

For PG programme

Open Elective Courses (OEC), Value Added Courses (VAC)/ Skill Enhancement Courses (SEC)/
Employability and Entrepreneurship Skills Courses (EEC)

Under Learning Outcome Based Curriculum Framework-Choice Based Credit System (LOCF-
CBCS) as per NEP-2020

Offered by
Department of Environmental Science & Engineering
w.e.f. Session 2025-26
Scheme and Syllabus
1st and 2nd Year

Subject: Environmental Science & Engineering

Open Elective Courses (OEC) – IIIrd

Semester	Course Code	Nomenclature	Credits	Hours/ Week	Marks			Exam Hours
					External	Internal	Total	
Semester-III	U25OEC331T(i)	Basics of Environmental Science	2	2	35	15	50	2
Semester-III	U25OEC331T(ii)	Environmental Health and Safety	2	2	35	15	50	2

Value Added Courses (VAC) – 1st

Semester	Course Code	Nomenclature	Credits	Hours/ Week	Marks			Exam Hours
					External	Internal	Total	
Semester-I	U25VAC115T(i)	Natural Resources & Biodiversity	2	2	35	15	50	2
Semester-I	U25VAC115T(ii)	Environmental Issues & Sustainable Development	2	2	35	15	50	2

Skill Enhancement Courses (SEC) – 1st

Semester	Course Code	Nomenclature	Credits	Hours/ Week	Marks			Exam Hours
					External	Internal	Total	
Semester-I	U25SEC415T	Solid Waste Management	2	2	35	15	50	2

Semester-III

Open Elective Courses (OEC) Basics of Environmental Science

Course Code: U25OEC331T(i)
Credit 2
30 Hrs (2Hrs/week)
Time: 2 Hours

Total Marks: 50
Internal Marks: 15
External Marks: 35

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus having 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one question from each unit consisting of 10 marks each including compulsory Question No. 1.

Course Objective: This course introduces the basics of Environmental Science, covering Earth's life support systems and key concepts like carrying capacity and ecological footprint. It highlights the environmental impacts of human activities such as industrialization and urbanization, and promotes understanding of sustainability principles and development strategies.

Unit-I

Environment: Definition and scope; A brief account of Earth's life support system; hydrosphere, lithosphere, atmosphere, biosphere; concepts of carrying capacity, assimilative capacity, carbon and ecological footprint.

Unit-II

Major human cultural changes: Agricultural and industrial revolution in relation to their environmental impacts, urbanization, urban sprawl and related environmental problems; concept of green-building, thermal, comfort and eco-cities, concept of sustainability principles and strategies of sustainable development, Population explosion and related environmental problems, human-centric and earth centric views of development

Reference Books:

1. Living in the Environment - T. J. Miller
2. Understanding Environment - Cunningham Saigo

Course Outcomes: After completion of this course, the students will be able to:

CO1: Define environment and various components of the environment.

CO2: Understand carrying capacity, assimilative capacity, carbon and ecological footprint.

CO3: Analyze agricultural and industrial revolution in relation to their environmental impacts, urbanization, urban sprawl and related environmental problems.

CO4: Evaluate population explosion and related environmental problems, environmental consumerism, green consumerism etc.

**Open Elective Courses (OEC)
Environmental Health and Safety**

Course Code: U25OEC331T(II)
Credit 2
30 Hrs (2 Hrs/week)
Exam Time: 2 Hours

Total Marks: 50
Internal Marks: 15
External Marks: 35

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus having 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one question from each unit consisting of 10 marks each including compulsory Question No. 1.

Course Objective: This course introduces the impact of occupational environments on human health, types of workplace hazards, and preventive measures. It covers key aspects of a safe workplace, accident prevention, first aid, and the role of safety practices and training.

Unit-I

Introduction: - Occupational environment and its relation to health, physiological response of man to different environmental stresses.

Occupational Health: - Types of interaction of man in occupation environment, Types of hazards associated with occupation environment, Occupational diseases with stress on antidotes

Unit II

General Working Environment: General features of a healthy and safe workplace: Workstations, Room dimensions and space, Floors & Gangways, Stairways, Lighting, Temperature, Ventilation, Housekeeping – Safe storage, Falling objects, Toilets and Washing Facilities, Smoking, Welfare provision, Personal hygiene, First Aid provision, Rest Areas, The importance of safety signs and their usage, Principles of accidents prevention & First aid, Plant layout for safety, promoting Safety, Safety and Health Training, Role of safety department.

Reference Books:

1. Nicholas, P Cheremisinoff, Madelyn L Graffia (1995) Environmental and Health and Safety Management 1st edition, William Andrew.
2. Barry S. Levy, David H. Wegman, Sherry L. Baron, Rosemary K. Sokas (2017) Occupational and Environmental Health: Recognizing and Preventing Disease and Injury 7th Edition OUP USA.
3. Jain, R. K., Rao S.S., (2000) Industrial Safety, Health and Environment Management Systems 4th Edition Khanna Publishers.
4. Robert H. Friis (2018) Essentials of Environmental Health 3rd Edition Jones and Bartlett Publishers, Inc.
5. Herman Koren, Michael S. Bisesi (2017) Handbook of Environmental Health, Volume I Biological, Chemical, and Physical Agents of Environmentally Related Disease CRC Press.

Course Outcomes: After completion of this course, the students will be able to:

CO1: Define environmental toxicants, their sources, origin and effects of various toxic materials and heavy metals that impact the environment adversely.

CO2: Understand common work-related diseases and train on methods used to assess the risk involved at occupational settings.

CO3: Apply handling and storage of hazardous substances at workplace.

CO4: Analyze health and safety problems in the working as well as living environment and ensure safety measures.

Semester-I

Value Added Courses (VAC) Natural Resources & Biodiversity

Course Code: U25VAC115T(i)
Credit 2
30 Hrs (2 Hrs//week)
Exam Time: 2 Hours

Total Marks: 50
Internal Marks: 15
External Marks: 35

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus having 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one question from each unit consisting of 10 marks each including compulsory Question No. 1.

Course Objective: This course introduces the classification, significance, and management of natural resources including soil, water, minerals, forests, and wildlife. It highlights the importance of biodiversity, its types, hotspots, and conservation strategies, while emphasizing sustainable use and protection of physical and biological resources.

Unit-I

Physical Resources: Renewable & non-renewable resources. Soil resources: soil type, soil profile and soil erosion. Water resources: Surface water, ground water, hydrological cycle. Mineral resources: Types, their characteristics & uses, minerals from the sea.

Unit-II

Biological resources: Forests: their types & importance, primary and secondary products -value & uses, forest resources of India. Wild-life of India. Range lands: Types, significance, range lands in India. Convention on biodiversity, Types of biodiversity, hot spots of biodiversity, biodiversity conservation strategies - in situ and ex situ conservation

Reference Books:

1. Natural Resources conservation-Oliver S Owen & Chiras
2. Living in the Environment -T.J.Miller
3. Environmental Science- Cunningham Saigo
4. Ecology of Natural Resources-Ramade
5. Global Biodiversity-W.R.L. IUCN
6. Soils-Miller, W & R.L. Donhau

Course Outcomes: After completing this course, the students will be able to:

- CO1: Understand renewable and non-renewable resources and their types.
CO2: Analyse and review various kind of energy resources and their environmental impacts.
CO3: Evaluate forests their types and products from the forests.
CO4: Formulate historical and geographical causes for diversity and Types of biodiversity.

Semester-I

Value Added Course (VAC) Environmental Issues & Sustainable Development

Course Code: U25VAC115T(ii)
Credit 2
30 Hrs (2 Hrs/week)
Exam Time: 2 Hours

Total Marks: 50
Internal Marks: 15
External Marks: 35

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus having 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one question from each unit consisting of 10 marks each including compulsory Question No. 1.

Course Objective: This course aims to provide an understanding of climate change, its causes, impacts, and global responses, including national policies and action plans. It also introduces the concept and principles of sustainable development, major international initiatives, and strategies for implementing eco-development and achieving sustainability goals.

Unit-I

Climate Change : Global Warming and Greenhouse gases- Global and national scenario. Sea level change- Impacts & adapting to Sea level changes. Climate Change and Biodiversity loss, Climate change and food security. Kyoto Protocol, Intergovernmental Panel for Climate Change (IPCC), COP; National Action Plan on Climate Change (NAPCC) Namami Ganga and Yamuna action plan.

Unit-II

Sustainable Development : World Summit on Sustainable Development, 2002; Principles of Sustainable Development: History and emergence of the concept of Sustainable Development, Action plan for implementing sustainable development, Brief of Millennium Development Goals: Pros and Cons; Sustainable Development Goals (SDGs) and Environment; Strategies for implementing eco-development programme.

Reference Books:

1. Asthana, D. K. (2001). *Environment: Problems and solutions*. S. Chand Publishing.
2. Cunningham, W., & Cunningham, M. A. (2010). *Principles of environmental science*. McGraw-Hill Higher Education.
3. Elliott, J. (2012). *An introduction to sustainable development*. Routledge.
4. Fulekar, M. H., Pathak, B., & Kale, R. K. (Eds.). (2014). *Environment and sustainable development*. Springer India.
5. Katila, P., Colfer, C. J. P., De Jong, W., Galloway, G., Pacheco, P., & Winkel, G. (Eds.). (2019). *Sustainable Development Goals*. Cambridge University Press.

Course Outcomes: After completing this course, the students will be able to:

CO1: State issues related to climate change and initiative taken at national and international level.

CO2: Understand contemporary issues related to environment.

CO3: Apply the concept of sustainable development and sustainable development goals to conserve environment and sustainable development.

CO4: Evaluate strategies for implementing eco-development programme.

Semester-I

Skill Enhancement Courses (SEC) Solid Waste Management

Course Code: U25SEC415T
Credit 2
30 Hrs (2 Hrs/week)
Exam Time: 2 Hours

Total Marks: 50
Internal Marks: 15
External Marks: 35

Note: The examiner is required to set five questions in all. The first question will be compulsory consisting of five short questions covering the entire syllabus having 3 marks each. In addition to this, four more questions (each question may be of 2-3 parts) will be set consisting of two questions from each unit. The student/candidate is required to attempt three questions in all selecting one question from each unit consisting of 10 marks each including compulsory Question No. 1.

Course Objective: This course provides an overview of solid waste sources, classification, and management techniques such as landfilling, recycling, composting, and energy recovery. It introduces key waste management rules, including municipal, biomedical, and hazardous waste regulations, along with methods for handling and treatment of hazardous wastes.

Unit-I

Solid wastes: Sources and classification of solid wastes, Solid waste management options: Sanitary Landfill, Recycling, Composting, Incineration, Energy recovery options from organic wastes.

Waste management rules: - Municipal Solid Waste (Management and Handling) Rules, 2000, Hospital waste management, Biomedical Waste (Management and Handling) Rules, 1988

Unit-II

Hazardous Waste Management: Physico-chemical properties of hazardous waste needed in management., Hazardous waste control, treatment and management, Hazardous Waste (Management and Handling) Rules (1989) and (2000) Amendments

References Books:

1. Solid Waste Management Manual CPCB, New Delhi
2. Ecotechnology for Pollution Control and Environmental Management by Trivedy R.K. and Arvind Kumar
3. Basic Environmental Technology Nathanson, J.A.

Course Outcomes: After completing this course, the students will be able to:

CO1: Define the various source of solid waste.

CO2: Describe the solid waste, hospital waste and biomedical waste management & handling rules.

CO3: Apply the energy recovery options from solid waste.

CO4: Evaluate the hazardous waste management, its control & treatment.