जम्मू केंद्रीय विश्वविद्यालय

Central University of Jammu

राया–सूचानी; बागला, जिला संबा–181143 जम्मू; जम्मू एवं कश्मीर

Rahya- Suchani (Bagla), District **Samba – 181143, Jammu (J&K)**

No. 4-1/EVS/CUJ/Reg/2019/ November, 2019

NOTIFICATION No. / 2019

Sub: Course Scheme and Syllabus of **1st** and **2nd Semester** of M.Sc. in Environmental Sciences w.e.f. Academic Session **2019-20** – Reg.

Ref: Notification No. 57 dated 29.10.2018

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It is hereby notified for the information of all concerned that on the recommendation of the Board of Studies, Department of Environmental Sciences, School Board, School of Life Sciences, the Academic Council has approved following **Course Scheme** and **Syllabus** of **1st** and **2nd semester** of M.Sc. Environmental Sciences w.e.f. Academic Session **2019-20**.

Semester I

Course Code	Course Title	Credit	CIA	MSE	ESE	Max. Marks
Core Courses						
PGEVS1C005T	Biodiversity and its Conservation	4	25	25	50	100
PGEVS1C007T	Ecosystem Analysis	4	25	25	50	100
PGEVS1C008T	Energy Resources and their Conservation	4	25	25	50	100
PGEVS1C007L	Lab Course I	2	-	-	-	50
PGEVS1C008L	Lab Course II	2	-	-	-	50
MOOC available on SWAYAM		-	-	-	-	-
Elective Courses (any one)						
PGEVS1E010T	Environmental Geosciences	4	25	25	50	100
PGEVS1E013T	Palaeoenvironment	4	25	25	50	100
PGEVS1E014T	Waste Management	4	25	25	50	100
PGEVS1E015T	Introduction to Atmospheric Sciences	4	25	25	50	100
PGEVS1E016T	Fundamentals of Meteorology	4	25	25	50	100
Foundation course						
PGEVS1F010T	Fundamentals of Ecology	2	12.5	12.5	25	50
Total		**22**				**550**

Semester II

Course Code	Course Title	Credit	CIA	MSE	ESE	Max. Marks
Core Courses						
PGEVS2C007T	Climatology	4	25	25	50	100
PGEVS2C008T	Environmental Geology	4	25	25	50	100
PGEVS2C009T	Environmental Pollution and Control	4	25	25	50	100
PGEVS2C007L	Lab Course I	2	-	-	-	50
PGEVS2C008L	Lab Course II	2	-	-	-	50
MOOC available on SWAYAM		-	-	-	-	-
Elective Courses (any one)						
PGEVS2E009T	Energy from wastes	4	25	25	50	100
PGEVS2E010T	Geochemistry	4	25	25	50	100
PGEVS2E011T	Advances in Atmospheric Environment	4	25	25	50	100
PGEVS2E012T	Advances in Meteorology and its Applications	4	25	25	50	100

PGEVS2E013T	Geomorphology and Himalayan Geology	4	25	25	50	100
Foundation course						
PGEVS2F009T	Fundamentals of Earth and Environmental Sciences	2	12.5	12.5	25	50
TOTAL		**22**				**550**

Deputy Registrar
(Admin – HR)

Encl: Syllabus of I and II Semester

To:

Head, Department of Environmental Sciences

Copy to:

OSD (Exam)

Programme Outcome (POs)

PG degree provides an opportunity and multidimensional exposure in developing analytical, reasoning, academic insight and research aptitude for pursuing research and development activities, in educational institution, research institutes and industries.

Programme Specific Outcome (PSOs)

- To understand the concept and significance of various spheres of environment.
- To carry out experiments for understanding the dynamics of biotic and abiotic components of environment.
- To develop an understanding for providing meaningful solutions on the problems and issues of the environment.
- To endow the skills amongst the students for securing a future environmental leader, environmental activist and environmental entrepreneur.

Course Code: PGEVS1C005T **Credit:4**

Course Title : Biodiversity and its Conservation

CLOs: This course will enable students to understands the following:

- Very general ideas about policies, environment and human interventions
- Environmental laws and ethics which is a significant part of environmental conservation
- Significance of nature for the sustainable of human and other living organisms.
- Requirement of laws to be in place to minimize the over-exploitation of nature.
- It also provides the gate way of developmental process to be continued along without harming the nature.

Semester – I

Course Code: PGEVS1C005T **Credit: 4**

Course Title: Biodiversity and its conservation

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit-I: Introduction to Biodiversity

1.1 Introduction: Definition, History, Components and importance of Biodiversity

1.2 Biodiversity Climatic Zones, resources of India

1.3 Protected areas: biospheres, national parks, Wildlife sanctuaries conservation reserves, marine protected areas, zoological parks and botanical gardens

1.4 Biodiversity hotspots and their characteristic flora and fauna, threatened plants and animals of India

Unit-II: Levels and Types of Biodiversity

2.1 Levels of Biodiversity (alpha, beta and gamma)

2.2. Gradients of biodiversity (latitudinal, altitudinal and insular)

2.3 Species, Genetic and Ecosystem diversity

2.4 Biodiversity use - direct and indirect

Unit-III: Threats to Biodiversity

3.1. Threats to biodiversity: (a) natural process, (b) anthropogenic processes: habitat destruction, fragmentation, (c) exploitation and effect on target species (d) land use and its impact

3.2. Impact of non-native / invasive species

3.3 Ecosystem degradation influences on biodiversity

3.4 Extinction of local population and its impacts

Unit-IV: Biodiversity and Conservation

4.1. Biodiversity conservation- In-situ and ex-situ conservation

4.2. Red Data Book (IUCN Red-list category), Red Data Book of Indian Plants

4.3. Environment conservation organizations: CITES, IUCN, WWF, UNEP, GREEN PEACE, Man and Biosphere Programme

4.4. Bioprospecting

Unit V: Biodiversity Restoration

5.1. Principle, Definition, degradation, tools and methods for biodiversity restoration

5.2. Recreational and Ecotourism

5.3. Public participation, Case studies related to biodiversity conservation

5.4. Biodiversity Conservation Act, 2002.

Suggested Readings:

1. Botkin, Daniel B .and Keller, Edward A . Environmental Science *: Earth as a Living Planet*. 6th ed. John Wiley & Sons, USA. 2007
2. Enger, E.D. and Smith, B.F Environmental Science: *A Study of Interrelationships*. 11thed . McGraw Hill Inc, USA. 2006
3. Frankel, O.H. Brown A.H.D. and Burdon, J.J. *Conservation of Plant Diversity.* Cambridge University Press, UK. 1995.
4. Gadgil, Madhav and Rao, P.R.S. *Nurturing Biodiversity* : An Indian Agenda. Centre for Environment Education, Ahmadabad, India.
5. MeffeG.k. and C.RonalsCorrol(1994) Principles of Conservation Biology, Sinaur Associates, Inc. Sunderland. Massachusetts.

Course Code: PGEVS1C007T **Credit:4**
Course Title: Ecosystem Analysis

CLOs: This course will enable the students to understand

- Understand the components of environment and their interactions
- Learn the importance of ecosystem and services provided by the ecosystem
- Gain knowledge on energy flow in ecosystem and concepts of productivity, food chain and food web
- Learn about various types of aquatic ecosystems and their importance
- Gain knowledge on various strategies used for conservation of ecosystem and learn about threat son ecosystem

Semester – I

Course Code: PGEVS1C007T **Credits: 4**

Subject Course Title: Ecosystem Analysis

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit-I: Introduction to Environment

1.1. Definition, scope and importance of Environmental Science; Interaction between man and environment

1.2. Components of environment (atmosphere, hydrosphere, lithosphere and biosphere)

1.3. Biogeochemical cycles: carbon, nitrogen, sulphur, phosphorus

1.4. Concept of biogeography: major biomes of the world: distribution and characteristic features; Floral and faunal peculiarities of Jammu and Kashmir an overview

Unit-II: Ecosystem

2.1 Structure and components of ecosystem

2.2 Ecosystem stability, ecosystem regulation

2.3 Gaia hypothesis, sustainable development; sustainability indicators

2.4 Goods and services of ecosystems: supporting, provisioning, regulatory and cultural

Unit-III: Terrestrial Ecosystem

3.1 Introduction to Tundra, forest, Grassland, Desert ecosystem

3.2 Energy flow in ecosystems-Laws of Thermodynamics

3.3 Productivity-Biomass production, primary productivity and net productivity.

3.4 Food Chain – Types of food chain with examples, Food web, Ecological pyramid of biomes

Unit-IV: Aquatic Ecosystem

4.1 Introduction to freshwater, estuarine, and marine ecosystem

4.2 Status of global aquatic resources

4.3 Hydrological cycle

4.4 Primary and secondary aquatic productivity

Unit-V: Ecosystem Analysis

5.1. Interspecific interactions, structured population dynamics and demographic effects

5.2. Meta population dynamics, MVP and PVA, small population paradigm,

5.3. Invasive species, habitat destruction and extinction vortex

5.4. Population risk analysis, conservation and ethics

Suggested Readings:

1. E.P. Odum and G.W. Barrett. 2005. Fundamentals of Ecology. Cengage Learning India Pvt. Ltd.

2. J.S. Singh, S.P. Singh and S.R. Gupta. 2008. Ecology, Environment & Resource Conservation. Anamaya Publications.

3. P.D.Sharma.2008. Ecology and Environment. Rastogi Publications

Course Code : PGEVS1C008T **Credit:4**

Course Title : Energy Resources and its Conservation

Course Learning Outcomes (CLOs): At the end of the course, the students will be able to know about

- Understand the environment impact of using fossil fuels
- Explain about harvesting of solar energy and solar collectors applications
- Deal the basics of wind energy, geothermal energy and hydro-energy conversion systems and their impact on environment
- Able to understand the difference between renewable and non-renewable energy sources
- Learn the overview of energy resources and their consumption patterns worldwide
- Gain knowledge on renewable energy sources and associated harvesting technologies
- Understand about the fossil fuels and their extraction processes
- Learn the conservation and management practices for energy resources

Semester – I

Course Code: PGEVS1C008T **Credit: 4**

Course Title: Energy Resources and its conservation

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit I: Introduction to Energy

1.1 Definition, forms and classification of energy
1.2 Measurement of energy
1.3 Indian and global energy resources
1.4 Pattern of energy consumption

Unit II: Renewable Energy Resources-I

2.1 Source of Sun's Energy, solar spectrum, solar radiation, earths energy balance, harnessing of solar energy
2.2 Wind energy; wind power, harnessing of wind energy, hybrid wind energy systems
2.3 Principles of hydroelectric power generation, ocean energy (tides, waves, currents)
2.4 Sources, harnessing methods and potential of geothermal energy

Unit-III: Renewable Energy Resources-II

3.1 Types and composition of biomass
3.2 Conversion processes; biomass gasification and biogas production
3.3 Production of biofuels (ethanol and bio-diesel)
3.4 Energy from landfill gas, distillery waste, Sewage, and paper mill waste
3.5 Biotoilets

Unit IV: Non-Renewable Energy Resources

4.1 Coal; formation, types and reserves of coal; coal mining and utilization
4.2 Petroleum (oil and natural gas); formation and reserve of petroleum; Processing of crude oil
4.3 Nuclear energy; sources, fuels refining and enrichment, fuel cycle. Nuclear reactors for energy generation disposal and safety measures of radioactive wastes

Unit V: Conservation and Management of Energy

5.1 Environmental degradation due to energy production and utilization
5.2 Principles of energy conservation
5.3 Objectives and principles of energy management
5.4 Energy Audit: need, types, and methodology

REFERENCE BOOKS:

1. Craig. J.R., Vaughan. D.J., Skinner. B.J., Resources of the Earth: origin, use, and environmental impact, 2nd Ed. Prentice Hall, New Jersey.
2. Klee. G.A, Conservation of natural resources. Prentice Hall Publ. Co., New Jersey.
3. Owen. O.S, Chiras. D.D, Reganold. J.P, 1998, Natural resource conservation– Management for a sustainable future, 7thEd. Prentice Hall.
4. Anjaneyulu. Y, Introduction to Environmental Science. B. S. Publications.
5. D. Daniel Chiras, Environmental Science, 6th Ed., Jones and Bartlett Publishers.
6. MukherjiShormila, Fragile environment, Manak Publication Pvt. Ltd.

Course Code : PGEVS1E010T **Credit: 4**

Course Title : Environmental Geosciences

Course Learning Outcomes (CLOs) : On completion of this course the students will able to:

- Develop the crucial skills needed to address important challenges
- How can we predict and mitigate the effects of global climate change?
- What tools can we use to reduce greenhouse gas emissions to the atmosphere?
- Why is our planet able to sustain life?
- How can we reduce the effects of environmental pollution?
- Will changes in seawater properties affect the ocean's role as a food source?
- How does the increased CO2 concentration in seawater affect life in the ocean?

Gain experience in:

- acquiring, analyzing, assessing and presenting a wide range of data
- using a range of specialist laboratory techniques
- applying observational and sample collection techniques in the field

Semester – I

Course Code: PGEVS1E010T **Credit: 4**

Course Title: Environmental Geosciences

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit I: Earth Processes

1.1 Brief geological history of the planet; fundamental concepts

1.2 Primary differentiation and formation of core, mantle, crust, magma, generation, eruption and volcanoes

1.3 Formation and classification of rocks

1.4 Plate tectonics-sea floor spreading, mountain formation rock deformation and evolution of continents

Unit-II: Soil

2.1 Weathering and soil formation

2.2 Soil profile, soil classification, soils of India

2.3 Ice sheets and fluctuations of sea levels

2.4 Volcanism: component and types of volcanoes, volcanic materials, processes and effects of volcanism

Unit III: Geo-resources

3.1 Important ferrous and nonferrous metals, non-metallic and industrial minerals in India and in the world; mineral deposits through geologic time

3.2 Geo-indicators, resources and reservoirs

3.3 Mineral resources of J&K

3.4 Ocean as a new area for exploration of natural resources

Unit IV: Geological Agents

4.1 Factors affecting landform development

4.2 Fluvial system: factors affecting stream erosion, deposition, erosional and depositional land form

4.3 Underground water system-water table, land forms formed through ground water action

4.4 Aeolian system, Glacial System: mechanism of erosion, erosional and depositional land forms

Unit -V: Environmental Geochemistry

5.1 Atomic properties of elements, Periodic table and geochemical classification of elements

5.2 Abundance of elements in the bulk earth, crust, hydrosphere, atmosphere and biosphere

5.3 Introduction to mineral structures and compositions; thermodynamic classification of elements into essential, structural, major and trace elements

5.4 Mineral stability diagrams and controls on the chemistry' of natural waters

Suggested Readings:

1. Press &Seiver, The Earth, Frank Press
2. Skinner & Porter, Dynamic Earth, Wiley
3. Krauskopf, Introduction to Geochemistry, Mc-Graw Hill
4. Parbin Singh, Engineering & General Geology, S.K. Kataria& Sons

Semester - I

Course Code No. PGEVS1E013T
Subject Course Title: Palaeo-Environment
Duration of Examination: 3 Hours **Maximum Marks: 100**
Credits: 4 **Contact Hours / Week: 4**

Unit- I Paleontology and Fossilization

1.1 Introduction to Palaeontology;
1.2 Fossils: definition, significance and applications
1.2 Distribution of fossils in space and time; index fossil
1.4 Processes of fossilization and uses of fossils

Unit- II : Evolution through time

2.1 Morphology, palaeo-environments, geological distribution and evolutionary history of Phylum Mollusca classes: Bivalvia and Gastropoda
2.2 Morphology, palaeo-environments, geological distribution and evolutionary history of Phylum Mollusca classes: Gastropoda
2.3 Morphology, palaeo-environments, geological distribution and evolutionary history of Phylum Brachiopoda, Arthropods (class: Trilobita)
2.4 Morphology, palaeo-environments, geological distribution and evolutionary history of Phylum Arthropods class: Trilobita

Unit-III: Stratigraphic correlation, Geochronology

3.1 Concept of strata and their orders, law of superimposition
3.2 Principles of Stratigraphy; Stratigraphic correlation; code of Stratigraphic nomenclature
3.3 Indian Stratigraphy, Type areas, biotas, palaeogeography and palaeoclimates.
3.4 Geochronology; principles of Rb-Sr dating and its applicability

Unit-IV: Structural element

4.1 Introduction: Stratification, dip and strike, stratum contour
4.2 Thickness and width of outcrops, outlier, inlier, Unconformities: significance
4.3 Folds: parts of fold, types and classification; Faults, types and classification
4.4 Methods of determination of top and bottom of beds.

Unit-V: Palaeo-botany and Vertebrate Palaeotology

5.1 Introduction to paleobotany; modes of fossilisation in fossil plants
5.2 Reptiles; their appearance and extinction Mesozoic reptiles with special reference to India
5.3 Vertebrate Paleontology: Introduction to vertebrate paleontology
5.4 Characteristics of vertebrates. Evolutionary trends in Equidae. Proboscidea and primates.

Suggested Readings

1. Clarkson, E.N.K.(1986). Invertebrate Palaeontology and Evolution. ELBS. London.
2. David Raup and Stanley (1985). Principles of Palaeontology, CBS Pub, Delhi.
3. Arnold, C.A. (2007). An Introduction to Paleobotany. Miller Press, Colorado. Brasier.
4. Carroll, R.L. (1988). Vertebrate Paleontology& Evolution. W.H. Freeman and Company, New York.
5. Marland P Billings (1990) Structural Geology. Prentice Hall, London
6. Ravindra Kumar (1987) Fundamentals of Historical Geology and Stratigraphy of India. Wiley Eastern Limited, Delhi

Semester – I

Course Code: PGEVS1E014T **Credit: 4**

Course Title: Waste Management

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit 1: Composition of Wastes

1.1.Sources and types of wastes
1.2.Composition of wastes
1.3.Physical, chemical and biological properties of wastes
1.4.Factors affecting waste generation, Environmental and health hazards of waste

Unit II: Collection Techniques

2.1.Collection services: Government and Private sectors
2.2. Types of collection system, transfer and transport
2.3. Handling, separation and storage
2.4. Technical merits and demerits of existing techniques

Unit III: Treatment and Disposal Techniques

3.1. Composting: aerobic, anaerobic, vermin-composting
3.2. Anaerobic digestion: basics, Mechanism, Traditional digesters,
3.3. Thermal processing: Incineration, Pyrolysis, Gasification
3.4. Landfilling: site selection, techniques according to type of waste

Unit IV: Management of Hazardous Waste

4.1.Definition and characteristics,
4.2. Sources, types, treatment technologies,
4.3. Biomedical waste
4.4. E-waste and Radioactive waste

Unit V: Environmental Policies and laws for waste management

5.1: Biomedical Waste (Management and Handling) Rules, 1998; Hazardous Waste (Management and Handling) Rules, 1989; New Plastic Waste (Management and Handling) Rules, 2011; Environmental Protection (Fifth Amendment Rules), 2014.
5.2. Global scenario for waste management; Implementation plans and bottlenecks
5.3. Integrated waste management systems, Merits and demerits of treatment techniques
5.4. Sustainable development-principles and practices in relation to economics and ecology

Suggested Readings:

1. George Tchobanoglouset.al., "Integrated Solid Waste Management", McGraw-Hill Publishers, 1993.
2. Solid Waste Management Manual CPCB, New Delhi
3. Environmental Hazards-Smith, Keith

Course Code: PGEVS1E015T **Credit: 4**
Course Title: Introduction to Atmospheric Sciences

CLOs: After the successful completion of this course, the student will be able to;

- Understand the structure and composition of the Earth's atmosphere.
- Apply the knowledge of basic science to discern atmospheric dynamics.
- Have good knowledge of constituents of atmosphere and their implications.

Semester – I

Course Code: PGEVS1E015T **Credit: 4**

Course Title: Introduction to Atmospheric Sciences

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit -I: Overview

1.1 History and evolution of the earth's atmosphere
1.2 Understanding the atmospheric strata
1.3 Measures of atmospheric composition: absolute concentration, fractional abundance and number density
1.4 Concept of meteorology, meteorological parameters: pressure, temperature, wind direction and wind speed, humidity and solar radiation

Unit-II: Atmospheric Thermodynamics and Radiative transfer

2.1 Understanding the laws of thermodynamics in atmosphere, the concept of air parcel, the dry adiabatic lapse rate
2.2 Moisture parameters: mixing ratio and specific humidity, saturation mixing ratios and vapour pressures, relative humidity; dew point and frost point
2.3 Lifting condensation level and normand's rule.
2.4 The spectrum of radiation and blackbody radiation laws

Unit - III: Atmospheric Cycles

3.1 The atmospheric sulfur cycle: natural and anthropogenic emission of SO_2 major pathways of sulphur compounds, reservoirs and burdens of sulphur, role of sulphate aerosols.
3.2 The atmospheric nitrogen cycle: nitrogen containing compounds, natural and anthropogenic processes for nitrogen fixation. Inter conversion among species, nitrous oxide and its sources, oxides of nitrogen and reactive odd nitrogen in atmospheric chemistry.
3.3 The global carbon cycle: the global mean atmospheric CO_2 level, the flux of carbon between various reservoirs, the six compartment model of carbon cycle.
3.4 The atmospheric oxygen cycle: odd oxygen chemistry, formation and destruction of ozone and OH radical.

Unit - IV: Particles in the lower atmosphere

4.1 Basic terminologies and properties of atmospheric particles
4.2 Spatial and temporal variations in aerosols
4.3 Reactions involved in particle formation and growth: nucleation, condensation and coagulation
4.4 Cloud processing of aerosols, concept of cloud condensation nuclei and ice particle nuclei

Unit-V: Behaviour of particles and gases in atmosphere

5.1 Atmospheric transport and diffusion of pollutants
5.2 Gas laws governing the behaviour of pollutants in the atmosphere.
5.3 The behaviour and categories of plume and effect of plume rise on ground level concentrations of atmospheric constituents.
5.4 The gaussian plume model and the derivation of the gaussian plume equation

Suggested Readings:

1. Finlayson-Pitts, B.J., Pitts J.N., J., (2000): Chemistry of the upper and lower atmosphere-Theory experiments and applications. Academic Press, US.
2. Seinfeld, J.H., Pandis, S.N., (2006): Atmospheric Chemistry and Physics: From Air Pollution to Climate Change. A wileyinterscience publication.
3. Wallace John M. Jr., Peter V. Hobbs (2006): Atmospheric Science: An Introductory Survey, 2nd Edition, Academic Press, ISBN: 978-0127329512
4. Gilbert, M. Masters &Ela, W. P. (2007): Introduction to Environmental Engineering and Science. PHI learning Pvt Ltd.

Course Code: PGEVS1E016T **Credit: 4**
Course Title: Fundamentals of Meteorology

CLOs: The students will be able to

- Familiar with basic parameters which affects daily weather across the scales.
- Primary and derived terms used in meteorology to understand the properties of atmosphere at different atmospheric height.
- How the atmospheric motion and wind system across the planet exists and changes with latitude and altitude.
- Air parcels behave over heterogenous landscape at different altitude.
- Local factors and global parameters works as one system to shape the weather and climate of the region varying scale.

Semester – I

Course Code: PGEVS1E016T
Course Title: Fundamentals of Meteorology
Duration of Examination: 3 Hours **Maximum Marks: 100**
Credits: 4 **Contact Hours / Week: 4**

UNIT 1: Basic Concepts

1.1. Importance of meteorology, various branches of meteorology and their applications,
1.2. Meteorological elements; Atmospheric Pressure, Dry Bulb, Wet Bulb,
1.3. Atmospheric Moisture and its representation, DPT,
1.4. Virtual Temperature, Potential Temperature, equivalent Potential Temperature, Wind description and measurement

UNIT II: Atmospheric stability

2.1. Concept of lapse rates, Laws of thermodynamics, Concept of Geopotential height
2.2. Geostrophic wind, pressure-height curve,
2.3. Thermodynamic diagram ,Fog,
2.4. Clouds and precipitation, basic knowledge of their formation

UNIT III: Weather Processes

3.1. Scales of weather systems, Indian summer monsoon,
3.2. Monsoon depressions, Easterly wave structure and associated weather,
3.3. Waves in mid-latitude westerlies, Western disturbance,
3.4. Jet streams around the globe and weather

UNIT IV: Weather products analysis

4.1. Surface and upper air observations,
4.2. Analysis of fields of meteorological elements on synoptic charts,
4.3. Wind and pressure analysis: slope of pressure system,
4.4. Analysis of surface charts, Tephigram

UNIT V: Climate change and Impacts

5.1. Basics of Climate Change,
5.2. Observed climate change over India and globe,
5.3. Global warming and its factors,
5.4. Possible causes and its impact on environment

Suggested Readings:

1. Monsoon Meteorology by C.P. Chang & T.N. Krishnmoorthy
2. Mesoscale Meteorological Modelling by Roger A. Pielke
3. Mesoscale Atmospheric Circulation by B.W. Atkinson
4. Atmospheric Turbulenceby Panofsky and J.A. Dutton.
5. Introduction to Boundary Layer Meteorology" Stull
6. The Atmospheric Boundary Layerby R.M. Stewart, WMO-523
7. Climate Change: The Science of Global Warming and Our Energy Future by Edmond Mathez
8. Tropical Meteorology Volume I & II by G.C. Asnani
9. Synoptic Meteorology by M.Kurz

Course Code : PGEVS1F010T **Credit : 2**

Course Title : Fundamentals of Ecology

After the successful completion of this course, the student will be able to

- Understand the basics of ecology
- Apply the diversity measures to understand population level attributes.
- Have good knowledge of structure and interactions at community level.

Semester – I

Course Code: PGEVS1F010T **Credit: 2**

Course Title: Fundamentals of Ecology

Duration of Examination: 2 Hours **Maximum Marks: 50**

Unit-I: Introduction to Ecology

1.1 Four levels of ecological organization: Population, Community, Ecosystem and Biosphere.

1.2 Concept of food chain, food web, ecological pyramids, trophic structure,

1.3 Energy flow pathways; Concept of primary and secondary productivity

1.4 Shelford's law of tolerance, Liebig's law of minimum

Unit-II: Population Ecology

2.1 Characteristics and attributes of population

2.2 Population growth vis-a-vis the concept of carrying capacity, s''& 'j' shaped growth curve, minimum viable population (MVP), metapopulation and model, extinction vortex, Population viable analysis (PVA).

2.3 Population interactions: positive and negative; Predator-prey relationship, Lotka –voltera equation. Concept of 'r' and 'k' species. Keystone species.

2.4 Population behaviour: Basic, regulatory, social and compensatory

Unit-III: Community Ecology

3.1 Concept of communities, concept of niche, edge effect, ecotypes, ecotone

3.2 Intra-community classification and the phenomenon of ecologicaldominance

3.3 Types of interactions – Commensalism, Mutualism, predation, parasitism and allelopathy.

3.4 Succession causes, trends and type of succession, climax community and types of climax.

Suggested Readings:

1. E.P. Odum and G.W. Barrett. 2005. Fundamentals of Ecology. Cengage Learning India Pvt. Ltd.
2. J.S. Singh, S.P. Singh and S.R. Gupta. 2008. Ecology, Environment & Resource Conservation. Anamaya Publications.
3. P.D.Sharma.2008. Ecology and Environment. Rastogi Publications

Course Code: PGEVS2C007T **Credit: 4**
Course Title: Climatology

CLOS: After completion of the course, the students will able to understand:

- Interpret climate and weather and have concept of climatic regions of the world
- Able to read the weather and climatic charts
- The climate modelling to understand the significance of climate and survival
- Fine tuning among the biosphere, cryosphere, atmosphere and hydrosphere

Semester – II

Course Code: PGEVS2C007T **Credits: 4**

Course Title: Climatology

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit-1

1.1 Introduction and subfields of climatology
1.2 A brief history of climate and the earth system
1.3 Link between climatology and meteorology,
1.4 spatial and temporal scales, normals, extremes and frequencies in climatology.

Unit-2

2.1 Physical factors of climate and their inter-relationship,
2.2 Earth-sun relationship, ecliptic and equatorial plane
2.3 Rotation of the earth, seasons, climatic controls
2.4 Long term changes (Climate of Past century, past millennium, past glacial period).

Unit-3

3.1 Climate variability and forcings;
3.2 Concept and types of feedback processes
3.3 Global seasonal variations in wind and pressure belts and its association with other spheres
3.4 General idea of internal dynamical processes of the atmosphere, oceanic processes, cryospheric processes and land processes

Unit-4

4.1 Climatic variables and classification
4.2 Secondary circulations, upper and mid-level flow
4.3 Divergence and convergence, global warming and dimming
4.4 Methods of determining past climate.

Unit-5

5.1 Climate monitoring and prediction
5.2 Future climate and potential consequences,
5.3 Definition and concept of climate models,
5.4 Simple climate model- 0D, 1D and 2D climate models.

Suggested Readings

5. Frederick K. Lutgens, Edward J. Tarbuck (2010): The Atmosphere: An Introduction To Meteorology, Phi (Prentice-hall New Arrivals), ISBN: 978-8120344150

6. Wallace John M. Jr., Peter V. Hobbs (2006): Atmospheric Science: An Introductory Survey, 2nd Edition, Academic Press, ISBN: 978-0127329512

7. John H. Seinfeld, Spyros N. Pandis (2006): Atmospheric Chemistry and Physics, John Wiley & Sons Inc., ISBN: 978-0-471-72018-8.

Course Code : PGEVS2C008T **Credit : 4**

Course Title : Environmental Geology

Course Learning Outcomes (CLOs): On completion of this course the students will able to:
On completion of this course the students will able to:

- Develop the crucial skills needed to address important challenges in the subject of Environmental Geology and Engineering Geology needed to be taken up for site specific construction activities

Acquire Skills and experience in :

- analyzing, assessing and presenting a wide range of environmental geological data
- using a range of specialist laboratory techniques related to civil engineering work
- applying observational and sample collection techniques in the field and constructional activities

Semester –II

Subject Course Code: PGEVS2C008T **Credits: 4**

Subject Course Title: Environmental Geology

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit I: Basics of Environmental Geology

1.1 Definition; History of Environmental Geology;
1.2 Environmental Geology and Commercial reality;
1.3 The Tools of the Environmental geologist;
1.4 Critical thinking about the environment; internal structure of earth

Unit II: Geological Resources and Natural Hazards

2.1 Water resources;, Exogenic hazards;
2.2 Endogenic hazards; Engineering geology in extreme events.
2.3 hazard zonation of India, anthropogenic hazards;
2.4 impact assessment and role of geologists in disaster management plan.
2.5 Urban planning and geology

Unit III: Waste Management & Medical Geology

3.1 Waste management and geological environment;
3.2 Chronic diseases and geologic environment;
3.3 Landfilling wastes; Effluent treatment and disposal;
3.4 Waste gases and the atmosphere; elements related health diseases.

Unit IV: Global Warming

4.1 Concept of global warming, climate change and palaeo-climate;
4.2 increase of green house gases (due to industrialization, urbanization, volcanic activity and deforestation);
4.3 ozone layer depletion and its impact, suggestive measures,

Unit V: Mass Movements, Glaciers and Deserts

5.1 Mass movements: definition, causes, types (falls, slumps, slides, flows and avalanches)
5.2 and consequences; slope control and stabilization.
5.3 change of glaciers due to global warming and its consequences, Desertification,

Suggested Readings :

1. Bell, F.G., 1999. Geological Hazards, Routledge, London.
2. Bryant, E., 1985. Natural Hazards, Cambridge University Press.
3. Valdiya, K.S., 1987. Environmental Geology - Indian Context. Tata McGraw Hill.
4. Keller, E.A., 1978. Environmental Geology, Bell and Howell, USA.
5. Patwardhan, A.M., 1999. The Dynamic Earth System. Prentice Hall.
6. Smith, K., 1992. Environmental Hazards. Routledge, London.
7. Subramaniam, v., 2001. Textbook in Environmental Science, Narosa International.

Course Code : PGEVS2C009T **Credit:4**

Course Title : Environmental Pollution and Control

Course Learning Outcomes (CLOs): At end of the course, the student will be able to

- Understand various environmental pollutions: water, Air, Soil, Noise, Thermal, Oil, E-waste and their impact on environment
- Conceptual knowledge on different technologies involved in control and management of environmental pollution
- Ability to analyses the water quality
- Have good knowledge on different technologies involved in air pollution monitoring and control devices
- Learn major developments in advancements of technologies related to pollution control

Semester –II

Subject Course Code: PGEVS2C009T **Credits: 4**

Subject Course Title: Environmental Pollution and Control

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit I: Introduction

1.1 Air Pollution: Types, sources and classification of air pollutants

1.2 Effect of air pollution on plants, animals and human health.

1.3 General methods of control of air pollutants from mobile and stationary sources.

1.4 Air quality standards

Unit II: Water Pollution

2.1 Water Pollution: Types, sources and classification

2.2 Industrial effluents characteristics of effluents from different industries (pulp and paper mills, oil exploration and refinery) water quality standards proposed by national and international agencies

2.3 Estuarine pollution, marine pollution, Eutrophication – causes, effects and control measures

2.4 Waste water characteristics-Domestic waste water, Sewage treatment: preliminary, primary, secondary and tertiary treatment; process description of aerobic and anaerobic processes: aerobic fixed film bed reactor, anaerobic fluidized bed reactor, Upflow Anaerobic Sludge Bed reactor (UASB)

Unit III: Noise and Radioactive Pollution

3.1 Noise Pollution: types, sources, consequences; measurement of noise pollution, threshold hearing level and abatement measures

3.2 Radio-active Pollution: types, sources and consequences

3.3 Biological effects of ionizing radiation's: the interactions of radiation's with cells – various stages, somatic and genetic effect; maximum permissible dose

3.4 Parameters affecting the radiation monitoring - personal monitoring equipment's; Disposal and management of radioactive waste

Unit IV: Soil Pollution

4.1 Sources of soil pollution: industrial effluents, fertilizers, pesticides, heavy metals and waste disposal

4.2 Effects of soil pollutants on flora, fauna and ground water

4.3 Solid-waste Pollution: types, sources and consequences

4.4 Waste management practices

Unit-V: Thermal, Oil and E-waste Pollution

5.1 Thermal pollution: sources, impact and control

5.2 Oil pollution; sources of oil spillage and impact, factors effecting fate of oil spillage

5.3 E-waste: generation, sources, types and constituents; environmental consequences and management of E-waste

5.4 Bio indicators of Pollution

Reference Books:

1. Introduction to Environmental Engineering and Science- Gilbert M Masters.
2. Environmental Engineering –Peavy and Rowe. McGraw Hill.
3. Environmental Engineering-Gerard Kiely (Tata McGraw-Hill Publishing Company
4. De, A. K. Environmental Chemistry. New age International (P) Ltd., New Delhi, India.2000
5. Baird, S.K. Environmental Chemistry. W. H. Freeman & Co.

Course Code : PGEVS2E009T **Credit :4**

Course Title : Energy from wastes

Course Learning Outcomes (CLOs): At end of the course, the student will be able to

- Explain about the energy from waste
- To understand the technologies for Waste to Energy options
- Able to gain knowledge on gasification, combustion, pyrolysis, anaerobic digestion processes
- Learn the concept of recycling and recovery of resources from various solid/liquid wastes
- Conceptualize about various conversion devices such as Combustors (Spreader Stokes, Moving grate type, fluidized bed etc.

Semester –II

Subject Course Code: PGEVS2E009T **Credits: 4**

Subject Course Title: Energy from Wastes

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit I: Energy from Waste

1.1 Introduction to waste to energy conversion: Waste to energy (WTE): An introduction
1.2 Environmental and social impacts of waste to energy (WTE) conversion plants
1.3 Recovery of energy from municipal solid waste and industrial waste,
1.4 Energy generation from waste: Refuse Derived Fuel (RDF)

Unit II: Conversion of Biomass to Energy

2.1 Biochemical conversions of industrial waste and agro residues for energy generation
2.2 Anaerobic digestion- biogas production; types of biogas plant
2.3 Thermochemical conversions: sources of energy generation,
2.4 Environmental impacts of biochemical and thermochemical conversion

Unit III: Biomass Energy

3.1 Sources of biomass energy, Petroleum plants, Energy plantation
3.2 Classification and generations of biofuel
3.3 Policy issues in biofuels, Indian Biofuel Programme
3.4 Advantages and disadvantages of biofuels, Recent Trends in biofuel production

Unit IV: Liquid Biofuels

4.1 Ethanol production from starch, sugar materials and lignocellulosic biomass
4.2 Ethanol and Biodiesel production from algae
4.3 Biodiesel fuel, origin, chemical and physical properties
4.4 Biodiesel production from Jatropha, cooking oil

Unit V: Gaseous and Solid Biofuels

5.1 Biogas and methane production from organic waste
5.2 Hydrogen production from organic waste and algae
5.3 Synthetic natural gas
5.4 Wood, charcoal, Briquetting; utilization and advantages of briquetting

Reference Books:

1.Martin Alexander. Biodegradation and Bioremediation. Academic press: 2nd edition, 1999
2.Kothari, D.P., Singal, K.C. and Ranjan, R. 2008. Renewable Energy Sources and Emerging Technologies, Prentice hall, New Delhi.
3. Armstrong, F. and Blundell, B. K. 2007. Energy beyond oil, Oxford, New York.
4. Bhojvaid, P.P. 2007. Biofuels Towards a Greener and Secure Energy Future Teri Press, New Delhi.
5. Klinghoffer, N. and Castaldi, M. 2013.Waste to Energy Conversion Technology. Woodhead Publishing

Course Code : PGEVS2E010T **Credit :4**

Course Title : Geochemistry

Course Learning Outcomes (CLOs): On completion of this course the students will learn throughout the course about:

- The concepts and principles of Geochemistry
- Understand the role of soil forming factors and processes in soil geochemistry
- Understand various physical, chemical and biological processes controlling the geochemical cycles of the planet, concept of resource and reserve
- Working knowledge of geochemical sampling of rocks, soil and sediments
- Practical Knowledge in assessing the geochemical data

Semester –II

Subject Course Code: PGEVS2E010T **Credits: 4**

Subject Course Title: Geochemistry

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit I: Introduction to Geochemistry

1.1 The history of Geochemistry, The periodic table, chemical bonding.

1.2 States of matter, and atomic environments of elements,

1.3 Geochemical classification and Mobility of elements.

Unit II: Geochemical Cycles

2.1 The formation of solar system, the Earth in the solar system

2.2 Composition of-the bulk Silicates, meteorites. Geochemical behaviour of selected elements like Fe, Ni, Si, Al etc.

2.3 Basic concept of biogeochemical cycling,concept of reservoirs and fluxes.

Unit III: Soil Geochemistry

3.1 Thermodynamic classification of elements into essential, structural, major and trace elements

3.2 Partitioning of element during mineral formation; chemical reactions involving proton and electron transfers.

3.3 Factors controlling Soil formation, Soil major nutrients and Trace elements,

3.4 Effects of modern agriculture on soil geochemistry.

Unit IV: Geological Processes and Geochemical Sampling

4.1 Sampling and Geochemical sample preparation.

4.2 Geological processes and their geochemical signatures,

4.3 Abundance of elements in the bulk earth, crust, hydrosphere, atmosphere and biosphere.

Unit V: Chemical Weathering and Isotope Geochemistry

5.1 Chemical weathering of rock-forming minerals,

5.2 Paleosols and past climate.

5.3 Health aspects of geochemistry in modern environment,

5.4 Radioactivity, decay of parent and growth of daughter nuclides and methods of radiometric dating,

5.5 Stable isotopes, their fractionation and application to paleoclimates.

Book References:

1. Faure, G (1998) Principles and Applications of Geochemistry. 2nd Edition Prentice- Hall, New Jersey
2. Hoefs, J (1986) Stable isotope geochemistry 3rd edition. Spriger- Verlag, Berlin.
3. Mason, B (1986). Principles of Geochemistry. 3rd Edition, Wiley New York.
4. Holme (1992). Principles of Physical Geology. Chapman & Hall.

Semester –II

Subject Course Code: PGEVS2E011T **Credits: 4**

Subject Course Title: Advances in Atmospheric Environment

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit-I: Emerging field of bio-aerosols

1.1 Definition, nature, sources and types of bio-aerosols

1.2 Traditional methods of characterization: cultivation and microscopy

1.3 Modern methods of analysis: molecular techniques, optical and non-optical methods

1.4 Atmospheric transport of bio-aerosols

Unit-II: Carbonaceous aerosols

2.1 Carbonaceous aerosols and their composition

2.2 Major compound classes and atmospheric tracers used in source apportionment

2.3 Methods for determination of carbonaceous aerosol components: TC, OC and EC

2.4 Recent advances in carbonaceous aerosol research

Unit-III: Application of chemical transport and statistical models

3.1 Air quality parameters and the concept of Air Quality Index (AQI)

3.2 Source apportionment methods and their importance

3.3 Types of Atmospheric Chemical Transport Models

3.4 Box Models: The Eulerian and Lagrangian Box Model

Unit-IV: Understanding the aerosol - climate change connection

4.1 Optical properties of aerosols

4.2 Aerosol scattering and colors in the atmosphere

4.3 Hygroscopic properties of aerosols, homogeneous and heterogeneous nucleation

4.4 Influence of aerosols on the climate system

Unit-V: Aerosols and climate in the Himalayan region

5.1 Concept of atmospheric brown clouds

5.2 Black Carbon and its impact on Himalayan glaciers

5.3 Biomass burning: causes of biomass burning and its impacts on climate.

5.4 Effect of Climate Change on the Himalayan Ecosystem

References:

8. Gelencsér, A, (2004) Carbonaceous Aerosol, Springer, The Netherlands.

9. Seinfeld, J.H., Pandis, S.N., (2006): Atmospheric Chemistry and Physics: From Air Pollution to Climate Change.Awileyinterscience publication.

10. Gilbert, M. Masters &Ela, W. P. (2007): Introduction to Environmental Engineering and Science. PHI learning Pvt Ltd

11. Andrews, D. G. (2010): An introduction to atmospheric physics, 2nd Edition, Cambridge university press.

Course Code : PGEVS2E012T **Credit :4**

Course Title : Advances in Meteorology and its Applications,

CLOs: This course enables the students in a variety of ways such as

- Advancement of atmospheric variable measurement as conventional and non-conventional methods
- Technology which are being used as long-range monitoring of weather system across the country as early warning system
- Satellite observations which have potential to shift the ability at exponential level to improve the fore see the climatic and other events and required mitigation
- Computational advancement to predict future of the earth's climate for planning and mitigation measure for weather and climate of the world and India as well

Semester –II

Subject Course Code: PGEVS2E012T **Credits: 4**

Subject Course Title: Advances in Meteorology and its Application

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit-1: Introduction

1.1. Meso-scale meteorology,
1.2. sea and land breezes,
1.3. Mountain/valley winds, mountain wave,
1.4. satellite, radar observations,

Unit-II: Satellite Meteorology

2.1. Meteorological satellites, Current and future meteorological satellites of the world,
2.2. Characteristics of various channels,
2.3. Identification of typical clouds and weather systems from cloud imageries,
2.4. Use of various satellite-derived products.

Unit-III : Weather Radars

3.1. Introduction to Weather radars,
3.2. Different frequency bands used in the weather radars and their applications,
3.3. Principle of Doppler Weather radar,
3.4. Derived DWR products, DWR and its application in prediction.

Unit-IV: Weather Monitoring tools

4.1. Principle of Radiosonde,
4.2. RS/RW observation, Meteorological Balloons, AWS,
4.3. Introduction to Windprofiler,
4.4. Global climatological observing System (GCOS System)

Unit-V: Numerical Weather Prediction

5.1.NWP, Global Forecast System,
5.2. Regional and mesoscale forecast system,
5.3. Nowcast model, Different NWP products; Direct and Derived,
5.4. Post processing of model output, NWP Application in severe and depression systems.

Reference Books:

1. Monsoon Meteorology by C.P. Chang & T.N. Krishnmoorthy
2. Mesoscale Meteorological Modelling by Roger A. Pielke
3. Mesoscale Atmospheric Circulation by B.W. Atkinson
4. Tropical Meteorology" by T.N. Krishnamurthy, WMO Publication.
5. Introduction to Boundary Layer Meteorology" Stull
6. The Atmospheric Boundary Layerby R.M. Stewart, WMO-523
7. Climate Change: The Science of Global Warming and Our Energy Future by Edmond Mathez
8. Tropical Meteorology Volume I & II by G.C. Asnani
9. Synoptic Meteorology by M.Kurz

Semester –II

Subject Course Code: PGEVS2E013T **Credits: 4**

Subject Course Title: Geomorphology and Himalayan Geology

Duration of Examination: 3 Hours **Maximum Marks: 100**

Unit-I : Evolution of landforms

1.1 Fundamental concepts of geomorphology; drainage patterns

1.2 Earth surface features, Landforms and their evolution: structural and lithological control

1.3 Detailed study of geological processes involved in the building of land forms

1.4 General degradational processes, processes of rock weathering and their effects on landform

Unit-II : Geological Processes

2.1 Mountain building processes

2.2 Geosynclines, evolution, classification and significance

2.3 Fluvial processes and landforms, morphology of ocean floor

2.4 Glacial and Aeolian processes and landforms

Unit-III : Soils, Karst topography, slope instability

3.1 Soils, their development and types

3.2 Processes and features of karst geomorphic cycle

3.3 Mass movements - causes

3.4 Hill slope instability, controls and mitigation

Unit-IV : Evolution of Himalayas

4.1 Geological and Geographical sub-divisions of Himalayas

4.2 Origin of Himalayas, different phases in evolution of Himalayas

4.3 Study of major groups and formations of Himalayas

4.4 HFF (Himalayan frontal fault), MBT (main boundary thrust), MCT (main central thrust)

Unit-V : Seismology

5.1 Seismology: seismic waves

5.2 Intensity and isoseismic lines, earthquake belts

5.3 Earthquake zones of India, Seismograph

5.4 Neo-tectonics and causes of earthquakes

Suggested Readings

1. Duff. D. (1993). Homes´ Principles of Physical Geology, 4 th Ed. Chapman & Hall. London.
2. Leet, L.D. and Judson, S. (1969). Physical Geology, 3rd Ed. Prentice Hall of India, New Delhi.
3. K.S. Valdiya (1998). *Dynamic Himalaya* Orient Blackswan.
4. K.S. Valdiya (1998). Aspects of Tectonics Tata-McGraw Hill, New Delhi.
5. E.W.Spencer (1972) Dynamic of earth, 5th Ed. John Wiley & Sons: London.

Semester –II

Subject Course Code: PGEVS2F009T **Credits: 2**

Subject Course Title: Fundamentals of Earth and Environmental Sciences

Duration of Examination: 2 Hours **Maximum Marks: 50**

Unit-I: Introduction to Origin of Earth

1.1 General characteristics and origin of the Universe, Solar System and its planets, Plate tectonics, Mountain building, Detailed Classification of igneous, sedimentary and metamorphic rocks.

1.2 Primary differentiations of the earth and Interior of earth

1.3 Geodynamic elements of Earth: Mid Oceanic Ridges, trenches, transform faults and island arc, geological time scale

1.4 Earthquake and Distribution of earthquake belts

Unit-II: Geomorphology and Oceanography

3.1 Basic concepts of geomorphology

3.2 Introduction to global geomorphology and overview of Indian geomorphology

3.3 Minerals: definition and classification, physical and chemical composition of common rock forming minerals.

3.4 Basics of crystal symmetry,basics of hydrosphere and its component, Elementary Oceanography, chemical composition of ocean

Unit-III: Geological Hazards and Engineering Geology

4.1 Geology vs. Engineering

4.2 Environmental considerations related to civil engineering projects

4.3 Construction materials

4.4 Geological hazards (landslides and earthquakes) their significance, causes and preventive/remedial measures,

4.5 Scope of hydrogeology and its societal relevance, Geological formations as aquifers, types of aquifers, geological classification of aquifers, springs

Reference Books

1 Singh, S. 1998. Geomorphology. Prayag PustakBhavan, Allahabad.

2 Todd, D.K. Groundwater hydrology, 2nd Ed., John Wiley & Sons, N.Y.

3 Emiliani, C, 1992. Planet Earth, Cosmology, Geology and the Evolution of Life and Environment. Cambridge University Press.

4 Press and Siever, The Earth; W.H. Freeman

5 Skinner & Porter, The Dynamic Earth; Wiley

6 Sharma, H.D., and Reddy, K.R., Geoenvironmental Engineering: Site Remediation, Waste Containment and Emerging Waste Management Technologies, John Wiley & Sons, Inc., Hoboken, New Jersey, 2004.

7 C.M.R. Fowler, The solid earth: An introduction to Global Geophysics, Cambridge University Press, 2005.

जम्मू केंद्रीय विश्वविद्यालय

Central University of Jammu

रायाॅसूचानी; बागला, जिला संबा–181143 जम्मू; जम्मू एवं कश्मीर

Rahya- Suchani (Bagla), District **Samba – 181143, Jammu (J&K)**

No. 4-1/EVS/CUJ/Reg/2021/ November, 2021

NOTIFICATION No. / 2021

Sub: Course Scheme and Syllabus of **3rd** and **4th** **Semester** of M.Sc. in Environmental Sciences w.e.f. Academic Session **2020-21** – Reg.

Ref: i) Notification No. 57 dated 29.10.2018
ii) Notification No 4-8/EVS/CUJ/Reg/2013/1701 dated 28.09.2016

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It is hereby notified for the information of all concerned that on the recommendation of the Board of Studies, Department of Environmental Sciences, School Board, School of Life Sciences, the Academic Council has approved following **Course Scheme** and **Syllabus** of **3rd** and **4th** **semester** of M.Sc. Environmental Sciences w.e.f. Academic Session **2020-21**.

Semester III

Course Code	Course Title	Credit	CIA	MSE	ESE	Max. Marks
Core Courses						
PGEVS3C001T	Environmental Technology	4	25	25	50	100
PGEVS3C004T	Environmental Chemistry	4	25	25	50	100
PGEVS3C005T	Disaster Management	4	25	25	50	100
PGEVS3C007L	Lab Course I	2	-	-	-	50
PGEVS3C008L	Lab Course II	2	-	-	-	50
MOOC available on SWAYAM		-	-	-	-	-
Interdisciplinary course (Offered to Other Department)						
PGEVS3I006T	Introduction to Ecology and Environmental Sciences	4	25	25	50	100
Foundation course						
PGEVS3F005T	Remote Sensing GIS	2	12.5	12.5	25	50
Total		**22**				**550**

Semester IV

Course Code	Course Title	Credit	CIA	MSE	ESE	Max. Marks
Core Courses						
PGEVS4C001D	Dissertation	8		50	50	100
PGEVS4C001T	Environmental Impact Assessment	4	25	25	50	100
PGEVS4C002T	Environmental Management System	4	25	25	50	100
PGEVS4C004L	Environmental Laws, Policies and Ethics	4	25	25	50	100
Interdisciplinary course (Offered to Other Department)						
PGEVS4I007T	Current Environmental Issues and Concern	4	25	25	50	100
MOOC Courses (Any One)						
To be opted as per availability on SWAYAM						
TOTAL		**24**				**550**

Deputy Registrar
(Admin – HR)

Encl: Syllabus of III and IV Semester

To:

Head, Department of Environmental Sciences

Copy to:

OSD (Exam)

Credits:4

Course Code: PGEVS3C001T

Course Title: Environmental Technology

Course Learning Outcomes (CLOs): After the successful completion of this course, the student will be able to

- Understand the importance of microorganisms in our environment
- Gain knowledge on structure and classification of bacteria, virus and fungi
- Learn about the biotechnological techniques used for genetic engineering and GMOs
- Understand the bioremediation techniques and zero waste techniques

Semester – III

Course Code: PGEVS3C001T Credits: 4
Course Title: Environmental Technology
Duration of Examination: 3 Hours Maximum Marks: 100

UNIT I: TYPES OF MICROBES AND THEIR IMPORTNACE

1.1 Environmental microbiology: definition, concept, scope and importance
1.2 Classification and structure of microorganisms (Bacteria, virus and Fungi)
1.3 Microbes in agriculture : bio-fertilizers
1.4 Food microbiology - micro-organisms of food, microbes in food production, food spoilage – fish and meat, food poisoning and its prevention

UNIT II: MICROBES AND ENVIRONMENT

2.1 Microbial Methods: types of culture, techniques used in enrichment of culture, method of pure culture, preparation, maintenance and preservation of microbial culture, sterilization and disinfection,
2.2 Microbes and environment: role of microorganisms in natural system and artificial system; microbes and nutrient cycles
2.3 Microbial communication system; microbial fuel cells; prebiotics and probiotics; vaccines.
2.4 Microbiology of water, air and soil; environmental aspects of infectious diseases (water born diseases)

UNIT III: BASIC BIOTECHNOLOGY

3.1 Structures and function of DNA
3.2 Gene expression
3.3 Introduction to cloning and recombinant DNA technology/genetic engineering: restriction enzymes, cloning vectors, agarose and polyacrylamide gel electrophoresis, automated DNA sequencing, genome resources, PCR, environmental applications of genetic engineering.
3,4 Development of Genetically modified organisms GMOs (transgenic plants and animals); GMOs for human welfare; consequences of GMOs on environment; issues related to Bt cotton and Btbrinjal

UNIT IV: ENVIRONMENTAL BIOTECHNOLOGY

4.1 Environmental Biotechnology in Pollution Control, Bioremediation: role of microbe, plants and GEMs.
4.2 Integrated system for biodegradation of PCBs, halogenated hydrocarbons, PAHs, pesticides and detergents; biodegradable plastics production from microorganisms.
4.3 Role of biotechnology in reclamation of wasteland; bioprospecting ;biopiracy, Biocomposting: Microbial process involvement; biopesticides production; biomining; biomethanation.
4.4 Development of gene probes for environmental remediation; biosensors.

UNIT V: NANOTECHNOLOGY AND GREEN TECHNOLOGY

5.1 Nanotechnology: Introduction, scope and applications.

5.2 Nanostructures and properties; metal nanoparticles; applications of nanoproducts.

5.3 Green technology: Introduction and tools, basic principles of Green technology; production of green technology based products; concept of Atom economy; Zero waste technology.

5.4 Biopolymers and bioplastics.

Suggested Readings:

1. Scragg, A.H., Environmental Biotechnology. Oxford University Press.
2. Rittmann, B. E. and McCarty, P.L., Environmental Biotechnology: Principles and applications. McGraw Hill.
3. Evans, G.M. and J.C. Furlong. Environmental Biotechnology: Theory and application. John Wiley and Sons Publication.
4. Microbiology 6th ed: Purohit, Agrobios
5. Global environmental Biotechnology : D. L. Wise
6. Methods in Biotechnology : Hans Peter Schmauder

Course Code : PGEVS3C004T **Credit: 4**

Course Title: Environmental Chemistry

After the successful completion of this course, the student will be able to

- Understand the basics of sampling and analysis.
- Apply knowledge of fundamental chemistry in daily life.
- Have practical experience of air, water and soil chemistry.

Semester-III

Course code: PGEVS3C004T **Credits: 4**

Course Title: Environmental Chemistry

Duration of Examination: 3 Hours **Maximum Marks: 100**

UNIT-I: FUNDAMENTALS OF ENVIRONMENTAL CHEMISTRY

1.1 Mole Concept, Solution Chemistry, solubility product, Solubility of gases, Phase change

1.2 Laws of thermodynamic- first, second and third, Stereochemistry

1.3 Gibbs enthalpy, Chemical Potential, Chemical Equilibrium, Acid-base reactions

1.4 Sources of natural and artificial radiations, Applications and handling of isotopes and other radionuclides in the environment

UNIT-II: ATMOSPHERE CHEMISTRY

2.1 Major and trace gases in the atmosphere; Physical and chemical attributes of aerosols; sources, fate and sink of ambient aerosols

2.2 Thermo-chemical and photochemical reactions in the atmosphere

2.3 Tropospheric oxidation-reduction processes, smog formation; stratospheric and surface ozone, acid rain

2.4 Role of hydrocarbons, oxides of sulphur and nitrogen, halogens in the atmosphere; chemical speciation, particles, ions, and radicals in the atmosphere

UNIT-III: CHEMISTRY OF WATER AND SOIL

3.1 Water chemistry: Structure and properties of water, Water quality parameters, Physicochemical concepts of color, odor, turbidity, pH, conductivity, DO, COD, BOD, alkalinity, carbonate system in water, redox reactions, eutrophication

3.2 Soil Chemistry: Physio-chemical composition of the soil, humus, Inorganic and organic components of soil, nutrients (NPK) in soil, the significance of C:N ratio, Cation exchange capacity (CEC), Reactions in soil solution

UNIT-IV: CHEMISTRY OF ORGANIC AND INORGANIC POLLUTANTS

4.1 Hydrocarbons: Chemistry of hydrocarbon decay, environmental effects, effects on macro and microorganisms

4.2. Surfactants: Cationic, anionic and non-ionic detergents, modified detergents.

4.3 Pesticides: Classification, degradation, analysis, pollution due to pesticides – DDT and Endosulfan

4.4. Heavy metals: Toxic effects of Cd, Pb & Hg.

UNIT-V: GREEN CHEMISTRY AND GREEN TECHNOLOGY

5.1 New trends in green chemistry, Basic principles, Atom economy concept and its environmental importance

5.2 Green reagents, Green solvents, Green technology, minimization of energy consumption

5.3 Microwave heating & pollution, Ultrasound technique, Industrial Ecology

REFERENCE BOOKS:

1. Mannahan, S.E. Environmental Chemistry. 9th Edition, CRC Press
2. Foth, H.D. Fundamentals of Soil Science. Wiley press
3. Gole, G.A. Text book of Limnology. Waveland Pr. Inc. Press
4. Sharma, B.K. and Kaur, H. Environmental Chemistry-Sharma & Kaur, Goel Publishing House
5. De, A. K. Environmental Chemistry, New Age International
6. Lancaster M.(2002). Green Chemistry: An Introductory Text, RSC Publishing, UK.
7. Clark J. H. and Macquarrie, D. J. (2002). Handbook of Green Chemistry and Technology, Wiley-Blackwell, UK.

Course Code: PGEVS3C005T **Credit :4**

Course Title: Disaster Management

Course Learning Outcomes (CLOs): On completion of this course the students will able to:

- Integrate knowledge analyze, evaluate and manage the different public health aspects of disaster events at a local and global levels, will develop the skills to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
- Will develop the skills on the knowledge and understanding of the International Strategy for Disaster Reduction (UN-ISDR) along with the implementation of Disaster Risk Reduction (DRR) Strategy.
- Build skills to disaster response.
- Understand approaches of Disaster Management

Course Title: Disaster Management **Course Code: PGEVS3C005T**
Duration of Examination: 3 Hours **Maximum Marks: 100**
Credits: 4

UNIT I: INTRODUCTION TO DISASTERS

1.1 Understanding a disaster; Hazard, vulnerability, Resilience and risks
1.2 Distinction between a disaster and a hazard;
1.3 Natural disasters: Meaning and nature of natural disasters, their types and effects.
1.4 Human -made disasters: Meaning and nature of Human-made disasters, their types and effects
1.5 Impacts of Disasters

UNIT II: NATURAL AND HUMAN-MADE DISASTERS

2.1 Geological and geomorphic disasters
2.2 Hydrological disasters
2.3 Climatic change: global warming, Ozone depletion, acid rain.
2.4 Nuclear, Chemical and Biological disasters(Epidemics and disease outbreaks)
2.5 Fires, air and water pollution; Deforestation and desertification

UNIT III: DISASTER MANAGEMENT CYCLE

3.1 Disaster management cycle: Introduction
3.2 Phase I : Mitigation
3.3 Phase II : Preparedness
3.4 Phase III : Response
3.5 Phase IV : Recovery

UNIT IV: HEALTH AND SOCIAL ISSUES ASSOCIATED WITH DISASTERS

4.1 Major health and social issues: communicable and vector related diseases, environmental health challenges, physical, socio-economic and emotional impacts, most vulnerable groups to disaters
4.2 Pre-disaster management plan, personnel training ,volunteer assistance, School based Programmes
4.3 Hazardous material, storing and handling, coping with exposure to hazardous materials
4.4 Education and public awareness about a) community based Initiatives b) Non Government Organizations (NGOs), regional and International organizations / donor agencies, methods of dissemination, c) Advantages and disadvantages of the community based approach
4.5 Emergency Management Systems; GIS applications

UNIT V: DISASTER MANAGEMENT

5.1 Pre-Disaster mitigation plan, personnel training, volunteer assistance, school-based Programmes
5.2 Education and public awareness about disasters

5.3 Community based Initiatives, NonGovernment Organizations (NGOs), regional (Panchayati Raj Institutions (PRIs)/ Urban Local Bodies (ULBs)) and International organizations.
5.4 Emergency Management Systems; GIS applications
5.5 Disaster Management Act and Policy

REFERENCE BOOKS:

1. Coppola P Damon, 2011, 2nd edition. Introduction to International Disaster Management, Butterworth-Heinemann Press.
2. Cuny, F. 2010.Development and Disasters, Oxford University Press.
3. Gupta Anil K, Sreeja S. Nair. 2011. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi.
4. Kapur Anu 2010: Vulnerable India: A Geophysical Study of Disasters, IIAS and Sage Publishers, New Delhi.
5. IFRC, 2005. World Disaster Report: Focus on Information in Disaster,pp.182-225

Course Title: Remote Sensing and GIS **Credits: 2**
Course Code: PGEVS3F005T

1. **Course Learning Outcomes (CLOs):** On completion of this course the students will able to:
   - Understand the fundamental concept and practice of GIS and its advancement.
   - Design creative application of geospatial technology.
   - Demonstrate the use of GIS to create interactive map for user's choice.
   - Understand the skill required for professional level.

Semester – III

Course Code: PGEVS3F005T **Credits: 2**

Course Title: Remote Sensing and GIS

Duration of Examination: 2 Hours **Maximum Marks: 50**

UNIT I: REMOTE SENSING AND IMAGE INTERPRETATION

1.1 Remote Sensing – fundamentals, Platforms in remote sensing, Satellites and their characteristics

1.2 Basic principles, types, steps and elements of image interpretation.

1.3 Concept of digital image processing. Image enhancement techniques, Concept of Spatial Filtering and edge Enhancement

1.4 Concept of Supervised and unsupervised classification and classification accuracy assessment

UNIT II:FUNDAMENTALS OF GIS AND GPS

2.1 GIS concepts, Coordinate system and projections**,** GIS data modeling

2.2 Basic concepts of cartography, Data structures- vector and raster data

2.3 Data inputting, data storage, data editing, Hardware and Software requirement for GIS.

2.4 Basic principles of global positioning system (GPS). GPS measurements and accuracy of GPS

UNIT III:APPLICATION OF GIS AND REMOTE SENSING

3.1 Remote sensing based land use/land cover mapping.

3.2 Remote Sensing & GIS application in hazard zonation mapping.

3.3 Remote sensing of water resources, Drainage mapping, flood mapping.

3.4 Remote sensing application in forest cover mapping.

Suggested Readings:

1. Lillesand Kiefer Chipman: Remote sensing and Inmage interpretation, Willey
2. Stephen Wise: GIS Fundamentals (Second Edition), CRC Press
3. Robert A. Schowengerdt: Remote Sensing, Elsevier

Course Code: PGEVS3I006T **Credit :4**

Course Title : Introduction to Ecology and Environmental Sciences

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

- Understand the basics of discipline of ecology and environmental sciences.
- Gain fundamental understanding of some important concepts of ecology at population and community level.
- Understand the basics of environment and important concepts of environmental physics and chemistry.

Semester – III

Course code: PGEVS3I006T **Credits: 4**

Course Title: Introduction to Ecology and Environmental Sciences

Duration of Examination: 3 Hours **Maximum Marks: 100**

UNIT I: INTRODUCTION

1.1 Introduction to Ecology and environmental sciences

1.2 Branches of ecology

1.3 Ecological factors

a) Abiotic

b) Biotic

c) Edaphic

1.4 Law of Minimum and law of Tolerance

UNIT II: COMPONENTS OF ENVIRONMENT

2.1 Atmosphere

2.2 Hydrosphere

2.3 Lithosphere

2.4 Biosphere and its components

UNIT III: INTRODUCTION TO ECOSYSTEM

3.1 Concept of Ecosystem

3.2 Energy flow in Ecosystem

3.3 Primary and secondary Productivity

3.4 Concept of Food chain, Food Web and Ecological Pyramids

UNIT IV: NATURAL RESOURCES AND THEIR CONSERVATION

4.1 Concept of Reserve and Resource

4.2 Classification of Natural Resources

4.3 Renewable and Non-renewable Resources: water, land, minerals, etc.

4.4 Resource management and Conservation

UNIT V: ENVIRONMENTAL ISSUES

5.1 Global Warming and Climate change

5.2 Ozone Layer depletion and UV-Exposure

5.3 Deforestation

5.4 Acid Rain, Smog

Suggested Readings:

1. Kormandy, E.J. Concepts of Ecology. 4th Edition. PHI Learning, New Delhi.2012
2. Odum, E.P. and Barrett, G.W. Fundamentals of Ecology. 4th Edition.Cengage Learning India Private Limited.2012
3. Subramanyam, N.S and Sabamurty, A.V.S 2nd Edition. Narosa Publishing House 2011.
4. Dash, M.C. Fundamentals of Ecology. 3rd Edition. Tata McGrawHill 2011.
5. Vishwanathan Prasad. An introduction to Environment.Rawat Publications. 2012.
6. Vasudevan, Essentials of Environmental Science. Atlantic Publishers. 2011.
7. Tiwari, S.K. Environmental Science. Atlantic Publishers. 2011.
8. Karki, M.M.S. Concise Encyclopaedia of Environment. Atlantic Publishers and Distributors.

Course Code: PGEVS4C001T **Credit:4**

Course Title: Environmental Impact Assessment

Course Learning Outcomes (CLOs): After the successful completion of this course, the student will be able to

- Understand the importance of EIA for any plan/ programme/policy
- Learn about the assessing the environmental impacts due to programme or policy
- Gain knowledge on biodiversity, social and health impact assessments

Semester – IV

Course Title: PGEVS4C001T **Credits: 4**

Course Title: Environmental Impact Assessment

Duration of Examination: 3 Hours **Maximum Marks: 100**

UNIT 1: EIA OVERVIEW

1.1 Historical account, Objectives of EIA, linkage between development and environment

1.2 Relationship of EIA to sustainable development

1.3 EIA in project planning and implementation

1.4 Environmental policy and regulatory guidelines regarding EIA in India1.5, EIA notification.

UNIT 2: EIA PROCESSES

2.1 Assessment of environmental impacts: the EIA approach

2.2 Environmental impact of developmental projects

2.3 EIA processes, Components and techniques

2.4 EIA of major projects case studies (Thermal power plant, River valley project)

UNIT-3: BIODIVERSITY IMPACT ASSESMENT AND RISK ANALYSIS

3.1 Role of BIA in the existing EIA process

3.2 Identification, prediction, and evaluation of impacts on biodiversity

3.3 Restoration and rehabilitation technologies

3.4 Environmental risk: analysis, assessment and management.

UNIT-4: SOCIAL & HEALTH IMPACT ASSESMENT

4.1 Impact of environment on health, Development framework and HIA analysis

4.2 Changing concept and approach in HIA

4.3 Overview and scope of Social Impact Assessment

4.4 Variables for SIA

UNIT-5: INTEGRATED IMPACT ASSESMENT (ENVIRONMENTAL, SOCIAL AND HEALTH)

5.1 Land use pattern and Land use policy of India, Urban and rural planning,

5.2 Concept of economic analysis, Scope for integrated approach in economic analysis

5.3 Cost benefit analysis and cost effectiveness analysis

5.4 Role and relevance of GIS techniques in EIA

REFERENCE BOOKS:

1. Canter, L. W. and Graw, Mc, Environmental Impact Assessment, Hill Publication, New York.
2. Vanclay F. and Bronstein, D.A. (1995), Environmental and social impact assessment, John Wiley & Sons, New York.
3. Bathwal, R.R (1988) Environmental Impact Assessment, New age Publication
4. Clark, B. D., Bissel, B. D. and Watheam, P. EIA – A Biography.
5. D. P. Lawrence (2003) Environmental Impact Assessment: Practical Solutions to RecurrentProblems, John Wiley and Sons, New Delhi.

Course Code: PGEVS4C002T **Credit:4**

Course Title : Environmental Management System

Course Learning Outcomes (CLOs): On completion of this course the students will able to:

- Describe organizations as systems and their role in environmental management
- Explain how environmental management can be used as environmental protection and how
- Organizations can define and manage risk.
- Understand the concept of PDCA cycle, Ecolabelling and Conducting the complete Life cycle analysis (LCA) of Product
- Develop skill for Green and Environmental Auditing

Semester – IV

Course Code: PGEVS4C002T **Credits: 4**
Course Title: Environmental Management System
Duration of Examination: 3 Hours **Maximum Marks: 100**

UNIT 1: OVERVIEW OF EMS

1.1 Environmental management system structure
1.2 Context of environmental management, overview of the state of the global environment
1.3 Introduction to EMS evaluation tool
1.4 Element and extent of application

UNIT 2: ISO-14000

2.1 Background
2.2 ISO-14000 series
2.3 Business and standards, ISO-14000 and world practices
2.4 ISO in developing World

UNIT-3: AUDITING

3.1 Scope and objectives
3.2 Standard for auditing, registration and implementing the audit
3.3 Procedures and benefits
3.4 Environmental auditing as a management tool and A Case study

UNIT 4: LIFE CYCLE ASSESSMENT (LCA)

4.1 Components of LCA
4.2 Measuring environmental impact (Life cycle stages of product, boundaries, functional unit, benefits of LCA)
4.3 Strategic framework for LCA
4.4 LCA- a tool for sustainability and A Case study

UNIT 5: RECENT CONCEPTS OF CORPORATE EMS

5.1 ISO-14062 – corporate EM
5.2 Principles of clean production, packaging, sustainable procurement
5.3 Social responsibility and function of corporate houses
5.4 Eco-labeling, ecological and carbon footprints (ISO 14064-65) and A Case study

REFERENCE BOOKS:

1. Christopher S. and Mark Y. (2007) Environmental Management Systems, (third edition), Earthscan Publications
2. David L.G. and Stanley B.D. (2001) ISO 14000 Environmental Management, Prentice Hall.
3. Madu C.N. (2007) Environmental Planning and Management, Imperial College Press.
4. Kenneth M.M. (1999). Basic concepts in Environmental Management System, Boca Raton FL, Lewis

Course Code: PGEVS4I007T **Credit:4**

Course Title: Current Environmental Issues and Concern

CLOs: This course will enable the students to understand

- Women, children and media role to conserve the nature from their place itself
- Highlighting the burning environmental concerns in front of society to aware and act
- Putting some case studies of conservation model to show the implementability of effort
- Modifying the people's perceptions towards nature through highlighting natures contribution for life survival.

Semester – IV

Course Code: PGEVS4C004T **Credits: 4**

Course Title: Environmental Laws, Policies and Ethics

Duration of Examination: 3 Hours **Maximum Marks: 100**

UNIT I: INTERNATIONAL EFFORTS FOR ENVIRONMENTAL PROTECTION

1.1 UN Conference on Human Environment, 1972

1.2 UN Conference on Environment and Development, 1992

1.3 UN Convention on Biological Diversity, 1992, UN Framework Convention on Climate Change, 1992

1.4 Kyoto Protocol, 1997 and Post Kyoto Developments, Sustainable Development : Salient features

UNIT II: ENVIRONMENTAL POLICIES AND ETHICS

2.1 National Environment Policy, 2006: Salient Features

2.2 National Action Plan on Climate Change, 2008

2.3 Environment Ethics with special reference to Ancient India

2.4 Environmental Movement in India

UNIT III: ENVIRONMENT PROTECTION AND LAW

3.1 Indian Constitution and Environment Protection

3.2 Judicial activism towards environment Protection

3.3 Environment Protection Act, 1986

3.4 Public Liability Insurance Act, 1991, National Green Tribunal Act, 2010

UNIT IV: POLLUTION ABATEMENT AND THE LAW

4.1 The Water (Prevention and Control of Pollution) Act, 1974

4.2 Hazardous Wastes(Management , Handling and Transboundary Movement) Rules, 2008

4.3 Explosive Act1872, Explosive substances act-1908, Mines and Minerals (Regulation and Amendments), Mines and Minerals (regulation and Development) Act, 1957

4.4 Insecticides Act,1968, Atomic Energy Act, 1962, Factories Act, 1948

UNIT V: NATURAL RESOURCES CONSERVATION AND LAW

5.1. Wildlife Protection Act, 1972: Relevant Features

5.2 Forest Conservation Act, 1986

5.3. Biological Diversity Act 2002

REFERENCE BOOKS:

1. S. Diwan and A. Roscencranj, Environmental Law and Policy in India, Oxford Pub.
2. P. Leelakrishan, Environmental Law in India, Butterworths Kladhira (2008)
3. P.S. Jaswal, Environmental Law (Pioneer Publications)
4. S. Lal Commentaries on Water, Air and Environmental Pollution
5. D.S. Senegar, Environmental Law, Transnational Publishers.
6. SC Shastri, Environmental Law in India (Eastern Book Company)

Course Code: PGEVS4I007T **Credit:4**

Course Title: Current Environmental Issues and Concern

CLOs: This course will enable the students to understand

- Women, children and media role to conserve the nature from their place itself
- Highlighting the burning environmental concerns in front of society to aware and act
- Putting some case studies of conservation model to show the implementability of effort
- Modifying the people's perceptions towards nature through highlighting natures contribution for life survival.

Semester – IV

Course Code: PGEVS4I007T **Credits: 4**

Course Title: Current Environmental Issues and Concerns

Duration of Examination: 3 Hours **Maximum Marks: 100**

UNITI: I: ENVIRONMENTAL AWARENESS

1.1 Environmental education: formal and in-formal methods; role of media in environmental awareness, role of NGOs, public participation in environmental movements

1.2 Current environmental issues, Stockholm Declaration, Earth summit, Vienna convention

1.3Montreal Protocol, Kyoto Protocol, Agenda 21, Environmental ethics

1.4 Sustainable development-principles and practices in relation to economics and ecology

UNIT-II GLOBAL ENVIRONMENTAL ISSUES

2.1 Biodiversity loss, Climate change,

2.2 Ozone layer depletion, Sea level rise,

2.3 Acid Rain, Forest fires

2.4 Carbon sequestration and carbon credits

UNIT-III: ENVIRONMENTAL DISASTERS

3.1 Flood, Landslides, Tsunamis, Earthquake, Volcanoes

3.2 Minamata Disaster, Love Canal Disaster

3.3 Bhopal Gas Disaster, 1984; Chernobyl Disaster, 1986; Fukushima Daiichi nuclear disaster.

3.4 COVID-19 pandemic: impacts and effects on environment and society

UNIT-IV: WASTE MANAGEMENT

4.1 Waste Management – Swachha Bharat Abhiyan

4.2 Solid waste and its management

4.3 Hazardous waste and its management

4.4 E-waste and its management; Plastic waste and its management

UNIT-V: CURRENT ENVIRONMENTAL ISSUES IN INDIA

5.1 Environmental issues related to water resource projects - Narmada dam, Tehri dam, Almatti dam, Cauvery and Mahanadi, Hydro-power projects in Jammu & Kashmir, Himachal and North-Eastern States.

5.2 Water conservation-development of watersheds, Rain water harvesting and ground water recharge

5.3 National river conservation plan – Namami Gange and Yamuna Action Plan.

5.4 Eutrophication and restoration of lakes. Conservation of wetlands, Ramsar sites in India

REFERENCE BOOKS:

1. Steie, G. Economics and Environment
2. Srivastav, Sweta. Basics of Environmental Science**,** Anmol Publications Pvt Ltd.
3. Bhatt, S. Environment protection and sustainable development, APH Publishing Corporation
4. Vishwanathan Prasad. An introduction to Environment.Rawat Publications. 2012.
5. Vasudevan, Essentials of Environmental Science. Atlantic Publishers. 2011.
6. Tiwari, S.K. Environmental Science. Atlantic Publishers. 2011.