook of Environmental Studies for Undergraduate Courses</i> (2nd ed.). Orient BlackSwan, Hyderabad.                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |    |
| 3. Basu, M., & Xavier Savarimuthu, S. J. (2017). <i>Fundamentals of Environmental Studies</i> . Cambridge University Press.                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |    |
| 4. Rajagopalan, R. (2016). <i>Environmental Studies: From Crisis to Cure</i> (3rd ed.). Oxford University Press.                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |    |
| 5. Goswami, P., Mandal, J., & Singh, S. (2022). <i>A Textbook on Environmental Studies</i> . Ashok Book Stall, Assam.                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |    |
| 6. University Grants Commission. (2023). <i>Guidelines and Curriculum Framework for Environment Education at Undergraduate Level</i> . University Grants Commission, New Delhi.<br>Official resource: UGC Environment Education Framework. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |    |
| 7. University Grants Commission. <i>Text Book on Environmental Studies</i> . UGC Model Curriculum and e-Resource.<br>Official resource: UGC Model Curriculum – Environmental Studies.                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |    |

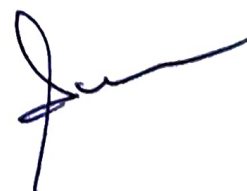
8. Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India. *Environmental Laws, Rules, Regulations and Notifications*.  
Official resource: MoEFCC.
  9. National Council of Educational Research and Training (NCERT). *Biology and Environmental/Ecology-related e-resources*. NCERT e-Books and digital learning resources.
  10. United Nations, *Sustainable Development Goals (SDGs)*. United Nations Sustainable Development Knowledge Platform.  
Official resource: <https://sdgs.un.org/goals>
  11. **SWAYAM – Study Webs of Active-Learning for Young Aspiring Minds**, Ministry of Education, Government of India. Courses and MOOCs related to environmental science, sustainability, ecology, climate change and environmental management.  
Official LMS/MOOC platform: <https://swayam.gov.in>.
  12. **e-PG Pathshala**, University Grants Commission/INFLIBNET Centre. Digital learning modules in Environmental Sciences and allied disciplines.  
Official resource: <https://epgp.inflibnet.ac.in/>
  13. **National Digital Library of India (NDLI)**, Ministry of Education. Digital books, articles, educational materials and multimedia resources related to environmental studies.  
Official resource: <https://ndli.itknp.ac.in>
  14. **UGC Curriculum and Credit Framework for Undergraduate Programmes (CCFUP)**, University Grants Commission. Resource for NEP-2020-aligned undergraduate curriculum design and multidisciplinary learning.  
Official resource: UGC CCFUP.
- Suggested Journals:**
15. *Environmental Science and Pollution Research*. Springer Nature.
  16. *Journal of Environmental Management*. Elsevier.
  17. *Environmental Monitoring and Assessment*. Springer Nature.
  18. *Environmental Research*. Elsevier.

### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes (PLOs) & Program Specific Outcomes (PSOs)

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> | PSO <sub>1</sub> | PSO <sub>2</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|------------------|------------------|
| CLO <sub>1</sub> | 3                | 1                | 1                | 3                | 2                | 2                | 1                | 2                | 2                | 1                 | 2                 | 3                | 1                |
| CLO <sub>2</sub> | 3                | 1                | 1                | 3                | 2                | 3                | 1                | 3                | 3                | 1                 | 2                 | 2                | 3                |

### Content Mapping with NEP thrust areas

| Field                                                   | Hours devoted |
|---------------------------------------------------------|---------------|
| Employability                                           | 2             |
| Entrepreneurship                                        | 1             |
| Skill Enhancement                                       | 3             |
| Communication Development                               | 2             |
| Indian Knowledge System                                 | 2             |
| Environmental Awareness/SDGs                            | 10            |
| Current Issues and Social Awareness                     | 4             |
| Gender issues                                           | 1             |
| Public policies                                         | 3             |
| Any Other(Disaster Preparedness & Community Resilience) | 2             |



**SEC-2****Part A – Introduction**

|                                                                                               |                                       |                                                                                                                                                                                                                                                                    |       |
|-----------------------------------------------------------------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Name of the Programme                                                                         | B.Sc. Environmental Science           |                                                                                                                                                                                                                                                                    |       |
| Semester                                                                                      | II                                    |                                                                                                                                                                                                                                                                    |       |
| Nature of Course/Course Composition                                                           | Theory + Practical                    |                                                                                                                                                                                                                                                                    |       |
| Nomenclature of the Course                                                                    | Food Waste and By-Product Utilization |                                                                                                                                                                                                                                                                    |       |
| Course Code                                                                                   | 26L4.5-SEC-EVS-201                    |                                                                                                                                                                                                                                                                    |       |
| Course Type                                                                                   | SEC-2                                 |                                                                                                                                                                                                                                                                    |       |
| Course Level                                                                                  | 100-199                               |                                                                                                                                                                                                                                                                    |       |
| Pre-requisite for the course (if any)                                                         | N.A                                   |                                                                                                                                                                                                                                                                    |       |
| Course Learning Outcomes (CLOs)<br>After completing this course, the learner will be able to: | CLO <sub>1</sub>                      | Explain the sources, types, causes and environmental, economic and social impacts of food waste across the food supply chain and describe appropriate strategies for its reduction and management.                                                                 |       |
|                                                                                               | CLO <sub>2</sub>                      | Explain the principles and applications of food-waste and by-product valorization, including recovery of bioactive compounds, production of biofuels and energy, value-added materials, animal feed, fertilizers, soil amendments and waste-to-packaging products. |       |
|                                                                                               | CLO <sub>3</sub>                      | Apply basic practical approaches to assess, manage and valorize food waste through food-waste auditing, composting, anaerobic digestion, field/industry observation and documentation of food-waste utilization practices.                                         |       |
|                                                                                               | Theory                                | Practical                                                                                                                                                                                                                                                          | Total |
| Credits                                                                                       | 2                                     | 1                                                                                                                                                                                                                                                                  | 3     |
| Teaching hours per week                                                                       | 2                                     | 2                                                                                                                                                                                                                                                                  | 4     |
| Internal Assessment Marks                                                                     | 15                                    | 05                                                                                                                                                                                                                                                                 | 20    |
| End Term Exam Marks                                                                           | 35                                    | 20                                                                                                                                                                                                                                                                 | 55    |
| Max. Marks                                                                                    | 50                                    | 25                                                                                                                                                                                                                                                                 | 75    |
| Examination Duration (in Hours)                                                               | 02                                    | 02                                                                                                                                                                                                                                                                 |       |

**Part B- Contents of the Course****Instructions for Theory Paper-Setter**

The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 7 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units.

**Instructions for Practical Examiner**

Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes.

|        | Topics                                                                                                                                                                                                                                                    | CLO/s Attempt | Contact Hours |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
| Unit-I | Introduction to Food Waste: Definition and types of food waste; Environmental, economic, and social impacts of food waste; Food waste throughout the supply chain; Factors Contributing to Food Waste; Post-harvest losses and storage challenges; Retail | CLO1          | 15            |

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |    |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----|
|                      | and consumer-related food waste; Food waste in foodservice establishments and restaurants.<br><b>Food Waste Management and Reduction-</b> Source reduction strategies; Composting and anaerobic digestion; Innovative technologies for food waste reduction.                                                                                                                                                                                                                   |      |    |
| Unit-II              | <b>Overview of by-product utilization-</b> Extraction of bioactive compounds from food waste; Conversion of food waste into biofuels and energy; Recovery of value-added materials from waste food.<br><b>Applications of Food Waste By-Products-</b> Food industry applications (e.g., food additives, functional ingredients); Animal feed and pet food production; Fertilizer and soil amendment production; Waste-to-packaging concepts; Policy frameworks and regulations | CLO2 | 15 |
| Practical Components | <ol style="list-style-type: none"> <li>To conduct an on-campus food waste audit</li> <li>To study the process of composting to convert food waste to compost.</li> <li>To study the process of anaerobic digestion to convert food waste to biogas.</li> <li>To study a successful food waste and by-product utilization project.</li> <li>To visit a local food processing industry and prepare a report.</li> <li>Any other relevant experiment</li> </ol>                   | CLO3 | 30 |
| Total Contact Hours  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      | 60 |

#### Evaluation Methods

| Internal Assessment:20                                | TH-15 | PR-5 | End Term Examination: 55                | TH-35 | PR-20 |
|-------------------------------------------------------|-------|------|-----------------------------------------|-------|-------|
| Class Participation:                                  | 5     | 0    | Lab record                              | NA    | 05    |
| Seminar/presentation/assignment/quiz/class test etc.: | 5     | NA   | Viva-Voce                               | NA    | 05    |
| Seminar/Demonstration/Viva-voce/Lab records etc.:     | NA    | 5    | Written Examination                     | 35    | NA    |
| Mid-Term Exam:                                        | 5     | NA   | Write-up and execution of the practical | NA    | 10    |

#### Part C-Learning Resources

##### Recommended Books/Journals/ e-resources/ Learning Management Systems (LMS):

- Subbulakshmi, G., Udipl, S. A., & Ghurge, P. S. (2021). *Food Processing and Preservation*. New Age International Private Limited.
- Westendorf, M. L. (2007). *Food Waste to Animal Feed*. John Wiley & Sons.
- Arvanitoyannis, I. S. (Ed.). (2008). *Waste Management for the Food Industries*. Academic Press.
- Joshi, V. K., & Sharma, S. K. (2011). *Food Processing Waste Management*. New India Publishing Agency.
- Waldron, K. W. (Ed.). (2007). *Handbook of Waste Management and Co-Product Recovery in Food Processing*. Woodhead Publishing.
- Food and Agriculture Organization of the United Nations (FAO). *Technical Platform on the Measurement and Reduction of Food Loss and Waste*. Resources on food-loss/waste measurement, reduction, management and

supply-chain practices.

[FAO Food Loss and Waste Technical Platform](#)

7. **Food and Agriculture Organization of the United Nations (FAO).** *Food Loss and Waste Database*. Open-access database containing scientific publications, reports and data on food loss and food waste across food products and stages of the value chain.

[FAO Food Loss and Waste Database](#)

8. **United Nations Environment Programme (UNEP).** *Food Waste Index*. Resources on food waste measurement, reduction and progress towards SDG Target 12.3.

9. **FAO.** *Food Loss and Waste Reduction*. Resources addressing prevention, measurement and reduction of food loss and waste across food systems.

[FAO Food Waste Reduction Resources](#)

10. **United Nations Sustainable Development Goals.** *Goal 12: Responsible Consumption and Production*, particularly Target 12.3 on reducing food loss and waste.

[UN SDG 12 – Responsible Consumption and Production](#)

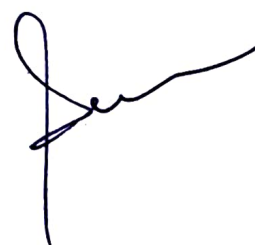
11. **SWAYAM – Study Webs of Active-Learning for Young Aspiring Minds**, Ministry of Education, Government of India. MOOCs relevant to food processing, waste management, biotechnology, sustainability and environmental science.

### Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes (PLOs) & Program Specific Outcomes (PSOs)

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLIO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|-------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 3                | 1                | 1                 | 3                | 2                | 2                | 1                | 2                | 2                | 1                 | 2                 |
| CLO <sub>2</sub> | 3                | 1                | 1                 | 3                | 2                | 2                | 2                | 3                | 3                | 2                 | 3                 |
| CLO <sub>3</sub> | 2                | 2                | 2                 | 3                | 2                | 3                | 3                | 3                | 2                | 3                 | 3                 |

### Content Mapping with NEP thrust areas

| Field                                            | Hours devoted |
|--------------------------------------------------|---------------|
| Employability                                    | 5             |
| Entrepreneurship                                 | 5             |
| Skill Enhancement                                | 10            |
| Communication Development                        | 6             |
| Indian Knowledge System                          | 2             |
| Environmental Awareness/SDGs                     | 12            |
| Current Issues and Social Awareness              | 6             |
| Gender issues                                    | 1             |
| Public policies                                  | 3             |
| Any Other (Circular Economy & Resource Recovery) | 12            |



|                      |                                                                                                                                                                                                                                                                                                                                                                                                                    |      |    |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----|
|                      | The Environment (Protection) Act, 1986; EIA notification 2006 - Prior EC requirements, authority and committees, categorization of projects and activities require EC.                                                                                                                                                                                                                                             |      |    |
| Unit-II              | Component of environmental audit, stages in the EIA. Appraisal process, application structure of EIA documents - ToR, different forms. Validity of EC, Post-EC monitoring. Need of public hearing in EIA, methods of public hearing. Environmental auditing firms, industry good practices to maintain a healthy environment, vocational aspects of Environmental audit.                                           | CLO2 | 15 |
| Practical Components | Environmental auditing of a new township project- a case study.<br>Public participation in the EIA process -a sand mining project as a case study.<br>Environmental audit in India -a MoEF&CC owned environmental clearance portal as a case study.<br>Raising FAR in a building project - through different methods of raising environmental performance.<br>Different environmental audit institutions in India. | CLO3 | 30 |

|                     |    |
|---------------------|----|
| Total Contact Hours | 60 |
|---------------------|----|

#### Evaluation Methods

| Internal Assessment:20                                | TH-15 | PR-5 | End Term Examination: 55                | TH-35 | PR-20 |
|-------------------------------------------------------|-------|------|-----------------------------------------|-------|-------|
| Class Participation:                                  | 5     | 0    | Lab record                              | NA    | 05    |
| Seminar/presentation/assignment/quiz/class test etc.: | 5     | NA   | Viva-Voce                               | NA    | 05    |
| Seminar/Demonstration/Viva-voce/Lab records etc.:     | NA    | 5    | Written Examination                     | 35    | NA    |
| Mid-Term Exam:                                        | 5     | NA   | Write-up and execution of the practical | NA    | 10    |

#### Part C-Learning Resources

##### Recommended Books/Journals/ e-resources/ Learning Management Systems (LMS):

1. Shrivastava, A. K. (2003). *Environmental Auditing*. APH Publishing Corporation.
2. Pathak, H. (2015). *Environmental Audit*. Create Space Independent Publishing Platform.
3. International Organization for Standardization. (2026). *ISO 14001:2026: Environmental management systems—Requirements with guidance for use*. ISO.
4. International Organization for Standardization. (2026). *ISO 19011:2026: Guidelines for auditing management systems*. ISO. The 2026 edition provides guidance on audit principles, audit-programme management, conducting management-system audits and auditor competence.
5. Ministry of Environment, Forest and Climate Change, Government of India. *Environment (Protection) Act, 1986 and Environmental Rules, Notifications and Regulations*. Government of India.
6. Ministry of Environment, Forest and Climate Change, Government of India. *Environmental Impact Assessment Notification, 2006 and subsequent amendments*. Government of India. The official PARIVESH portal provides the notification and related amendments, circulars and environmental-clearance resources.
7. Ministry of Environment, Forest and Climate Change, Government of India. *PARIVESH: Environmental Clearance and Environmental Management Resources*. Government of India.
8. Central Pollution Control Board. *Environmental Standards, Guidelines and Monitoring Resources*. Government of India.
9. United Nations Environment Programme. *Environmental Management and Sustainable Development Resources*. UNEP.

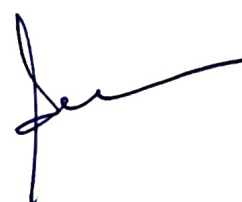
10. University Grants Commission/INFLIBNET Centre. *e-PG Pathshala*. Digital learning modules in Environmental Sciences and allied disciplines.
11. Ministry of Education, Government of India. *SWAYAM*. MOOCs and digital learning resources related to environmental management, sustainability and environmental sciences.
12. National Digital Library of India. *Digital Learning Resources in Environmental Science, Environmental Management and Sustainability*. Ministry of Education, Government of India.

**Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes (PLOs)  
& Program Specific Outcomes (PSOs)**

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 3                | 1                | 1                | 3                | 2                | 2                | 1                | 2                | 2                | 1                 | 2                 |
| CLO <sub>2</sub> | 3                | 2                | 1                | 3                | 2                | 3                | 2                | 3                | 3                | 2                 | 2                 |
| CLO <sub>3</sub> | 2                | 3                | 2                | 3                | 2                | 3                | 3                | 3                | 3                | 3                 | 3                 |

**Content Mapping with NEP thrust areas**

| Field                                                                      | Hours devoted |
|----------------------------------------------------------------------------|---------------|
| Employability                                                              | 7             |
| Entrepreneurship                                                           | 3             |
| Skill Enhancement                                                          | 12            |
| Communication Development                                                  | 4             |
| Indian Knowledge System                                                    | 2             |
| Environmental Awareness/SDGs                                               | 10            |
| Current Issues and Social Awareness                                        | 5             |
| Gender issues                                                              | 1             |
| Public policies                                                            | 7             |
| Any Other (Environmental Governance, Compliance & Sustainable Development) | 9             |



### SEC-3

#### Part A – Introduction

|                                       |                             |
|---------------------------------------|-----------------------------|
| Name of the Programme                 | B.Sc. Environmental Science |
| Semester                              | III                         |
| Nature of Course/Course Composition   | Theory + Practical          |
| Nomenclature of the Course            | Waste Management Techniques |
| Course Code                           | 26L5.0-SEC-EVS-301          |
| Course Type                           | SEC-3                       |
| Course Level                          | 200-299                     |
| Pre-requisite for the course (if any) | NA                          |

Course Learning Outcomes (CLOs)  
After completing this course, the learner will be able to:

|                  |                                                                                                                                                                                                                                                                     |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CLO <sub>1</sub> | Explain the classification, generation, characterization, collection, transportation, treatment and disposal of solid, hazardous, biomedical and e-wastes, including sanitary landfill, incineration, composting and vermicomposting techniques.                    |
| CLO <sub>2</sub> | Describe industrial waste characteristics, treatment and disposal methods and explain the role of biotechnology in waste minimization, resource recovery, wastewater reuse, sludge utilization and biological conversion of wastes into useful products and energy. |
| CLO <sub>3</sub> | Apply appropriate waste-management and waste-treatment techniques through field-based observations, case studies and laboratory investigations, including wastewater quality assessment using BOD and COD and evaluation of waste-treatment facilities.             |

|                                 | Theory | Practical | Total |
|---------------------------------|--------|-----------|-------|
| Credits                         | 2      | 1         | 3     |
| Teaching hours per week         | 2      | 2         | 4     |
| Internal Assessment Marks       | 15     | 05        | 20    |
| End Term Exam Marks             | 35     | 20        | 55    |
| Max. Marks                      | 50     | 25        | 75    |
| Examination Duration (in Hours) | 02     | 02        |       |

#### Part B- Contents of the Course

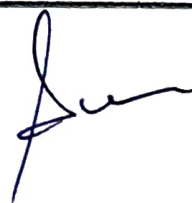
##### Instructions for Theory Paper-Setter

The paper setter shall prepare 5 questions selecting two questions from each of the two units with consideration given to the Course Learning Outcomes. Among these, question number 1 will be compulsory question comprising 7 short answer type questions carrying one mark each (total 07 marks) and covering the entire syllabus. The remaining questions will be carrying 14 marks each. Examinees will be required to attempt three questions: the compulsory question no. 1 and 1 question from the each of the two units.

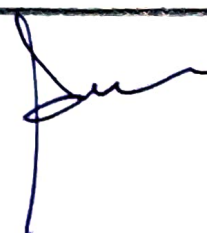
##### Instructions for Practical Examiner

Write-up and execution of the practical will be conducted as per the nature of the practical by the external examiner, with consideration given to the Course Learning Outcomes.

|        | Topics                                                                                                                                                                     | CLO/s Attempt | Contact Hours |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
| Unit-I | Waste: Classification, generations and characterization. Basic aspects of Solid waste management generation; on-site handling, storage and processing; collection of solid | CLO1          | 15            |



|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |    |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----|
|                      | <p>wastes; transfer and transport; processing techniques; ultimate disposal.</p> <p>Hazardous waste –Definition, sources, effects, disposal and management techniques. Physical, chemical, physico-chemical treatment, and thermal treatment: - Solidification, chemical fixation, encapsulation, pyrolysis and incineration.</p> <p>Biomedical wastes – Definition, categories, and management, E-waste: Sources and management.</p> <p>Disposal of Solid waste: sanitary land filling – site selection, design and operation of sanitary landfills – Leachate collection &amp; treatment. Secure land filling.</p> <p>Incineration: Mass burn, Rotatory Kiln, Fluidized Bed incinerator, liquid injection incinerator, Waste gas flare incinerator, fixed grate incinerators, Plasma Pyrolysis. Composting, vermicomposting.</p> |      |    |
| Unit-II              | <p>Principles of Industrial waste treatment - sources of pollution physical chemical, organic and biological properties. Manufacturing processes, flow sheets, characteristics and composition of wastes including waste reduction, treatment and disposal methods for Food Industries: Sugar, Fermentation, Material Industries: Paper, Steel-Metal- plating and petroleum refineries.</p> <p>Role of Biotechnology in waste minimization; Recovery of by-products and raw material from wastewater conversion: waste recovery and reuse, reclamation by ground water recharge, agriculture reuse of effluent; sludge as fertilizer; biomass for energy, metal recovery, bio-scrubbing. Biological Treatment Biological methods for waste processing: Bio-methanation, Bio-deisel, Bio-hydrogen.</p>                              | CLO2 | 15 |
| Practical Components | <ol style="list-style-type: none"> <li>1. To study about the various sources of solid waste generation in the locality.</li> <li>2. To study about the categories of hazardous waste.</li> <li>3. To study about the sanitary land fill management –case study</li> <li>4. To estimate the BOD5 and COD of the wastewater.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CLO3 | 30 |



|                     |                                                                     |  |    |
|---------------------|---------------------------------------------------------------------|--|----|
|                     | 5. To study about the working of Sewage treatment plant-case study. |  |    |
|                     | 6. Any other relevant experiment.                                   |  |    |
| Total Contact Hours |                                                                     |  | 60 |

#### Evaluation Methods

| Internal Assessment:20                                | TH-15 | PR-5 | End Term Examination: 55                | TH-35 | PR-20 |
|-------------------------------------------------------|-------|------|-----------------------------------------|-------|-------|
| Class Participation:                                  | 5     | 0    | Lab record                              | NA    | 05    |
| Seminar/presentation/assignment/quiz/class test etc.: | 5     | NA   | Viva-Voce                               | NA    | 05    |
| Seminar/Demonstration/Viva-voce/Lab records etc.:     | NA    | 5    | Written Examination                     | 35    | NA    |
| Mid-Term Exam:                                        | 5     | NA   | Write-up and execution of the practical | NA    | 10    |

#### Part C-Learning Resources

##### Recommended Books/Journals/ e-resources/ Learning Management Systems (LMS):

1. Tchobanoglous, G., Theisen, H., & Vigil, S. A. (1993). *Integrated Solid Waste Management: Engineering Principles and Management Issues*. McGraw-Hill.
2. Tchobanoglous, G., & Kreith, F. (Eds.). (2002). *Handbook of Solid Waste Management* (2nd ed.). McGraw-Hill.
3. LaGrega, M. D., Buckingham, P. L., & Evans, J. C. (2010). *Hazardous Waste Management* (2nd ed.). Waveland Press.
4. Blackman, W. C. (2001). *Basic Hazardous Waste Management* (3rd ed.). CRC Press.
5. Rao, M. N., & Sreemurthy, R. (2017). *Solid and Hazardous Waste Management*. B.S. Publications.
6. Pichtel, J. (2014). *Waste Management Practices: Municipal, Hazardous, and Industrial* (2nd ed.). CRC Press.
7. Williams, P. T. (2013). *Waste Treatment and Disposal* (2nd ed.). Wiley.
8. Deublein, D., & Steinhauser, A. (2011). *Biogas from Waste and Renewable Resources: An Introduction* (2nd ed.). Wiley-VCH.
9. Environmental Protection Agency. *Sustainable Materials Management and Waste Management Resources*. U.S. EPA.
10. Central Pollution Control Board. *Solid Waste Management, Hazardous Waste, Biomedical Waste and E-Waste Management Resources*. Government of India.
11. Ministry of Environment, Forest and Climate Change, Government of India. *Solid Waste Management Rules, 2016*. Government of India.
12. Ministry of Environment, Forest and Climate Change, Government of India. *Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016*. Government of India.
13. Ministry of Environment, Forest and Climate Change, Government of India. *Bio-Medical Waste Management Rules, 2016*. Government of India.
14. Ministry of Environment, Forest and Climate Change, Government of India. *E-Waste (Management) Rules, 2022*. Government of India.
15. United Nations Environment Programme. *Global Waste Management Resources and Sustainable Consumption and Production*. UNEP.

**Mapping of Course Learning Outcomes (CLOs) to Program Learning Outcomes (PLOs)  
& Program Specific Outcomes (PSOs)**

| CLOs             | PLO <sub>1</sub> | PLO <sub>2</sub> | PLO <sub>3</sub> | PLO <sub>4</sub> | PLO <sub>5</sub> | PLO <sub>6</sub> | PLO <sub>7</sub> | PLO <sub>8</sub> | PLO <sub>9</sub> | PLO <sub>10</sub> | PLO <sub>11</sub> |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|-------------------|
| CLO <sub>1</sub> | 3                | 1                | 1                | 3                | 2                | 2                | 2                | 3                | 3                | 2                 | 2                 |
| CLO <sub>2</sub> | 3                | 1                | 1                | 3                | 2                | 2                | 3                | 3                | 3                | 2                 | 3                 |
| CLO <sub>3</sub> | 3                | 2                | 2                | 3                | 2                | 3                | 3                | 3                | 3                | 3                 | 3                 |

**Content Mapping with NEP thrust areas**

| Field                                                            | Hours devoted |
|------------------------------------------------------------------|---------------|
| Employability                                                    | 7             |
| Entrepreneurship                                                 | 4             |
| Skill Enhancement                                                | 12            |
| Communication Development                                        | 4             |
| Indian Knowledge System                                          | 2             |
| Environmental Awareness/SDGs                                     | 10            |
| Current Issues and Social Awareness                              | 5             |
| Gender issues                                                    | 1             |
| Public policies                                                  | 6             |
| Any Other(Circular Economy, Resource Recovery & Waste-to-Energy) | 9             |

