BANKURA UNIVERSITY

(West Bengal Act XIX of 2013- Bankura University Act, 2013)

Main Campus, Bankura Block-II, P.O.: Purandarpur, Dist.: Bankura, Pin- 722155, West Bengal

Office of the Secretary

Faculty Council for Undergraduate Studies

Ref:BKU/FCUG/214/2023 Date: 16/07/2023

NOTIFICATION

As directed, the undersigned is pleased to inform all concerned that Bankura University has initiated the process to implement New Curriculum and Credit Framework for Undergraduate Programme, UGC 2022 (as per NEP 2020) for 4-years Undergraduate programme with Environmental science as Major, Minor etc. from the academic session 2023-2024. The Syllabus for the purpose will be framed and finalized as per the guidelines of appropriate authority. As an important corollary to the process, the workshop through online mode will be organized on the date mentioned herewith to get the feedback from the stakeholders. Present Students, Alumni, Guardians, Academicians and other stakeholders related to the specific programme/course are requested for their kind participation in the workshop and to present their views/ observations etc. The stakeholders may go through the draft syllabus attached herewith and convey their observations to the office of the undersigned on ugsecretaryoffice@bankurauniv.ac.in within seven days from the date of publication of notice.

Date: 17th July, 2023.

Time: 3pm onwards

Google Meet joining info

Video call link: http://meet.google.com/eoq-ikfp-mzf

Sd/-
Dr. Arindam Chakraborty
Secretary
Faculty Council for Undergraduate Studies

SYLLABUS FOR
FOUR YEARS UNDER-GRADUATE COURSE IN
ENVIRONMENTAL SCIENCE
(w.e.f. - 2023-2024)

BANKURAUNIVERSITY

BANKURA

WEST

BENGAL

PIN722155

1.1 Scheme for NEP Curriculum First Year (Certificate Course In Environmental Science)

SEMESTER–I

Course Code	Course Title	Credit	Marks			No. of Hours/Week		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
S/ENV/ 101/MJC-1	DSCT-1: Earth and Earth Surface Processes DSCP-1: Earth and Earth Surface Processes (Practical)	4	10	25 15	50	3	NA	2
S/ENV/ 102/MN-1	**(For students of other discipline)** MIT-1:Earth and Earth Surface Processes MIP-1:Earth and Earth Surface Processes (Practical)	4	10	25 15	50	3	NA	2
S/ENV/ 103/MD-1	**(For students of other discipline)** MLT-1: Environment and Society MLP-1: Environment and Society (Practical)	3	10	25 15	50	2	NA	2
ACS/104 /AEC-1	Communicative English	2	10	40	50	2	NA	NA
S/ENV/ 105/SEC-1	SECT-1: Remote Sensing, Geographic Information System and Modeling SECP-1: Remote Sensing, Geographic Information System and Modeling (Practical/ Project)	3	10	25 15	50	2	NA	2
ACS/106 /VAC-1	Environmental Studies	4	10	40	50	4	NA	NA
Total in Semester - I		**20**	**60**	**240**	**300**	**16**		**12**

N.B. MJ – Minor paper, MN- Minor paper, MD – Multidisciplinary paper, AEC- Ability enhancement course, SEC- Skill enhancement course, VAC- Value added course
Theory:-1Credit =1hour/Week, Practical:-1Credit =2hours/Week

SEMESTER–II

Course Code	Course Title	Credit	Marks			No. of Hours/Week		
			I.A.	ESE	Total	Lec.	Tu.	Pr.
S/ENV/201 /MJC-2	DSCT-2: Physics and Chemistry of Environment DSCP-3: Physics and Chemistry of Environment (Practical)	4	10	25 15	50	3	NA	2
S/ENV/ 202/MN-2	**(For students of other discipline)** MIT-2: Physics and Chemistry of Environment MIP-2:: Physics and Chemistry of Environment (Practical)	4	10	25 15	50	3	NA	2
S/ENV/ 203/MD-2	**(For students of other discipline)** MLT-2:Human Wildlife Conflict and Management MLP-2:Human Wildlife Conflict and Management (Practical)	3	10	25 15	50	2	NA	2
ACS/204 /AEC-2	English / Hind/ MIL	2	10	40	50	2	NA	NA
S/ENV/ 205/SEC-2	SECT-2: Environmental Impact and Risk Assessment SECP-2: Environmental Impact and Risk Assessment (Practical/ Project)	3	10	25 15	50	2	NA	2
ACS/206 /VAC-2	2A: Health and Wellness 2B: Understanding India	4	10	40	50	4	NA	NA
Total in Semester - II		**20 + 4**	**60**	**240**	**300**	**16**		**8**
TOTAL IN FIRST IN		**40 + 4**	**120**	**480**	**600**			

N.B. MJ – Minor paper, MN- Minor paper, MD – Multidisciplinary paper, AEC- Ability enhancement course, SEC- Skill enhancement course, VAC- Value added course
Theory:-1Credit =1hour/Week, Practical:-1Credit =2hours/Week

*** Certificate course in Environmental Science will be awarded to a student if he or she completes Internship of 4 credits in addition to total 40 credits in Semester I & II**

SEMESTER –I

Major T- 1:
EARTH AND EARTH SURFACE PROCESSES
(S/ENV / 101/MJC-1)

Total credit- 04

Theory (60 Lectures) Marks: 25

Unit 1: History of Earth **(10 lectures)**

Solar system formation and planetary differentiation; Big Bang theory, formation of the Earth: formation and composition of core, mantle, crust, atmosphere and hydrosphere; Chemical differentiation; geological time scale; evolution of Earth's surface features

Unit 2: Earth system processes **(10 lectures)**

Movement of lithospheric plates; mantle convection and plate tectonics, major plates and hot spots, plate boundaries; Sea Floor Spreading; Earthquakes, volcanism and orogenesis in the light of Plate Tectonic Theory; Models of Isostasy; Pratt and Airy; Continental Drift: Mechanisms and Evidences

Unit 3: Minerals and rocks. **(15 lectures)**

Minerals and important rock forming minerals; Rock Cycle: Lithification and metamorphism; rock structure, igneous, sedimentary and metamorphic rocks; weathering: physical and biochemical processes; erosion: physical processes of erosion, factors affecting erosion.

Unit 4: Earth surface processes. **(15 lectures)**

Atmosphere: evolution of earth's atmosphere, composition of atmosphere, physical and optical properties, circulation; interfaces: atmosphere–ocean interface, atmosphere–land interface, ocean–land interface; Evolution of landforms in fluvial, glacial, Aeolian and coastal processes

Unit 5: Mountain: Origin and Evolution. **(10 lectures)**

Formation of Peninsular Indian mountain systems - Western and Eastern Ghats, Formation of the Himalaya; Evolution of Himalayan and peninsular river systems; formation of Indo-Gangetic Plains.

Major P 1:
EARTH AND EARTH SURFACE PROCESSES
(S/ENV / 101/MJC-1)

Practical: Marks 15

a) Identification of rocks and mineral specimens and their characteristics.
b) Identification of different land features from topo sheet.

Other than Environmental Science Major Students

Minor T- I:
EARTH AND EARTH SURFACE PROCESSES
(S/ENV / 102/MN-1)
Total credit -04

Theory (60 Lectures) Marks: 25

Unit 1: History of Earth (10 lectures)

Solar system formation and planetary differentiation; Big Bang theory, formation of the Earth: formation and composition of core, mantle, crust, atmosphere and hydrosphere; Chemical differentiation; geological time scale; evolution of Earth's surface features

Unit 2: Earth system processes (10 lectures)

Movement of lithospheric plates; mantle convection and plate tectonics, major plates and hot spots, plate boundaries; Sea Floor Spreading; Earthquakes, volcanism and orogenesis in the light of Plate Tectonic Theory; Models of Isostasy; Pratt and Airy; Continental Drift: Mechanisms and Evidences

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Minerals and important rock forming minerals; Rock Cycle: Lithification and metamorphism; rock structure, igneous, sedimentary and metamorphic rocks; weathering: physical and biochemical processes; erosion: physical processes of erosion, factors affecting erosion.

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Unit 5: Mountain: Origin and Evolution. (10 lectures)

Formation of Peninsular Indian mountain systems - Western and Eastern Ghats, Formation of the Himalaya; Evolution of Himalayan and peninsular river systems; formation of Indo-Gangetic Plains.

Minor P- I:
EARTH AND EARTH SURFACE PROCESSES
(S/ENV / 102/MN-1)

Practical: Marks 15

a) Identification of rocks and mineral specimens and their characteristics.

b) Identification of different land features from topo sheet.

Multidisciplinary- T-I
ENVIRONMENT AND SOCIETY
(S/ENV / 103/MD-1)

Total credit- 03
Theory (60 Lectures) Marks: 25

Unit 1: Introduction **(06 lectures)**
Social and cultural construction of 'environment'; environmental thought from historical and contemporary perspective; Environmental education and Ethics; Deep and shallow ecology.

Unit 2: Issues in environmentalism. **(10 lectures)**
Significant global environmental issues such as climate change, and resource depletion; historical developments in cultural, social and economic issues related to land, forest, and water management in a global context; interface between environment and society.

Unit 3: Development-environment conflict. **(10 lectures)**
Developmental issues and related impacts such as ecological degradation; ecorestoration; environmental pollution; development-induced displacement, resettlement, and rehabilitation: discussion on Project Affected People (PAPs).

Unit 4: Urbanization and environment. **(10 lectures)**
Production and consumption oriented approaches to environmental issues in Indian as well as global context; impact of industry and technology on environment; urban sprawl, traffic congestion and social-economic problems.

Unit 5: Environment and social inequalities. **(10 lectures)**
Inequalities of race, class, gender, region, and nation-state in access to healthy and safe environments; history and politics surrounding environmental, ecological and social justice.

Unit 6: Regulatory framework. **(04 lectures)**
Brief account of Forest Conservation Act, 1988; Land Acquisition Act, 2011, Land Acquisition Rehabilitation and Resettlement Act, 2013.

Unit 7: Community participation. **(10 lectures)**
State, corporate, civil society, community, and individual-level initiatives to ensure sustainable development; case studies of environmental movements (Appiko Movement, Chipko Movement, Narmada Bachao Andolan); corporate responsibility movement; appropriate technology movement; environmental groups and movements, citizen groups; role played by NGOs.

Multidisciplinary- P-I
ENVIRONMENT AND SOCIETY
(S/ENV / 103/MD-1)

Practical: **Marks-15**

Tutorials, analysis and exercise based on:

a) To study soil profile; Measurement of soil temperature and moisture.

b) Measurement of soil organic carbon NPK.

c) To determine pH, chloride of soil.

SKILL ENHANCEMENT COURSE – T-I

REMOTE SENSING, GEOGRAPHIC INFORMATION SYSTEM AND MODELLING

(S/ENV/ 105/SEC-1)
Total credit - 03

Theory (Lecture: 30) **Marks: 25**

Unit 1: Basic concept of remote sensing **(8 lectures)**

Remote Sensing: definitions and principles; electromagnetic spectrum; interaction of EMR with Earth's surface; spectral signature; satellites and sensors; aerial photography and image interpretation.

Unit 2: Geographical Information Systems **(8 lectures)**

Geographical Information Systems: definitions and components; spatial and non-spatial data; database generation; database management system; land use/ land cover mapping; data import, processing, and mapping.

Unit 3: Application of Geographical Information Systems **(8 lectures)**

Applications and case studies of remote sensing and GIS in geosciences, water resource management, land use planning, forest resources, agriculture, marine and atmospheric studies.

Unit 4: Environmental statistics **(6 lectures)**

Basic elements of statistical analyses: Frequency Distribution; sampling; types, errors and fluctuation; measures of central tendency and dispersion; skewness; correlation and regression; curve fitting; Standard Error of Estimate; Absolute Regression Residual Mapping.

SKILL ENHANCEMENT COURSE – P-1

REMOTE SENSING, GEOGRAPHIC INFORMATION SYSTEM AND MODELLING

(S/ENV/ 105/SEC-1)

Practical / Project: **Marks-15**

Submit a project on the following:

a) Geo referencing of maps and images.

b) Image classification, post-classification analysis and class editing.

c) Plotting of GPS data in Microsoft Excel.

Value Added Courses Common for All
COURSE TITLE: ENVIRONMENTAL STUDIES
COURSE CODE: ACS/ 106/ VAC-1
Credit- 04

Marks: 50 (10 + 40)

Unit 1: Introduction to Environmental Studies
- Multidisciplinary nature of environmental studies
- Definition, Nature, Scope and Importance of environmental studies
- Types and Components of environment
- Sustainable development

Unit 2: Ecosystems
- Concept of Ecology and Eco-system, Structure and Function of an Ecosystem
- Different types of ecosystem; Forest, Desert and Aquatic (Ponds and Oceans) Biomes
- Energy flow in the ecosystem, energy flow models
- Food chains, food weds and ecological pyramids
- Ecological Succession

Unit 3: Natural Resources: Renewable and Non- Renewable Resources
- Land resources: Land degradation, Landslides, Soil erosion
- Forest resources: Uses, types and importance, deforestation and its effects, Forest biodiversity and tribal population
- Water resources: Distribution of water on Earth; Use and over-exploitation of surface and groundwater; conflicts over water
- Energy resources: Renewable and Non-renewable energy sources; Use of alternative energy Sources

Unit 4: Biodiversity and conservation
- Introduction – Definition: Levels of biological diversity: Genetics, Species and Eco-System Diversity, Biodiversity hot spots and mega biodiversity countries.
- Threats to biodiversity; Value (services) of biodiversity; man-wildlife conflicts, biological invasions
- Conservation of biodiversity: In situ and Ex situ conservation of biodiversity; Endangered and endemic species of India

Unit 5: Environmental Pollution
- Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks.
- Solid waste management: Control measures of urban and industrial waste
- Fireworks Pollution

Unit 6: Environmental Policies and Environment Laws
- Climate change, global warming, ozone layer depletion, acid rain and its impacts on human communities and agriculture
- Environment Laws: Environment Protection Act, 1986; Air (Prevention, Practices & Control of Pollution) Act, 1981; Water (Prevention and control of Pollution) Act, 1972; Wildlife Protection Act, 1972, Forest Conservation Act, 1920, 1988; International agreements: Montreal protocols, 1987 and Kyoto protocols, 1997 and Convention on Biological Diversity (CBD)
- Tribal populations and rights

Unit 7: Human Communities and the Environment
- Human population growth: Population Explosion, Impacts on environment, human health and welfare
- Disaster management: floods, earthquake, cyclones and landslides
- Environmental movements: Chipko, Silent valley
- Environmental ethics: Role of Indian and other religions and cultures in environmental Conservation
- Environment and human health: Concept of health and diseases (Vector Borne Diseases)
- Human Rights, Value Education, Role of Information Technology in Environment

Unit 8: Field Work (Project Work)
- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds and basic principles of identification
- Study of simple ecosystems-pond, river etc

SEMESTER – II

Major T- II:

PHYSICS AND CHEMISTRY OF ENVIRONMENT
(S/ENV / 201/MJC-2)

Total credit 04

Theory (60 Lectures) Marks: 25

Unit 1: Fundamentals of environmental physics (15 lectures)

PartA: Basic concepts of light and matter; quantum mechanics (relation between energy, wave length and frequency), Electromagnetic spectrum; black body radiation, Kirchhoff's law, Boltzmann equation, photovoltaic and solar cells; scattering of light, Rayleigh and Mie scattering.
Part B: Coriolis force, gravitational, centripetal, and centrifugal force; concept of heat transfer, conduction, convection; concept of adiabatic lapse rate (dry and moist adiabatic); laws of thermodynamics; concept of heat and work.

Unit 2: Movement of pollutants in environment (06 lectures)

Diffusion and dispersion, point and area source pollutants, pollutant dispersal; Gaussian plume model, mixing heights, hydraulic potential, Darcy's equation, types of flow, turbulence.

Unit 3: Fundamentals of environmental chemistry (15 lectures)

Part A: Atomic structure, electronic configuration, periodic properties of elements (ionization potential, electron affinity and electro negativity), types of chemical bonds (ionic, covalent, coordinate and hydrogen bonds); mole concept, molarity and normality.
Part B: Thermodynamic system; types of chemical reactions; acids, bases and salts, solubility products; solutes and solvents; redox reactions, concepts of pH.
Part C: Basic concepts of organic chemistry, hydrocarbons, aliphatic and aromatic compounds, organic functional groups, polarity of the functional groups, synthesis of xenobiotic compounds like pesticides and dyes, synthetic polymers.

Unit 4: Atmospheric chemistry (08 lectures)

Composition of atmosphere; photochemical reactions in atmosphere; smog formation, types of smog (sulphur smog and photochemical smog), aerosols; chemistry of acid rain, ozone layer depletion, role of CFCs in ozone depletion.

Unit 5: Water chemistry (08 lectures)

Chemical and physical properties of water; alkalinity and acidity of water, hardness of water, calculation of total hardness; solubility of metals, complex formation and chelation; colloidal particles; heavy metals in water.

Unit 6: Soil chemistry (08 lectures)

Soil composition; relation between organic carbon and organic matter, inorganic and organic components in soil; soil humus; cation and anion exchange reactions in soil; nitrogen, phosphorus and potassium in soil; phenolic compounds in soil.

Major P -II:

PHYSICS AND CHEMISTRY OF ENVIRONMENT
(S/ENV / 201/MJC-2)

Practical: Marks 15

a) Measurement of soil horizon.

b) To study a soil profile; Measurement of soil temperature and moisture.

c) Measurement of soil pH, organic carbon and NPK.

Other than Environmental Science Major Students

Minor T- II:

PHYSICS AND CHEMISTRY OF ENVIRONMENT
(S/ENV / 202/MN-2)

Total credit 04

Theory (60 Lectures) Marks: 25

Unit 1: Fundamentals of environmental physics (15 lectures)

Part A: Basic concepts of light and matter; quantum mechanics (relation between energy, wave length and frequency), Electromagnetic spectrum; black body radiation, Kirchhoff's law, Boltzmann equation, photovoltaic and solar cells; scattering of light, Rayleigh and Mie scattering.
Part B: Coriolis force, gravitational, centripetal, and centrifugal force; concept of heat transfer, conduction, convection; concept of adiabatic lapse rate (dry and moist adiabatic); laws of thermodynamics; concept of heat and work.

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Part A: Atomic structure, electronic configuration, periodic properties of elements (ionization potential, electron affinity and electro negativity), types of chemical bonds (ionic, covalent, coordinate and hydrogen bonds); mole concept, molarity and normality.
Part B: Thermodynamic system; types of chemical reactions; acids, bases and salts, solubility products; solutes and solvents; redox reactions, concepts of pH.
Part C: Basic concepts of organic chemistry, hydrocarbons, aliphatic and aromatic compounds, organic functional groups, polarity of the functional groups, synthesis of xenobiotic compounds like pesticides and dyes, synthetic polymers.

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Composition of atmosphere; photochemical reactions in atmosphere; smog formation, types of smog (sulphur smog and photochemical smog), aerosols; chemistry of acid rain, ozone layer depletion, role of

CFCs in ozone depletion.

Unit 5: Water chemistry **(08 lectures)**

Chemical and physical properties of water; alkalinity and acidity of water, hardness of water, calculation of total hardness; solubility of metals, complex formation and chelation; colloidal particles; heavy metals in water.

Unit 6: Soil chemistry **(08 lectures)**

Soil composition; relation between organic carbon and organic matter, inorganic and organic components in soil; soil humus; cation and anion exchange reactions in soil; nitrogen, phosphorus and potassium in soil; phenolic compounds in soil.

Minor P- II:
PHYSICS AND CHEMISTRY OF ENVIRONMENT
(S/ENV / 202/MN-2)

Practical: **Marks 15**

a. Measurement of soil horizon.

b. To study a soil profile; Measurement of soil temperature and moisture.

c. Measurement of soil pH, organic carbon and NPK.

Multidisciplinary- T-II
HUMAN-WILDLIFE CONFLICT AND MANAGEMENT
(S/ENV / 203/MD-2)

Total credit- 03

Theory (60 Lectures) Marks: 25

Unit 1: Introduction to wildlife management. **(10 lectures)**

Need and policy frame of wildlife conservation: philosophy of wildlife management; Role of government, wildlife biologists and social scientists.

Unit 2: Evolution of the concept of wildlife management **(10 lectures)**

Journey of mankind from predator to conservator; prehistoric association between wildlife and humans: records from Bhimbetka wall paintings; excerpts from rock edicts; Bishnoi community.

Unit 3: Wildlife conservation laws in India **(10 lectures)**

Types of protected areas (Wildlife Sanctuaries, National Parks, Biosphere Reserves); IUCN categories of protected areas, Natural World Heritage sites; concept of core and buffer area in a protected range, brief introduction to Wildlife Protection Act, 1972; Forest Act, 1927; Environmental Protection Act, 1986; and Forest

conservation Act, 1920;Introduction of Tiger task force, Status of current protected areas in India.

Unit 4: Socio-economic and legal basis of conflicts (10 lectures)

Concepts of development and encroachment, Impact of conflict on humans and wildlife, impact of habitat fragmentation, social inequality in terms of forest conservation: luxury hotels within protected areas *vs.* displacement of native tribes, forest produce as a need *vs.* forest exploitation, introduction to tribal rights in India, demographic profile of tribes in India, importance of forest product, Scheduled tribes and other traditional Forest dwellers (Recognition of forest right) Act, 2006.

Unit 5: Wildlife conflicts (06 lectures)

Insight into the important conflicts, Human and elephant conflicts of Junglemahal, Fisherman and tiger conflict of Sundarbans.

Unit 6: Human wild life coexistence (14 lectures)

Symbiotic relationship between tribals and forest, forest and development, focus on the inclusive growth of tribes: community participation in forest management, case study of Chipko movement, sacred groves forests, India's Bishnoi community and their conservation practices; ecological- economic welfare and development: conservation of indigenous culture and traditions, role of international organizations: Man and biosphere programmes; concept of conservation reserves and community reserves, importance of wildlife corridors in minimizing the conflicts and conservation.

Multidisciplinary- P-II

HUMAN-WILDLIFE CONFLICT AND MANAGEMENT

(S/ENV / 203/MD-2)

Practical: Marks: 15

1) Identification with reasons of the following

   A) Study of micro-fauna of water viz., plankton, (e.g. *Cyclops, Nauplius larva, Bosmina, Moina*).

   B) Study of aquatic flora, e.g., *Spirogyra, Zygnema, Pistia, Eichhornia, Hydrilla, Ipomoea, Azolla, Lemna (*minor and major*), Marselea, Nymphae, Nelumbo.*

2) Preparation of field report based on the visit to a Wild Life Sanctuary or National Park or Zoo or Biosphere Reserve.

   Or

   Project Report to be submitted on Human Elephant conflict in Junglemahal.

SKILL ENHANCEMENT COURSE – T-II
ENVIRONMENTAL IMPACT AND RISK ASSESSMENT
(S/ENV/ 205/SEC-2)

Total credit- 03

Theory (30 Lectures) Marks: 25

Unit 1: Environmental impact assessment (EIA) (8 lectures)

Definitions, introduction and concepts; rationale and historical development of EIA; scope and methodologies of EIA; Impact identification and prediction; baseline data collection; Environmental Impact Statement (EIS), Environmental Management Plan (EMP): principles, problems and strategies

Unit 2: Strategic Environmental Assessment (8 lectures)

Social Impact Assessment; Cost-Benefit analysis; Life cycle assessment; environmental appraisal; environmental planning; environmental audit; Principles of International Standard Organizations

Unit 3: EIA regulations (6 lectures)

EIA regulations in India, status of EIA in India, current issues in EIA, case study of hydropower projects / thermal projects.

Unit 4: Risk assessment (8 lectures)

Introduction and scope; project planning; toxicity assessment; hazard identification and assessment; risk characterization; risk communication; environmental monitoring; community involvement; legal and regulatory framework; human and ecological risk assessment.

SKILL ENHANCEMENT COURSE – P-II
ENVIRONMENTAL IMPACT AND RISK ASSESSMENT
(S/ENV/ 205/SEC-2)

Practical/ Project: Marks: 15

Submit any one project from the followings:

a) Impact Assessment Methods- Adhoc, Checklist methods.

b) Preparation of Environmental Impact Statement (EIS).

c) Risk Zone Mapping.

Question Pattern

Major Stream, Minor Stream, Multidisciplinary and Skill enhancement courses/ papers

Theory (F.M: 25)	Practical (F.M: 15)
UNIT-I 1. Any five out of eight **1×5=5**	1. Work out/ Project /Experiment: **10/9** 2. Laboratory Record and/or Field record: **2/3** 3. Viva Voce: **3**
UNIT-II 2. Any two out of four **5×2=10**	
UNIT-III 3. Any one out of two **10×1=10**	

Time- Theory- 2 Hrs. and Practical- 1hr 15 min.