Course Structure along with credit distribution for P.G Diploma in Environmental Management (From batches 2026-27 and onwards)

First Semester for 1-year Adv. P.G. Diploma program

Adv. P.G. Diploma program First Semester						
Course Code	Course Category		Course Title	Credits		Total Credit
				T	P	
SOLS/APGDEE -C-001	DSC-1		Fundamentals of Environmental Study	**3**	**2**	**5**
SOLS/APGDEE - C-002	DSC-2		Environmental Economics and Green Development	**3**	**2**	**5**
SOLS/APGDEE -C-003	DSC-3		Green Business, IPR and International Agreements	**3**	**2**	**5**
SOLS/APGDEE - SEC-001	SEC-1	Opt any one out of two	Ecosystem Restoration and Management	**3**	**2**	**5**
SOLS/APGDEE - SEC-002	**SEC-1 Vocational**		Field Visit	**5**	**0**	**5**
SOLS/APGDEE - DSE-001	DSE-1	Opt any one out of two	Environmental Monitoring and Pollution Control	**3**	**1**	**4**
SOLS/APGDEE - DSE-002			Mountain Ecology	**3**	**1**	**4**
OR						
SOLS/APGDEE - MDE-001	MDE-1	Opt any one out of two	Human–Wildlife Conflict	**3**	**1**	**4**
SOLS/APGDEE - MDE-002			Himalayan Bioresources and Management	**3**	**1**	**4**
OR						
SWAYAM 1	Opt any one out of two		Climate and Environmental Protection	**4**	**0**	**4**
SWAYAM 2			Rural Water Resource Management	**4**	**0**	**4**
AEC	**AEC (Non-CGPA Course)**		Indian Knowledge System	**1**	**0**	**1**
Total Credit				**15**	**09**	**24**

Note: ***1. In lieu of SEC the departments may offer any one course i.e. skill-based courses/Vocational Course work of 5 credits.***

2. In lieu of DSE the departments may offer any one course i.e. Field work based/Swayam Course work of 4 credits.

3. The University shall provide a common syllabus for the course titled "*Indian Knowledge System*."

Second Semester for 1-year Adv.P.G. Diploma program

Adv.P.G. Diploma program Second Semester						
Course Code	Course Category		Course Title	Credits		Total Credit
				T	P	
SOLS/APGDEE - C-004	DSC-4		Ecosystem Services and their valuation	**3**	**2**	**5**
SOLS/APGDEE - C-005	DSC-5		EIA and Environmental Auditing	**3**	**2**	**5**
SOLS/APGDEE - C-006	DSC-6		Biodiversity Conservation and Management	**3**	**2**	**5**
SOLS/APGDEE - C-007	DSC-7		Research Methodology and Environmental Statistics	**3**	**2**	**5**
OR						
Optional Component (Research / Skill Oriented) in lieu of DSC			**Option–I: Minor Dissertation / Project Work** *(in lieu of any **one** DSC)*	**5**		**5**
			Option–II: Major Dissertation / Project Work *(in lieu of any **two** DSCs)*	**10**		**10**
SOLS/APGDEE - DSE-003	DSE-2	Opt any one out of two	Environmental Laws and Policies	**3**	**1**	**4**
SOLS/PGDEM - DSE-004			Traditional Ecological Knowledge	**3**	**1**	**4**
OR						
SOLS/APGDEE - MDE-003	MDE-2	Opt any one out of two	Disaster Risk Reduction	**3**	**1**	**4**
SOLS/APGDEE - MDE-004			Spring-shed Conservation and Management	**3**	**1**	**4**
SEC	**SEC (Non-CGPA Course)**		Community outreach activities	**1**	**0**	**1**
Total Credit				**15**	**09**	**24**
NHEQF Level-6.5	***Student on successfully completing one-year Adv. PG Diploma programme (i.e., securing minimum required 48 credits will be awarded "Postgraduate Diploma in Environmental Economics***					

Note: 1. ***In lieu of* DSC *the departments may offer any one course i.e. core paper course/ Minor Dissertation / Project Work of 5 credits. Or Major Dissertation / Project Work*** *(in lieu of any **two** DSCs)* ***of 10 credit***

2 . In lieu of* SEC Non-CGPA Course) *the departments may offer Community outreach activities of 1 credit.

First Semester for 1-year Adv.P.G. Diploma program

Course Code: SOLS/APGDEE -C- 001
Course Title: DSC-1 Fundamentals of Environmental Study (03 credits)

Unit I. Environment

1.1 Definition, scope and importance of Environmental Sciences
1.2 Components of environment: atmosphere, hydrosphere, lithosphere and biosphere
1.3 Concept of Biosphere-2, Technosphere and Noosphere
1.4 Various activities under national environment awareness Campaigns (NEAC)

Unit II. Ecosystem

2.1 Structure and types of an ecosystem
2.2 Energy pathways and ecological processes
2.3 Ecosystem productivity (primary and secondary)
2.4 Biogeochemical cycles: Nitrogen, Carbon, Phosphorus, Sulphur, Water and Oxygen
2.5 Food chain, food web and ecological pyramids
2.6 Ecological succession: primary and secondary succession, climax communities and trends in succession

Unit III. Population, Community, Ecological Succession

3.1 Characteristics of population
3.2 Population growth
3.3 Concept and characteristics of communities (concept of habitat, niche, keystone species, dominant species, flagship species and ecotones)
3.4 Ecological succession: primary and secondary succession, climax communities and trends in succession
3.5 Ecological adaptations (Air, Hill, Stream water, Desert and Deep Sea)

Unit IV. Environmental Issues and Problems

4.1 Green house effect, Global warming and climate change
4.2 Conflicts on emission of green house gases
4.3 Eutrophication
4.4 Mega dams and its impact on Environment
4.5 International and national water disputes and coastal zone conflicts

Course Code: SOLS/APGDEE -C-P-001

Course Title: DSC -1 Practical **(02 Credits)**

Exercise 01: Analysis of various components of ecosystems.

Exercise 02. Determination of soil texture in different terrestrial habitats.

Exercise 03. Calculation of frequency, density and abundance of different ecosystem.

Exercise 04. Calculation of Importance Value Index (IVI) for grassland ecosystems/forest patches.

Exercise 05. Monitoring of biological diversity and calculation of Shannon Wiener diversity index in aquatic/ terrestrial habitats.

Course Code: SOLS/APGDEE-C- 002

Course Title: DSC-2 Environmental Economics and Green Development (03 credits)

Unit I. Fundamentals of Environmental Economics

1.1 Definition, concepts, issues and scope of Environmental Economics

1.2 Concept of the commons, tragedy of commons, externalities (indirect costs), economic goods/ services, supply, demand, intangibles, public goods and bads

1.3 Limitations of Environmental Economics

Unit II. Economic Tools

2.1 Valuing the environment and natural resources

2.2 Ecology and equity

2.3 Natural resource accounting, cost-benefit analysis

2.4 Life cycle assessment (LCA)

Unit III. Sustainable Development

3.1 Principles of Sustainable Development: History and definition of Sustainable Development

3.2 Goals of Sustainable Development

3.3 Approaches from unsustainable to sustainable development

Unit IV. Urbanization and Environmental Economics

4.1 Urban Growth and Environmental Stress

4.2 Economics of Urban Pollution (air, water, waste)

4.3 Sustainable Urban Planning and Transport

4.4 Green Infrastructure and Urban Resilience

Course Code - SOLS/APGDEE-C- P-002

Course Title: DSC -2 Practical (02 Credits)

Exercise 01: To study socio-economic status- Preparing of questionnaire and case studies.

Exercise 02:Inventorization of local NTPFs.

Exercise 03: Economic evaluation of a forest area/lake/river.

Exercise 04: Cost-benefit analysis of a river valley project.

Exercise 05: Market survey for forest products.

Course Code: SOLS/APGDEE-C- 003
Course Title: DSC-3 Green Business, IPR and International Agreements (03 credits)

Unit I: Introduction to Green Business

1.1 Concept, definition and scope of Green Business
1.2 Evolution of green economy and sustainable development
1.3 Principles of sustainability and the Triple Bottom Line approach (People, Plant, Profit)
1.4 Role of green business in achieving Sustainable Development Goals (SDGs)
1.5 Scope, challenges and future prospects of green business in India

Unit II: Tools and Practices of Green Business

2.1 Green production, clean technology and eco-efficient processes
2.2 Green marketing, eco-labeling and green consumer behavior
2.3 Green supply chain management and green logistics
2.4 Carbon footprint, Life Cycle Assessment (LCA) and energy audits
2.5 Corporate environmental responsibility

Unit III: Intellectual Property Rights (IPRs): Concepts and Types

3.1 Meaning, nature and objectives of Intellectual Property Rights (IPRs)
3.2 Patents: concept, procedure, rights and duration
3.3 Copyrights, trademarks and industrial design
3.4 Geographical Indications (GI) and protection of traditional knowledge
3.5 Importance of IPRs in innovation, startups and green technologies

Unit IV: IPRs in the International Framework

4.1 Role and functions of World Intellectual Property Organization (WIPO)
4.2 TRIPS Agreement: objectives and provisions
4.3 IPRs under the World Trade Organization (WTO)
4.4 Technology transfer and access to environmentally sound technologies
4.5 Issues of biopiracy, biodiversity and IPR challenges for developing countries

Course Code- SOLS/APGDEE-C- P-003
Course Title – DSC 3 Practical **(02 credits)**

Exercise 1: Green marketing case study

Exercise 2: Preparation of a green business plan

Exercise 3: Patent search and drafting patent (Google Patents, WIPO, InPASS)

Exercise 4: Copyright and trademark study

Exercise 5: Comparative analysis of major agreements (CBD, UNFCCC, Kyoto, Paris, Ramsar, CITES)

Course Code - SOLS/APGDEE -SEC-001
Course Title -SEC-1 - Ecosystem Restoration and Management (03 Credit)

Unit–I-Fundamentals of Ecosystems and Ecological Restoration

- **1.1** Concept, structure, and functions of ecosystems
- **1.2** Types of ecosystems: Forest, grassland, wetland, freshwater, marine, agro-ecosystems, and mountain ecosystems
- **1.3** Causes and processes of ecosystem degradation
- **1.4** Relationship between conservation, restoration, and sustainable development

Unit–II-Ecosystem Degradation, Assessment, and Restoration Techniques

- **2.1** Land degradation and desertification
- **2.2** Deforestation, habitat fragmentation, and biodiversity loss
- **2.3** Afforestation, reforestation, and revegetation methods
- **2.4** Restoration of degraded forests, grasslands, wetlands, rivers, and mined areas

Unit–III- Ecosystem Restoration and Community Participation

- **3.1** Principles and objectives of ecosystem management
- **3.2** Role of local communities, NGOs, and other stakeholders in restoration programs
- **3.3** Joint Forest Management (JFM) and participatory approaches
- **3.4** Ecosystem restoration for livelihood enhancement and sustainable development

Unit–IV- Policies, Planning and Case Studies in Ecosystem Restoration

- **4.1** Convention on Biological Diversity (CBD), UN Decade on Ecosystem Restoration, Sustainable Development Goals (SDGs)
- **4.2** Indian environmental policies, Forest Policy, Biodiversity Act, CAMPA, and restoration initiatives
- **4.3** Case studies of successful restoration programs in India and the Himalaya
- **4.4** Restoration of degraded Himalayan ecosystems and mountain landscapes

Course Code - SOLS/APGDEE -SEC-P-001
Course Title -SEC-1 – Practical **(02 Credit)**

Exercise 01: Interpretation of Satellite Imagery

Exercise 02: Analysis of spectral signatures of vegetation, soil and water bodies.

Exercise 03: Preparation of thematic maps using GIS software and spatial data.

Exercise 04: Demonstration of image enhancement, classification and image interpretation methods.

Exercise 05 Environmental Modeling Exercises.

Course Code - SOLS/APGDEE -SEC-001
Course Title -SEC-1 – Field Visit (Vocational) (05 Credit)

Field Visit: Opt any one of following:

1. **Ecosystem Study Tour**

   1.1 Field visit to any National Parks, wetlands, forests, rivers, disaster prone areas

   1.2 Preparation and submission of a detailed field study report including observations, data collection, analysis, findings, and recommendations.

2. **Industrial Environmental Management**

   2.1 Visit to industries or industrial areas to study pollution control systems, effluent treatment plants (ETP), and environmental management practices.

   2.2 Preparation and submission of a detailed field study report including observations, data collection, analysis, findings, and recommendations.

3. **Sustainable Agriculture and Rural Ecology**

   3.1 Visit to organic farms, agroforestry systems, and rural communities to understand sustainable farming and natural resource management.

   3.2 Preparation and submission of a detailed field study report including observations, data collection, analysis, findings, and recommendations.

4. **Waste and Water Management Study**

   4.1 Visit to solid waste management facilities, sewage treatment plants (STP), rainwater harvesting sites, and water treatment plants for practical understanding of resource management.

   4.2 Preparation and submission of a detailed field study report including observations, data collection, analysis, findings, and recommendations.

Course Code: SOLS/APGDEE-DSE-001
Course Title: DSE-1 Environmental Monitoring and Pollution Control (03 credits)

Unit I. Environmental Monitoring

1.1 Concept and objectives of environmental monitoring
1.2 Global environmental monitoring system (GEMS)
1.3 National environmental monitoring programmes
1.4 Bio-indicators and biological monitoring

Unit II. Air Pollution

2.1 Sources of air pollution
2.2 Effects of pollutants on human beings, plants and animals
2.3 Methods of monitoring of gaseous and particulate pollutants
2.4 Control of air pollution

Unit III. Water Pollution

3.1 Major sources of water pollution
3.2 Effects of water pollution on animals, plants and human beings
3.3 Sewage and wastewater treatment and recycling
3.4 Industrial effluent treatment

Unit IV. Noise Pollution

4.1 Sources of noise pollution
4.2 Measurement of noise, exposure levels and standards
4.3 Impact of noise on human health
4.4 Noise control and abatement measures

Unit V. Radioactive and Thermal Pollution

5.1 Radioactive pollution: causes and consequences
5.2 Radioactive fallout, Chernobyl Accident: Three Mile Island accident, Fukushima radio-active leakage
5.3 Radioactive waste management
5.4 Thermal pollution: causes and consequences

Course Code: SOLS/APGDEE -DSE-P-001

Course Title: DSE-1 Practical **(01 Credits)**

Exercise 01: Determination of total microbial count in water sample.

Exercise 02: Determination of total count (MPN) of coliform in a water sample.

Exercise 03: Quantitative analysis of heavy metals in environmental samples. Lead, Cadmium, Mercury, Chromium and Arsenic in air, water and soil samples.

Exercise 04: Study of risk assessment model through flow chart.

Exercise 05: Assessment and calculation of toxicity (LD50 / LC 50) through dose response relation.

Course Code: SOLS/APGDEE-DSE-002

Course Title: DSE-1 Mountain Ecology (03 Credits)

Unit I. Introduction to Mountain Ecology

- **1.1** Definition, importance and scope of Mountain Ecology
- **1.2** Characteristics and specificity of mountain ecosystems
- **1.3** Environmental importance of mountains
- **1.4** Indigenous communities of mountains and their livelihood security

Unit II. Mountain Ecosystem

- **2.1** Structure and components of Mountain Ecosystem
- **2.2** Geological formations of mountains
- **2.3** Vulnerability of mountain ecosystems
- **2.4** Environmental degradation in mountains

Unit III. Environmental Hazards in the Mountains

- **3.1** Landslides, soil erosion and sedimentation
- **3.2** Cloud bursts
- **3.3** Flash floods and river blockades
- **3.4** Avalanches and Glaciers Lake Outburst Floods (GLOF)
- **3.5** Earthquakes
- **3.6** Forest fires

Unit IV. Conservation and Management of Natural Resources of Mountains

- **4.1** Natural resources of mountains (Forest, Water, Wildlife and Minerals)
- **4.2** Sustainable exploitation of natural resources
- **4.3** Traditional knowledge for management of natural resources
- **4.4** Social and Economic dimension of mountain's natural resources
- **4.5** National and international efforts for management natural resources of mountains

Course Code: SOLS/APGDEE -DSE-P-002

Course Title: DSE-1 Practical **(01 Credits)**

Exercise 01: Analysis of various components of mountain ecosystem.

Exercise 02: To study the environmental degradation in mountain ecosystem.

Exercise 03: Assessment of threats to biodiversity in mountain region.

Exercise 04: To study the geological formations of mountains.

Exercise 05: To study the socio-economic status of mountain's natural resources.

Course Code: SOLS/APGDEE -MDE-001
Course Title: MDE -1 Himalayan Wildlife Conflict **(03 Credits)**

Unit I. An Introduction to the Himalaya

- **1.1** Physiography- location, expansion and importance
- **1.2** Origin and evolution of the Himalaya
- **1.3** Himalayan Environment
- **1.4** Natural resources of the Himalaya
- **1.5** Fragility of the mountain ecosystem

Unit II. Wildlife of the Himalaya

- **2.1** Unique characteristics and importance of the wildlife
- **2.2** Himalayan biodiversity
- **2.3** Endemism
- **2.4** Depletion of Himalayan wildlife

Unit III. Manifestation of Himalayan Wildlife

- **3.1** Himalayan wild Mammals
- **3.2** Himalayan wild Birds
- **3.3** Himalayan Reptiles and Amphibians
- **3.4** Himalayan Fish
- **3.5** Himalayan Butterflies
- **3.6** Rare and Endangered Himalayan wild flora

Unit IV. Conservation and Management

- **4.1** Administrative and legislative measures for protection of wildlife
- **4.2** Protected areas (National parks, sanctuaries, biosphere reserves) in the Himalaya
- **4.3** Tiger Project, Project Elephant, Project Rhino, Project Snow Leopard
- **4.4** Man-Wildlife Conflict: agriculture-wildlife conflict
- **4.5** Wildlife Protection Act 1972 and successive amendments
- **4.6** Problems in implementation of the Wildlife Protection Act

Course Code: SOLS/APGDEE-MDE- P-002

Course Title: MDE-1 Practical **(01 Credits)**

Exercise 1: Documentation of Wild life conflict hotspots using field mapping & interviews.

Exercise 2: Mitigation measure evaluation for Himalayan Wild life

Exercise 3: Preparation of a micro-management plan for a Himalayan wildlife habitat.

Exercise 4: Assessment of anthropogenic pressures to Himalayan Wild life

Exercise 5: Preparation of corridor maps for species movement (least-cost path analysis).

Course Code: SOLS/APGDEE -MDE-002
Course Title: MDE-1 Himalayan Bioresources and Management (03 Credits)

Unit I: Introduction to Himalayan Bioresources

- **1.1** Concept, classification and Socio-economic importance of bioresources for mountain communities
- **1.2** Himalayan ecosystem: geography, climate and
- **1.3** Forest, agricultural, medicinal, aromatic and wild edible bioresources of the Himalaya
- **1.4** Indigenous and traditional knowledge systems related to bioresource utilization

Unit II: Diversity and Utilization of Himalayan Bioresources

- **2.1** Medicinal and aromatic plants, Wild edibles, and non-timber forest products (NTFPs)
- **2.2** Agro-biodiversity and traditional farming systems in the Himalaya
- **2.3** Ethnobotanical and ethnomedicinal importance of Himalayan flora

Unit III: Conservation and Sustainable Management

- **3.1** Threats to Himalayan bioresources: climate change, habitat degradation, overexploitation and invasive species
- **3.2** In-situ and ex-situ conservation approaches
- **3.3** Community-based natural resource management and participatory conservation

Unit IV: Emerging Approaches and Policy Perspectives

- **4.1** Bioprospecting, bioeconomy and sustainable entrepreneurship
- **4.2** Intellectual Property Rights (IPR), traditional knowledge and biopiracy issues
- **4.3** Case studies on successful bioresource management initiatives and sustainable development practices

Course Code: SOLS/APGDEE -MDE-P-002
Course Title: MDE-1 Practical **(01 Credits)**

Exercise 01: Identification and Documentation of Bioresources

Exercise 02: Resource Assessment and Sustainable Utilization

Exercise 03: Conservation and Management Techniques

Exercise 04: Field-Based Skill Development and Case Studies

SWAYAM 1: Climate and Environmental Protection

By Prof. B S Balaji, Chairperson, Special Centre for E-Learning and Professor in School of Biotechnology| Jawaharlal Nehru University, New Delhi
https://onlinecourses.swayam2.ac.in/ugc25_ge08/preview

Course layout

Week wise schedule (including the assignment to be kept in the week):

Week 1
- Introduction to Arctic
- Arctic-definition
- Arctic overview-part-1

Week 2
- Arctic overview-part-2
- Arctic expedition-Part 1
- Arctic expedition-Part 2

Week 3
- Solar irradiance and Albedo
- Albedo, Evapotranspiration
- Arctic-amplification

Week 4
- Arctic-amplification-contributors
- Arctic Aerosols and Mechanisms-Part 1
- Arctic Aerosols and Mechanisms-Part 2: Short-lived climate forcers (SLCFs)

Week 5
- Arctic Cryosphere and Glacier Change Mechanism
- Plant-biodiversity-Part-1
- Plant-biodiversity-Part-2

Week 6
- Animal-biodiversity-Part-1
- Animal-biodiversity-Part-2

Week 7
- Marine biodiversity
- Biogeochemical cycle and arctic-Part-1

Week 8
- Biogeochemical cycle and arctic-Part-2
- Carbon cycle and Arctic
- Anti-freeze proteins Part 1

Week 9

- Anti-freeze proteins Part 2
- Persistent Pollutants in the Arctic
- Methanogenesis, Mechanisms, Pathways, and its Relevance to the Arctic

Week 10

- Ocean Acidification
- Ocean Acidification and trace metal biogeochemistry
- Organic Carbon Recycling and its Influence on the Arctic

Week 11

- Marine Contamination in the Arctic
- Permafrost and Biogeochemistry Relationship

Week 12

- Arctic Chemical and Climate Stressors
- Chemolithotrophy and Arctic Ecosystems

Week 13

- Greenhouse Gases and Climate Change Mechanism in the Arctic
- Halogens and Atmospheric Chemistry in the Arctic

Week 14

1. Influence of Ozone and UV Radiation in the Arctic
2. Arctic Water and Carbon Cycle and Climate Change Mechanisms
3. Northern Sea route and climate change

Week 15

- Asian countries working in the Arctic region
- NCPOR and arctic studies a brief overview
- Interaction with researchers, opportunities for student

SWAYAM 2: Rural Water Resource Management
By Prof. Pennan Chinnasamy | IIT Bombay

https://onlinecourses.nptel.ac.in/noc22_ce45/preview

Course layout

Week wise schedule (including the assignment to be kept in the week):

Week 1
- Importance of water resource management in India and Introduction to Hydrological Cycle and representations

Week 2
- Key Hydrological Parameters 1

Week 3
- Key Hydrological Parameters 2

Week 4
- Introduction to Groundwater hydrology

Week 5
- Groundwater components

Week 6
- Surface water hydrology

Week 7
- Water Mass Balance Equation

Week 8
- Rural water management issues, data challenges and observation records.

Week 9
- Rural water resource management infrastructure (engineered)

Week 10
- Rural water resource management infrastructure (nature based)

Week 11
- Rural hydrological databases for India

Week 12
- Remote Sensing data bases for Rural water resources

Second Semester for 1-year Adv.P.G. Diploma program

Course Code: SOLS/APGDEE-C- 004
Course Title: DSC-4 Ecosystem Services and their Valuation (03 credits)

Unit I. Aquatic Ecosystem

1.1 Definition, concept and scope of aquatic ecosystem
1.2 Goods and services of aquatic ecosystem
1.3 Distribution of aquatic ecosystem
1.4 Basic concept of Hyporheic biodiversity and crenobiodiversity
1.5 Drivers of degradation of aquatic ecosystems and their conservation and management

Unit II. Terrestrial Ecosystem

2.1 Structure and function of terrestrial ecosystem
2.2 Biomes and Biogeographic realms of the worlds
2.3 Forest Ecosystem
2.4 Grassland Ecosystem
2.5 Desert Ecosystem
2.6 Goods and services provided by terrestrial ecosystems
2.7 Drivers of degradation of terrestrial ecosystems and their conservation and management

Unit III. Agro-ecosystem and their Management

3.1 Agriculture in India and the World
3.2 Key concepts of Agro-ecosystems
3.3 Functional basis for the sustainable management of Agro-ecosystems
3.4 Management of Agro-ecosystems

Unit IV. Valuation of Ecosystem Services

4.1 Rationale and Objectives of Valuation
4.2 Types of Values: Use, Non-use, Option, and Existence
4.3 Overview of Valuation Methods
4.4 International Initiative regarding Ecosystem Services: MA,TEEB, IPBES, CICES

Course Code: SOLS/APGDEE -C-P-004

Course Title: DSC-04 Practical **(02 Credits)**

Exercise 01: Distribution of freshwater sources in your local area.

Exercise 02: Collection and identification of aquatic diversity in nearby river or streams.

Exercise 03: To study forest stratification, dominant vegetation, and ecological services in a nearby forest area.

Exercise 04: A case study of ecosystem services provided by any ecosystem (forest/lake/river).

Exercise 05: To study the different economic value and valuation methods for ecosystem services.

Course Code: SOLS/APGDEE -C-005
Course Title: DSC-5 EIA and Environmental Auditing (03 credits)

Unit I. Environmental Impact Assessment (EIA)

1.1 Concept, scope and objectives of EIA
1.2 Developmental projects under EIA
1.3 EIA law, policy and notifications
1.4 Concept, objectives and procedures of Public Consultation

Unit II. Methods of Impact Analysis

2.1 Procedure of EIA
2.2 Impact assessment methodologies (Ad-hoc, Simple Checklist, Overlays, Matrices, Network, Combination Computer aided)
2.3 Impact prediction on air, water, land, biota, socio-economic environment
2.4 Concept of Cumulative Environmental Impact Assessment (CEIA)

Unit III. Statuary Clearance Procedure and Public Consultation

3.1 Expert Appraisal Committee(EAC)
3.2 Environmental Clearance, Wildlife Clearance and Forest Clearance
3.3 State Expert Appraisal Committee (SEAC) and State EIA Authority (SEIAA)

Unit IV. Environmental Auditing

4.1 Principles, objectives and guidelines of environmental auditing
4.2 Methodology and basic structure of environmental auditing
4.3 Procedure of environmental auditing
4.4 ISO: 9001, ISO:14000 series

Unit V. Environmental Management Plan

5.1 Concept, objectives and scope of environmental management.
5.2 Guidelines for EMP development
5.3 Rehabilitation and resettlement
5.4 Compensatory Afforestation and Green Belt Development

Course Code: SOLS/APGDEE -C-P-005

Course Title: DSC-5 Practical (02 Credits)

Exercise 01: Presentation of procedure of Environmental Impact Assessment (EIA) through flowchart

Exercise 02: Presentation of procedure of Environmental Clearance through flowchart

Exercise 03: Presentation of procedure of Forest Clearance through flowchart

Exercise 04: Presentation of procedure of Environmental Auditing through flow chart

Exercise 05: Presentation of procedure of Environmental Management Plan (EMP) through flow chart

Course Code: SOLS/APGDEE -C-006
Course Title: DSC-6 Biodiversity Conservation and Management (03 Credits)

Unit I. Introduction to Biodiversity

1.1 Concept and values of biodiversity
1.2 Biodiversity and ecosystem services
1.3 Biodiversity at different levels (genetic, species and ecosystem)
1.4 Magnitude and distribution of biodiversity
1.5 Biodiversity hotspots and keystone species
1.6 Threats to biodiversity: Habitat loss and fragmentation, Genetic drift, Inbreeding, Disturbance, Pollution, Climate Change, Overexploitation, Invasive Species, Disease, etc.

Unit II. Biodiversity: Conservation and Management

2.1 Need for biodiversity conservation and management
2.2 Biodiversity and livelihood security
2.3 Extinction to species: IUCN threatened species categories, causes of species extinction, endangered species, Red and Green Data Books.
2.4 *In -situ* and *Ex-situ* conservation
2.5 Current Trends in Biodiversity Conservation

Unit III. Biodiversity Policy and Climate Change

3.1 Biodiversity Policies, Act, Rules and Regulations
3.2 International efforts for conserving biodiversity *viz.*, CITES, CBD, IUCN, MAB, UNEP, UPOV and WTO
3.3 International treaty on Plant Genetic Resources
3.4 International Agreement for conserving biodiversity, wetland conservation, rangeland management.
3.5 Environmental and Climate change impacts on biodiversity and adaptation strategies

Unit IV. Environmental Monitoring and Biodiversity Assessment

4.1 Environmental Monitoring: Concept, objectives and types of environmental monitoring
4.2 Biodiversity Assessment: Biodiversity inventory and sampling methods for flora and fauna
4.3 Ecological Indices: Species richness, abundance and diversity indices
4.4 Bioindicators and Biomonitoring: Indicator organisms and biological monitoring techniques
4.5 Applications of Remote Sensing and GPS in environmental monitoring and biodiversity mapping
4.6 Role of biodiversity assessment in EIA and environmental management

Course Code: SOLS/APGDEE -C-P-006
Course Title: DSC-6 Practical (02 Credits)

Exercise 01: To calculate the Alpha ($\propto$) diversity, Beta (β) diversity and total diversity of given community.

Exercise 02: Survey of biological resources in your locality.

Exercise 03: Assessment of threats to biodiversity of a given region.

Exercise 04: Preparation of inventory of endangered and extinct species of plants/animals of Garhwal Himalaya.

Exercise 05: To study the role of key stone species in ecosystem.

Course Code: SOLS/APGDEE -C-007

Course Title: DSC-07 Research Methodology and Environmental Statistics (03 Credits)

Unit I. Introduction of Research Aptitude

1.1 Research: Meaning, Types and Characteristics
1.2 Positivism and post positivistic approach to research
1.3 Methods of research
1.4 Qualitative and Quantitative methods

Unit II. Various steps in the Research

2.1 Identification of research problems
2.2 Search of literature
2.3 Experimental design/construction of hypothesis
2.4 Materials and methods
2.5 Field study and collection of samples/questionnaire
2.6 Collection and analysis of data
2.7 Presentation of data in graphic and tabular form
2.8 Use of statistical tools
2.9 Discussion of results/ testing of hypothesis, Citation of references and bibliography

Unit III. Application of computer in Environmental Research

3.1 Use of different software for analysis of data- SPSS, Excel
3.2 Use of internet and search for literature
3.3 Format and styles of referencing
3.4 Writing of thesis and dissertation
3.5 Plagiarism and research ethics

Unit IV. Environmental Statistics

4.1 Measurement of central tendency- Mean, Mode and Median
4.2 Dispersion- Standard deviation, Standard error, Mean deviation and Coefficient of variation
4.3 Moments – measure of Skewness and Kurtosis
4.4 Distributions - Normal, log-normal, Binomial, Poisson
4.5 Simple and multiple correlation and regression coefficient
4.6 Basic laws and concept of probability
4.7 Test of hypothesis and significance.
4.8 t, F, chi square tests
4.9 ANOVA

Course Code: SOLS/APGDEE -C-P-007

Course Title: DSC-07 Practical **(02 Credits)**

Exercise 01: Experimental design/construction of hypothesis

Exercise 02: Methods of collection, presentation and analysis of data

Exercise 03: Measurement of Standard deviation, Standard error, Mean deviation correlation and regression

Exercise 04: Chi square tests

Exercise 05: ANOVA

Course Code: SOLS/APGDEE -DSE-003
Course Title: DSE-02 Environmental Laws, Ethics and Policies (03 Credits)

Unit I. National and International Efforts for Environmental Protection

- **1.1** Brief introduction about the structure of Indian Constitution
- **1.2** Environmental protection in the Indian Constitution
- **1.3** International and national efforts related to environmental Pollution, Climate change, Green house Gas emission, Ozone layer depletion and biodiversity conservation)
- **1.4** REDD+ in India

Unit II. National Environmental Laws

- **2.1** Indian Forest Act 1927; The Forest Conservation Act 1980, and Forest conservation Rules 2003
- **2.2** Wildlife Protection Act 1972 and its successive amendments
- **2.3** Biological Diversity Act 2002 and Biological Diversity Rules 2004
- **2.4** Water (Prevention and Control of Pollution) Act 1974 and Rules 1975 and subsequent amendments
- **2.5** Air (Prevention and Control of Pollution) Act 1981 and Rules 1982 and successive amendments
- **2.6** The Environmental (Protection) Act 1986 and its amendment in 1991, The environment (Protection) Rules 1986
- **2.7** The scheduled tribes and other traditional forest dwellers (recognition of forest rights) act, 2006
- **2.8** The National Green Tribunal Act 2010
- **2.9** Disaster Management Act, 2005

Unit III. National Laws related to waste management

- **3.1** Biomedical Waste Management rules, 2016, as Amended 2019
- **3.2** Hazardous and other waste (Management & Transboundary movement) Rules,
- **3.3** Plastic waste management rules 2016, as amended 2021
- **3.4** Solid waste management rules 2016
- **3.5** E-waste rules 2016 and E-waste (Management) Amendment Rules, 2018

Unit IV. National Policies

- **4.1** National Environment Policy, 2006 (Approved by the Union Cabinet on 18 May, 2006
- **4.2** National Forest Policy, 1988, and New National Forest Policy Draft,2018
- **4.3** National Policy on Disaster Management (NPDM) and Disaster Management Act, 2005
- **4.4** National water policy (2012) and new national water policy-2021

Course Code: SOLS/APGDEE -DSE-P-003
Course Title: DSE-02 Practical **(01 Credits)**

Exercise 01: Presentation of salient features of Wildlife Protection Act 1972

Exercise 02: Presentation of salient features of Water (Prevention and Control of Pollution) Act 1974

Exercise 03: Presentation of salient features of the Air (Prevention and Control of Pollution) Act 1981

Exercise 04: Presentation of salient features of The Environmental (Protection) Act and Rules 1986

Exercise 05: Presentation of salient features of The Indian Forest Conservation Act 1980

Exercise 06: Disaster Management Act, 2005

Course Code: SOLS/APGDEE -DSE-004
Course Title: DSE-2 Traditional Ecological Knowledge (03 Credits)

Unit I. Introduction

- **1.1.** Definition, concept, and scope of TEK
- **1.2.** Traditional ecological knowledge as a science
- **1.3.** TEK in different forms (stories, legends, folklore, rituals, folk songs, and dictums)
- **1.4.** Traditional technology of subsistence (artifacts, crafts *etc.*)
- **1.5.** Language and traditional knowledge

Unit II. Cultural, Sacred, Myth, Rituals and Beliefs

- **2.1.** Basic concept of society, culture and religion
- **2.2.** Nature, aims and objectives of comparative religion (caste, community and their culture).
- **2.3.** Basic feature of religion and principal sets of religion
- **2.4.** Myths, rituals and beliefs associated with TEK in Hinduism, Buddhism, Islam and Christainity
- **2.5.** TEK in Indian Himalayan states

Unit III. TEK and Natural Resources Management

- **3.1.** TEK for forest conservation,
- **3.2.** TEK for water harvesting,
- **3.3.** TEK for wildlife case study
- **3.4.** TEK for conservation of biodiversity
- **3.5.** TEK related with medicinal plants
- **3.6.** TEK related with agriculture, horticulture and cattle rearing

Unit IV. Knowledge Transfer: Old Concepts and Barriers

- **4.1.** Old concepts and barriers in transferring indigenous traditional knowledge
- **4.2.** Old myths in transferring traditional knowledge
- **4.3.** God and man
- **4.4.** Ways of prayers, rituals in different communities

Unit V. Documentation and Preservation of TEK

- **5.1.** Need for Documentation and Preservation
- **5.2.** International laws and policy of TEK
- **5.3.** Laws and policy in India for TEK

Course Code: SOLS/APGDEE -DSE-P-004
Course Title: DSE-2 Practical **(01 Credits)**

Exercise 01: To study origin and evolution of various environmental movement.

Exercise 02: Preparation of an inventory of TEK for water conservation.

Exercise 03: Preparation of an inventory of TEK for biodiversity conservation.

Exercise 04: Preparation of an inventory of TEK related to medicinal plants.

Exercise 05: Documentation of traditional technology of subsistence (Artifacts, Crafts, Handlooms etc.)

Course Code: SOLS/APGDEE -MDE-003
Course Title: MDE-02 Disaster Risk Reduction **(03 Credits)**

Unit I. An overview of Disaster

1.1 Introduction and definition of vulnerability, risk, hazard, disaster and catastrophe
1.2 Impact of disaster on economy and society
1.3 Disaster management and sustainability
1.4 Disaster management cycle
1.5 The Disaster Management Act 2005 and subsequent amendments

Unit II. Natural Disasters

2.1 Natural disasters: introduction, meaning and nature
2.2 Natural Disasters in Himalaya: Earthquake, cloudburst, Glacier lake outburst (GLOF), Landslides, Snow Avalanches, flesh-flood
2.3 Natural hazards Cyclone, volcanic eruptions, drought, floods, heat and cold waves and Tsunami

Unit III. Anthropogenic Disasters

3.1 Anthropogenic disasters: introduction, meaning and nature
3.2 Nuclear disaster, fires (Forest fire, Building, coal, and chemical fires), Desertification causes, effects, management
3.1 Transportation Accidents, war, stamped and riots: causes, effects, management

Unit IV. Disaster Mitigation and Risk Reduction

4.1 Risk and vulnerability assessment
4.2 Disaster preparedness; information, education, awareness and communication
4.3 Disaster mitigation; approaches and strategies
4.4 Disaster response and planning; Search, Rescue and evacuation, damage, community health and casualty management
4.5 Disaster recovery: social and economic aspects of rehabilitation and resettlement
4.6 Prediction and perception of the hazards
4.7 Community based disaster risk reduction strategies

Course Code: SOLS/APGDEE -MDE-P-003
Course Title: MDE-02 Practical **(01 Credits)**

Exercise 1: Understanding the occurrence of various hazards in Himalayas

Exercise 2: Role of various agencies in disaster management

Exercise 3: Rehabilitation of People from disaster affected areas

Exercise 4: Preparation of master plan for any Environmental Hazard mitigation

Exercise 5: To assess the disaster awareness preparedness in nearby communities

Course Code: SOLS/APGDEE -MDE-004

Course Title: MDE-02 Spring-shed Conservation and Management (03 Credits)

Unit I: Introduction to Springs and Spring-Sheds

- **1.1** Definition, scope and importance of spring-sheds
- **1.2** Types and Classification of Springs: Gravity, artesian, contact, fracture, and solution springs.
- **1.3** Hydro-geological Framework of Spring Systems: Structure of aquifers; groundwater flow in mountainous terrains.
- **1.4** Ecological and Socioeconomic Importance of Springs: Role in drinking water, irrigation, biodiversity, and community livelihoods.

Unit II: Hydrological and Climatic Influences

- **2.1** Watershed and Spring Hydrology: Rainfall-runoff processes, infiltration, percolation, and aquifer recharge.
- **2.2** Impacts of Land Use and Land Cover Change (LULC): Effects of deforestation, agriculture, road construction, and urbanization.
- **2.3** Climate Change and Seasonal Variability: Impacts on spring discharge, recharge cycles, and long-term water availability.
- **2.4** Monitoring Tools and Techniques: Use of rain gauges, piezometers, flow meters, and soil moisture sensors.

Unit III: Spring-Shed Management Approaches

- **3.1** Spring Rejuvenation Techniques: Implementation of recharge structures like trenches, percolation pits, check dams, and ponds.
- **3.2** Delineation and Mapping using GIS & Remote Sensing: Application of geospatial tools for spring-shed mapping and intervention planning.
- **3.3** Community-Based Water Resource Management: Participatory rural appraisal (PRA), stakeholder engagement, and local knowledge integration.
- **3.4** Demand and Supply Side Water Management: Strategies for efficient water use, rainwater harvesting, and equitable distribution.

Unit IV: Conservation and Policy Perspectives

- **4.1** National Water Policies and Programs: Overview of Jal Shakti Abhiyan, Atal BhujalYojana, MGNREGA in spring conservation.
- **4.2** Institutional and Governance Framework: Roles of Panchayati Raj institutions, Van Panchayats, NGOs, and water user groups.
- **4.3** Environmental and Social Safeguards: Inclusion of gender, marginalized groups, and mechanisms for conflict resolution.
- **4.1** Ecosystem Services and Valuation of Springs: Assessing provisioning, regulatory, cultural, and supporting services of spring ecosystems.

Course Code: SOLS/APGDEE -MDE-P-004
Course Title: MDE-02 Practical (01 Credits)

Exercise 1: To identify, document, and map springs in a designated area.

Exercise 2: To measure the quantity of water discharged by a spring.

Exercise 3: To assess the land use and land cover (LULC) of the spring catchment area.

Exercise 4: To evaluate the basic quality of spring water for human use.

Exercise 5: To plan and construct basic recharge or conservation structures in a spring-shed.

Course Code: SOLS/APGDEE--SEC-002

Course Title: SEC- Community Outreach Activities (01 Credits)

1. Environmental Awareness Campaigns

- Awareness rallies on pollution control, **Solid Waste Management Programme**, biodiversity conservation, **Water Conservation Activities**, and climate change
- Public lectures and village awareness programmes

2. Tree Plantation and Green Belt Development

- Plantation drives in University, local area
- Monitoring survival and growth of planted saplings

3. Biodiversity Conservation Programmes

- Nature walks and biodiversity documentation with local communities
- Awareness on wildlife conservation and human–wildlife conflict

4. Report Writing

- Preparation of field reports on community outreach activities