

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's  
**New Arts, Commerce, and Science College, Ahmednagar**  
**(Autonomous)**  
**(Affiliated to Savitribai Phule Pune University, Pune)**



**National Education Policy (NEP)**  
**Choice Based Credit System (CBCS)**

**Program Skeleton and Syllabus of**  
**B.Sc. Environmental Science (Major)**

Implemented from  
**Academic Year**  
**2023-24**

**1. Prologue/ Introduction of the programme:**

The course curriculum for undergraduate studies under New Education policy for B.Sc. in Environmental Science. The course curriculum outlined here is designed in an inclusive and interdisciplinary manner and draws content from various allied disciplines. Ideally, an undergraduate programme in environmental science should focus equally on theory and practice so that students are able to pick up necessary skills enabling them to find gainful employment at the job market. Therefore, a number of skill-based courses have been identified and made a part of the curriculum. Attention was also paid to structuring various core courses so as to make them appealing from a practitioner's point of view. It is hoped that a student with a B.Sc. Environmental Science degree, after having read the courses outlined here, should feel adequately equipped to meet the challenges of career development. At the same time, there is sufficient content for those who wish to continue academic life at the university beyond undergraduate level. That said, due care has been taken to maintain necessary academic rigor and depth in the course content so that the learning outcomes from these courses will lead to intellectual growth of a student.

During the first year of the programme, the students are trained on basic concepts of Environmental science. From second year students are allowed to concentrate on specific areas of the subject, on which they complete their practical and field survey reports. After completing the course, the students will be amply prepared for professional careers in M.Sc. in Environmental Science

This is a job oriented programme and relevant to the current needs of our society. The extent (scope, depth and outcomes) of B.Sc. Environment Sciences programme has taken into account the extent of the knowledge provided at school level in 10th, 11th and 12th standard according to syllabi of NCERT and state boards. It has been designed to bridge the gap between the school level and M.Sc. programmes on environment. This is essential because of the interdisciplinary nature of the subject. More so, there is a current trend to look at the environment through a transdisciplinary approach which is relevant by the nature of the subject and the socio-economic fabric of India

## **2. Programme Outcomes (POs)**

1. Provide students with the scope to develop knowledge base covering all attributes of the environment and enable them to attain scientific/technological capabilities to find answers to the fundamental questions before the society with regards to human action and environmental effects with due diligence.
2. Enhance the ability to apply this knowledge and proficiency to find solutions relating to environmental concerns of varied dimensions of present times

3. Provide with a direction and technical capability to carry on lifelong learning and show teamwork and collaborative endeavor and decision making
4. Improve the employability of the graduates including the enhancement of self-employment potential and entrepreneurial aptitude, and fill the technical resource gap especially in the Indian context
5. Help graduates appreciate requirement of framing environmental policy guidelines.
6. Motivate graduates to appreciate that they are an integral stakeholder in the environmental management of India irrespective of their future jobs or working environments in accordance of the provisions vide Article 48A (Directive Principles of State Policy) and Article 51A(g) (Fundamental Duties) of the Constitution of India.
7. Help graduates to understand the concerns related to Sustainable Development Goals (SDGs) and the Indian obligation

#### **Program Objectives:**

1. To develop basic understanding of Fundamentals of Environmental Science as a discipline.
2. To bring sensitization towards the environment and also increase student competency & employability.
3. To inculcate a sense of responsibility among students about various principles and laws of environment to develop conscience towards social responsibility, human values and sustainable development through curriculum delivery and extra-curricular activities
5. To develop scientific temperament with strong fundamental knowledge of the subject
6. To develop analytical thinking and problem-solving skills needed for various entrance and competitive examinations  
and Post Graduate Studies
7. To train students in laboratory skills and handling equipment along with soft skills needed for placement

#### **Program Outcomes:**

- 1. Provide students with the scope to develop knowledge base covering all attributes of the environment and enable** them to attain scientific/technological capabilities to find answers to the fundamental questions before the society with regards to human action and environmental effects with due diligence.

- 2.Enhance the ability to apply this knowledge and proficiency to find solutions relating to environmental concerns of varied dimensions of present times
- 3.Provide with a direction and technical capability to carry on lifelong learning and show teamwork and collaborative endeavor and decision making
- 4.Improve the employability of the graduates including the enhancement of self-employment potential and entrepreneurial aptitude, and fill the technical resource gap especially in the Indian context
- 5.Help graduates appreciate requirement of framing environmental policy guidelines.
- 6.Motivate graduates to appreciate that they are an integral stakeholder in the environmental management of India irrespective of their future jobs or working environments in accordance of the provisions vide Article 48A (Directive Principles of State Policy) and Article 51A(g) (Fundamental Duties) of the Constitution of India.
- 7.Help graduates to understand the concerns related to Sustainable Development Goals (SDGs) and the Indian obligation
8. The students will graduate with holistic development and will be qualified to continue higher studies in their subject.
- 3) The students will be eligible to appear for various competitive examinations and pursue and apply for the Jobs

**Program Specific Outcomes:**

- After successful completion of B.Sc. Environmental Science Course, student **will** have:
- Fundamental and Advanced knowledge of theory and practica courses in Environmental science.
- Students will understand about how the subject knowledge helps in solvingvarious social, economic and environment related problem
- Knowledge about Environmental (Resource, Energy) Management, Monitoring,introductory aspects of Environmental Biotechnology and Microbiology
- Skills in laboratory techniques and experience in instrument handling

**Ahmednagar Jilha Maratha Vidya Prasarak Samaj's**  
**New Arts, Commerce and Science College, Ahmednagar**  
**(Autonomous)**  
**Syllabus**  
**B.Sc. Environmental science (Major)**

Title of the Course: Introduction to Environmental Biology								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-1	BS-EN111T	02	00	02	30	15	35	50

**Learning Objectives:**

1. To learn the theories and fundamental concepts of environmental biology.
2. To know the origin of life on planet earth and related theories.
3. To Gain knowledge about distribution of life on earth

**Course Outcomes (Cos): -**

1. To Understand the theories and fundamental concepts of plant and animal taxonomy.
2. Students Acquire knowledge about Bio-resources availability, its distribution and importance.
3. Students Develop the skills of identification of native plants and animals.

**Detailed Syllabus:**

Unit. No.	Name of the Unit	Course contents	No of lectures
1	Introduction To Biology	<ul style="list-style-type: none"> <li>• Introduction to Biology, Branches, Scope and Importance in today's context from environmental point of view.</li> <li>• Biological diversity of India – Major genera, species, sub-species of flora and fauna.</li> <li>• Major ecological types of India</li> </ul>	4
2	Origin of Life	<ul style="list-style-type: none"> <li>• The origin of Life; Evolution of Life through the geological time i.e. – Eras, Periods, Epochs; Events of (Evolutionary) 'Explosions' and 'Mass Extinctions' &amp; Paleontological Evidences for these. Charles Darwin's Voyage of HMS Beagle – His theory of 'Survival of the Fittest'.</li> </ul>	4
3	Biogeography	<ul style="list-style-type: none"> <li>• Biogeography – The meaning; Importance</li> <li>• Biographical profile of the world; and India</li> <li>• Classification of Biogeographic Region (Realms)</li> <li>• Biogeographic zone in India</li> <li>• Biodiversity Hotspot</li> </ul>	6

4	Taxonomy	<ul style="list-style-type: none"> <li>• Taxonomic Principles - aim, objectives, hierarchy, kingdoms.</li> <li>• History; Linnaeus system of classification; Bentham &amp; Hooker system of classification.</li> <li>• Components of systematic - characterization, classification, identification &amp; nomenclature.</li> <li>• The concept of species- morphological, biological, phylogenetic, ecological etc.</li> </ul>	8
5	Ecological Adaptations and Bio- resources	<ul style="list-style-type: none"> <li>• Ecological Adaptations under various environmental conditions – i) In plants - hydrophytes, mesophytes, epiphytes, xerophytes &amp; halophytes ii) In animals - mimicry, vestigiality etc.</li> <li>• Bio-resources- <ul style="list-style-type: none"> <li>i) Forests- major types of the world &amp; India</li> <li>ii) Agricultural crops - major food plants of the world &amp; India</li> <li>iii) Livestock- major varieties of the world &amp; India</li> <li>iv) Fisheries resources - saline &amp; fresh water</li> </ul> </li> <li>• Significances and use of the Bioresources; Extraction of Bioresources by traditional &amp; modern methods; Threat to local bioresources - overexploitation, habitat loss, invasive species etc.</li> </ul>	8
			Total 30

## 1. Reference Books -

- 1) 'A Textbook of Plant Ecology' Ambashta R.S. & Ambashta N.K (1999) CBS Publ. & Distributers, New Delhi
- 2) 'Ecology: Principles and Applications' Chapman J.L. & Reiss M.J. (1995) Cambridge University Press
- 3) 'Environmental Science: A Global Concern' Cunningham W.P. & Saigo S.W. (1997) WCB, McGraw Hill
- 4) 'Elements of Ecology' Sharma P.D. Rastogi Publication
- 5) 'Environmental Science' Tyler M.G. Jr. (1997) Wadsworth Publ. Co.
- 6) 'Environmental Studies' Benny Joseph (2005) Tata McGraw Hill Publ. Co. Ltd.
- 7) 'Patterns in the Living World' – Biology-an Environmental approach, John Murray, London
- 8) 'Diversity Among Living Things' Biology-an Environmental approach, John Murray, London
- 9) 'Paleobotany and the Evolution of Plants' Wilson N. Stewart (1983) Cambridge University Press
- 10) Biological science, D. J. Taylor, N.P.O. Green & G.W Stout, Cambridge Low Price Edition, 3rd Edtn.

Title of the Course: Fundamental of Environmental Chemistry								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-2	BS-EN112T	02	00	02	30	15	35	50

### Learning Objectives:

1. To Know the Concept of Environmental Chemistry.
2. Motivating the knowledge about the analysis techniques of various parameters.
3. Importance of various interactive reactions in atmosphere.

### Course Outcomes (Cos): -

1. Understand the concept of Green chemistry
2. Understand the concept of Environmental Chemistry, (solution, normality, molarity & types of chemical reactions)
3. Understand the structure and composition of atmosphere
4. Effect and impact of Soap, detergent and chemical food adulteration in nature

### Detailed Syllabus:

Unit No.	Name of the Unit	Course contents	Number of lectures
1	Introduction	<ul style="list-style-type: none"> <li>• Scope of Environmental Chemistry</li> <li>• Segments of Environment and various interactive reactions occurring between these segments.</li> <li>• Bio-geo-chemical cycles</li> <li>• Green Chemistry</li> </ul>	6
2	Fundamental Of Environmental Chemistry	Solution concentratio(Normality, Molarity, Molality, ppm, Equivalent weight etc.) Types of chemical reactions; acids, bases and salts, solubility products; solutes and solvents; Redox reactions, concepts of pH and pE,	6
3	Chemical Composition of Atmosphere	<ul style="list-style-type: none"> <li>• Characteristic of the Chemical Reactions involved inatmosphere. Pollutants in Atmosphere</li> <li>• Chemistry of Some Atmospheric Gases</li> <li>• Oxides of Nitrogen, Oxides of Sulphur, Oxides of Carbon</li> </ul>	6
4	Chemistry of Surfactants and food additives	<ul style="list-style-type: none"> <li>• Soaps and Detergents, Need,Classification, Characteristicand Composition</li> <li>• Environmental Impacts and Toxicity of Soaps andDetergents</li> <li>• Food Additives and Contaminants (Preservatives,Flavoring and coloring agents)</li> <li>i)Adulterants –Properties and their effects</li> <li>• Tests and Examples of food adulterations,</li> </ul>	6

5	<b>Environmental Analysis</b>	<ul style="list-style-type: none"> <li>• Titrimetric, colorimetric and spectro-photometric methods.</li> <li>• Instrumentation, Principle and working</li> <li>• Basic Principle and working of colorimetry and spectro-photometer</li> <li>• Basic Principle and working of pH meter, conductivity meter, Turbidity meter,</li> </ul>	6
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**Reference Books –**

- 1) Environmental Chemistry, A. K. De, New Age International Publishers, 7thEdtn.
  - 2) Elements of Environmental Chemistry, H. V. Jadhav, Stosius Incorporated/Advent Books Division, 1992
  - 3) Environmental Chemistry, H. Kaur, APragatiEdtn., 2ndEdtn. (2007)
  - 4) Environmental Chemistry, S. K. Banerjee, PHI Learning Pvt. Ltd., 2nd Edtn.
  - 5) Air Pollution- M. N. Rao & H. V. N. Rao; Tata McGraw Hill, New Delhi, 1989.
  - 6) "Environment Pollution Control and Environmental Engg." C. S. Rao, Tata McGraw Hill, New Delhi, 1994.
  - 7) Soil pollution & Soil Organism - P.V. Mishra
  - 8) Water Pollution—A.K. Tripathy & S.N. Pandey; A. P. H. Publishing Corporation
  - 9) Environmental Air pollution & its control—G.R. Chatwal; Anmol Publications, New Delhi, 1989
  - 10) Environmental Chemistry; A. K. De; New Age International Publishers; 6thEdtn.
  - 11) Understanding Environment; Edt by Kiran B. Chhokar, Mamata Pandya, Meena Raghunathan; Centre for Environment Education; Sage Publication.
  - 12) Perspective in Environmental Studies; Kaushik & Kaushik; New Age International Pvt. Ltd Publishers
  - 13) Environmental Science; S. C. Santra; New Central Book Agency (P) Ltd.; 2ndEdtn.
  - 14) Water Pollution, P.K. Goel, New Age International, 2006 Revised
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Title of the Course: Practical Based on BS-EN-111& BS -EN112								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-3	BS-EN113P	00	02	02	30	15	35	50

#### Learning Objectives:

1. Collection, preservation and analysis of water sample.
2. Collection, preservation and analysis of air sample
3. Study of Plant Adaptations under various environmental condition.

#### Course Outcomes (Cos)

- 1.To understand the preparation of chemicals, normality, molarity etc.
- 2.Understand native plants for plantation with respect to Geography and Climate
- 3.Acquire knowledge about working of PUC Machine-Gas Analyzer.

#### Detailed Syllabus:

Unit. No.	Course contents	Number of Practical
1.	Laboratory safety rules and introduction to laboratory equipment's	1
2.	Collection and preservation of water and soil samples (Field Practical)	1
3.	Determination of pH and Electrical Conductivity of Water samples/ Soil samples	1
4.	Determination of Alkalinity from water sample	1
5.	Determination of Total Hardness (Ca& Mg) from water	1
6.	Determination of Chlorides from water	1
7.	Identification of Food adulterants in various food samples	1
8.	Determination of Organic Content from soil.	1
9.	Identifying native plants for plantation with respect to Geography and Climate	1
10.	Study of the working of PUC machine-Gas Analyzer (Demonstration).	1
11.	Study of Plant / Animal Fossil Forms from different geological periods/visit to Paleo-botanical museum	1
12.	Study of Plant Adaptations under various environmental conditions (Hydrophytes, mesophytes, epiphytes, halophytes & xerophytes).	1
13.	Visit to study different Fishery resources in the local market	1

Title of the Course: Ecological Practical and field Visit								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
SEC-1	BS-EN114P	00	02	02	30	15	35	50

### Learning Objectives:

1. The Student will understand the diversity of plants and animals in their region
2. Understanding the inter and intra relationship between ecosystem in various biotic and abiotic components
3. Understand the importance and types of nature conservation

### Course Outcomes (Cos): -

1. Handling and estimation of essential water parameter
2. To encourage incitation of a thought process & hence, development of a practical perspective amongst the students
3. Students will be able to enumerate the intricate relationship between all type's life and the present trend of man – environment relationship
4. To inculcate sense of Scientific Temperament

### Detailed Syllabus:

Unit. No.	Course contents	Number of Practicals
1.	Determination of diversity indices in plant communities..	1
2.	To construct ecological pyramids of population sizes in ecosystem..	1
3.	Determination of Chlorophyll content from plant species.	1
4.	Determination of Harvest method from plant species.	1
5.	Quantitative measurement of plankton in fresh and marine water samples.	1
6.	Determination of primary productivity by light and dark bottle method.	1
7.	Identification and description of Local plant species.	1
8	Indicate distribution range of a plant and animal species identified as endangered on an Indian map.	1
9	Prepare a map of Maharashtra showing Protected Area Network (PAN) in it	1
10	Prepare a map of India showing wild life sanctuaries and Biodiversity Hot Spot in it	1

Title of the Course: Indian Traditional Knowledge and Environment								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical					
						CIE	ESE	Total
IKS-1	BS-EN 115P	02	00	02	30	15	35	50

### Learning Objectives:

1. To know the rich cultural heritage and practices
2. To acquire the information related with the traditional and practices for environment protection
3. The field visits and studies will academically enrich the students

### Course Outcomes (Cos)

1. The students will practically identify and understand the traditions
2. Students will understand the multidisciplinary nature of the subject and thus the Scope of study
3. Students will understand the importance of from environmental point of view in day today's life
4. Students will understand intra and inter relationship between indigenous and traditional knowledge
5. Use of traditional ethics and practices for nature conservation

### Detailed Syllabus:

Unit. No.	Course contents	Number of Lectures
1.	<ul style="list-style-type: none"> <li>• Introduction to traditional knowledge:</li> <li>• Define traditional knowledge, nature and characteristics, scope and importance,</li> <li>• kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge</li> </ul>	6
2.	Biodiversity, sustainable development and disaster management <ul style="list-style-type: none"> <li>• Biodiversity, conservation and culture, international and national policy on biodiversity and local communities</li> <li>• Indigenous knowledge for development, traditional knowledge and its role in the global economy and poverty reduction</li> <li>• Indigenous Knowledge and Climate change challenges ahead.</li> <li>• Indigenous knowledge and disaster risk reduction.</li> </ul>	8
3.	<b>Indigenous Health and Healing</b> <ul style="list-style-type: none"> <li>• Indigenous and traditional concept of health and wellbeing, disease and Illness and cure</li> <li>• Traditional medicine practitioner Shamanism and faith Healing, Altered states of consciousness (ASC)</li> <li>• Ethno botany and Medicinal Plants, Zoo-therapeutic medicine, ethno nutrition</li> </ul>	8

4.	<p><b>Traditional Knowledge in Different Sectors:</b></p> <ul style="list-style-type: none"> <li>• Traditional knowledge and engineering, Traditional medicine system,</li> <li>• TK in agriculture, Traditional societies depend on it for their food and healthcare needs,</li> <li>• Importance of conservation and sustainable development Management of biodiversity,</li> <li>• Food security of the country and protection of TK</li> </ul>	8
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#### References:

- Baird, Ian G. Peoples Livelihoods and Developments in the Xekong River Basin Laos, white lotous Bangkok 2009
- Dzodzi Tsikata and Pamela Golah (Ed) Land Tanure Gender And Globalization: Research AndAnalysis From Africa Asia And Latin America Zubaan New Delhi 2010
- Agrawal, Bina. Gender and Green Revolution, OUP New Delhi 2010
- Dove, Michael R. and Carol Carpenter (eds.) Environmental Anthropology: A Historical Reader.Blackwell, Boston. 2007
- Schutkowski H. Human Ecology: Bio cultural adaptation, Springer 2006
- Singh Gyan *et al* :Ethno medicine of North- East India Proceedings of National seminar published by National Institute of Science Communication And Information Resources, New Delhi, 2003
- Munasighe, Mohan, et al 2008 Climate change. The Encyclopedia of Earth (Cutler J. Cleveland, ed.)
- Environmental Information Coalition, National Council for Science and the Environment,
- Washington, D.C. [http://www.eoearth.org/article/Climate change](http://www.eoearth.org/article/Climate%20change)

Title of the Course: Basics in Geoscience								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-4	BS-EN121T	03	00	03	45	30	70	100

### Learning Objectives:

1. Understand the internal structure of the planet earth and related theories
2. Understand the various types of natural disaster its causes and effects
3. Understand the composition and structure of atmosphere

### Course Outcomes (Cos)

1. Acquire knowledge related with types, properties and structures of rocks and minerals
2. To know about the temperature distribution patterns in atmosphere
3. Basic information related hydrological cycle and various forms of water in atmosphere and its behavior.

### Detailed Syllabus:

Unit. No.	Name of the Unit	Course contents	Number of lectures
1	Introduction of Earth and it's Structural Components	<ul style="list-style-type: none"> <li>Formation of the Earth: Internal Structure of Earth, History of Earth:- Orbital Theory, Theories of geological evolution – Wager's Continental Drift Theory, Plate Tectonic Theory, Earth &amp; it's Structural Component</li> <li>Types of Rocks – Igneous, Sedimentary, Metamorphic, Rock cycle</li> <li>Mineral:-Definition, Characteristics of mineral, Types, Minerals, Properties of minerals, Examples of minerals</li> <li>Rock forming minerals – quartz, feldspar, micas, Clay minerals, calcite, dolomite etc.</li> </ul>	10
2	Soil	<ul style="list-style-type: none"> <li>Formation – weathering processes (types), biomass addition</li> <li>Physical &amp; chemical properties; composition; macro &amp; micro plant nutrients, Soil Profile, Soil classification Soils of India – with respect to their agriculture significances, Soil Survey &amp; their types</li> <li>Soil fauna and Soil flora; , Soil erosion and its type</li> </ul>	10
3	Earth's Atmosphere and Atmospheric temperature	Definition of Biosphere; Components of biosphere. <ul style="list-style-type: none"> <li>Introduction, general properties, Atmosphere: Definition, Composition of air; Physico- chemical structure of atmosphere: Troposphere, Stratosphere, Mesosphere, Ionosphere, And Exosphere. Vertical &amp; horizontal structures</li> <li>Chemical composition – in each of the vertical layers; Significance of Atmosphere, Atmospheric temperature measurement – Instruments; Methods (maximum, minimum, mean temperature, temperature range);</li> <li>Factors regulating atmospheric temperature: Lapse rate; Types – ELR, DALR &amp; WALR</li> </ul>	8

4	Hydrological Cycle & Atmospheric pressure	<ul style="list-style-type: none"> <li>Hydrological cycle – Introduction &amp; significance               <ul style="list-style-type: none"> <li>i) Evaporation; Factors affecting the rate of Evaporation</li> <li>ii) Condensation; Factors affecting the rate of forms of condensation – dew, frost, fog &amp; cloud.</li> <li>iii) Precipitation; Factors affecting precipitation; Forms of precipitation – rain, drizzle, snow, hail, sleet etc.</li> </ul> </li> <li>Atmospheric pressure – Introduction; Measurement; Factors affecting the atmospheric pressure, Spatial &amp; Temporal variations, Atmospheric pressure &amp; Generation of winds; Factors affecting winds</li> </ul>	8
5	Natural Calamities & Resources	<ul style="list-style-type: none"> <li>Natural Calamities – Volcanoes, Earthquakes, Landslides, Cyclones, Floods &amp; Droughts; Causes; Planning &amp; Management to prevent/ mitigate their effects; Case studies for each.</li> <li>Introduction of Resources, Classification of Resources</li> <li>Significance of wind, geothermal &amp; solar energy as alternative energy resources</li> </ul>	8
			Total 45

#### Reference Books -

- 1) Environmental Geology; Valdiya K.S.; Indian Context. Tata McGraw Hill
  - 2) Essentials of Climatology; D. S. Lal; Chaitanya Publishing House, Allahabad, 1989.
  - 3) Holmes' – Principles of Physical Geology; Edt. by P. McL. D. Duff; E.L.B.S. Chapman & Hall Low Priced Edtn; 4th Edtn.
  - 4) A Textbook of Soil Science; T.D. Biswas & S.K. Mukharjee; Tata McGraw-Hill Education
  - 5) Introductory Soil Science; Dilip Kumar Das; Kalyani Publishers; 2nd Edtn.
- Environmental Geology; Kellar E.A. (2011); Prentice Hall, 624 p; 9th
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Title of the Course: Environmental Pollution								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-5	BS-EN122T	03	00	03	45	30	70	100

### Learning Objectives:

1. Students will learn about various types of pollution, its impact and control measures.
- 2.. Students will correlate about how the subject knowledge helps in solving various social, economic and environment related problems
- 3.. Students will be empowered with recent technologies that are ecofriendly and can help them to be the entrepreneurs

### Course Outcomes (Cos)

1. Collect the information related with major air pollution related disasters
2. Understand the radioactive pollution with examples
3. Understand Water pollution with examples
4. Understand Noise pollution, causes and effects with examples

### Detailed Syllabus:

Unit.No.	Name of the Unit	Course contents	Number of lectures
1	Introduction	<ul style="list-style-type: none"> <li>• Pollution –Definition; Types – On the basis of physical environment (soil, water, air) On the basis of types of pollutants</li> <li>• Pollutants – Definition; Types – Primary, secondary Biodegradable, non-biodegradable Solid, liquid, gaseous etc.</li> <li>• Sources – Point source, non-point source Stationary, mobile Natural, anthropogenic</li> <li>• Effects</li> </ul>	5
2	Air and Radioactive Pollution	<ul style="list-style-type: none"> <li>• Major air pollutants and their sources;</li> <li>• Effects – On Biological system – Animals, humans &amp; plants</li> <li>• On Non Biological systems –material; physical environment, Green House Effect, Ozone depletion, Smog, Acid Rain, Global warming</li> <li>• Case studies – London smog; Los Angeles smog Bhopal Gas Tragedy, Taj-Mahal.</li> <li>• Radioactive pollution- Definition, Sources and Effects ,Chernobyl disaster</li> </ul>	8
3	Water and Thermal pollution	<ul style="list-style-type: none"> <li>• Definition, Types (Ground, Surface and Marine) Sources, Effects and control measures</li> <li>• Eutrophication Bioaccumulation and bio magnifications of pollutants</li> <li>• Case studies – Itai- Itai Minamata(Japan); Arsenic poisoning (West Bengal) Fluorides in ground water.</li> <li>• Thermal Pollution - Definition, Sources and Effects</li> </ul>	8
4	Soil Pollution	<ul style="list-style-type: none"> <li>• Definition; Sources</li> <li>• Effects of soil pollution: soil quality, productivity, Acidification, Alkalization, Salinization, Desertification etc.</li> <li>• Effect on - Biological system, soil microorganisms and plants.</li> </ul>	8

		<ul style="list-style-type: none"> <li>• Control measures/ Alternatives–</li> <li>• Bio fertilizers &amp; biological pest management;</li> <li>• Organic farming &amp; other agricultural interventions.</li> </ul>	
5	Noise Pollution	Definition, Sources Measurement & sources <ul style="list-style-type: none"> <li>• Effects of noise: Reactions to noise- Auditory &amp; non auditory On plants, animals &amp; materials acoustic trauma, psychological effects- speech interference, annoyance, sleep interference, effects on performance, subjective response ii) Effect on Man –.</li> <li>iii) Control measures •</li> <li>• <b>Noise control at source:</b> Sound path receiver concept, control by</li> <li>• design, control, personal protection devices</li> </ul> Any/ local case study of Noise Pollution	8
	Solid Waste Pollution	Definition, Sources Source and characterization iii) Impact of Urbanization iv) Effects • Any/ local case study of Solid Waste Pollution	08
			<b>Total 45</b>

### Reference Books -

- 1) Air Pollution- M. N. Rao & H. V. N. Rao; Tata McGraw Hill, New Delhi, 1989.
- 2) "Environment Pollution Control and Environmental Engg." C. S. Rao, Tata McGraw Hill, New Delhi, 1994.
- 3) Soil pollution & Soil Organism - P.V. Mishra
- 4) Water Pollution—A.K. Tripathy & S.N. Pandey; A. P. H. Publishing Corporation
- 5) Environmental Air pollution & its control—G.R. Chatwal; Anmol Publications, New Delhi, 1989
- 6) Environmental Chemistry; A. K. De; New Age International Publishers; 6th Edn.
- 7) Understanding Environment; Edt by Kiran B. Chhokar, Mamata Pandya, Meena Raghunathan; Centre for Environment Education; Sage Publication.
- 8) Perspective in Environmental Studies; Kaushik & Kaushik; New Age International Pvt. Ltd Publishers
- 9) Environmental Science; S. C. Santra; New Central Book Agency (P) Ltd.; 2nd Edn.
- 10) Water Pollution, P.K. Goel, New Age International, 2006 Revised Ed.



Title of the Course: Hands on training : Water and soil analysis								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
SEC-2	BS-EN123P	00	02	02	30	15	35	50

### Learning Objectives:

- 1.To understand various chemical analysis of waste water
- 2.Understand the water and soil relationship in biological environment

### Course Outcomes (Cos)

- Enable to collect, label and shipment of sample
- Sludge indices give knowledge of loading of waste water in treatment
- Designing of the treatment unit by provided data

### Detailed Syllabus:

Unit. No.	Course contents	Number of Practicals
1.	DOs and DON'Ts in the Laboratory	1
2.	Collection, Labelling and shipment of soil and water Sample .	1
3.	Determination of Solids in Water	1
4.	Determination of Turbidity of Water	1
5.	Determination of Alkalinity of Water	1
6.	Determination of Hardness of Water by EDTA Titrimetric Method	1
7.	Determination of Chloride in Water	1
8	Determination of Organic Carbon from soil sample	1
9	Determination of Available or Mineralizable Nitrogen from soil sample	1
10	Determination of Available Phosphorus from soil sample	1
11	Determination of available Potassium from soil sample	1

Title of the Course: Designing of Rain Water Harvesting								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
VSC-1	BS-EN124P	00	02	02	60	15	35	50

### Learning Objectives:

1. To understand the Concept of Rainwater Harvesting.
2. To understand the Rainwater Harvesting Principles, Techniques and resource opportunity to design. .

the site

### Course Outcomes (Cos): -

1. Calculate Potential Rainwater resources for specific location.
2. acquire the knowledge about Site Selection, Design and cost estimation of Farm ponds
3. acquire the knowledge about Site Selection, Design and cost estimation of roof top water .

harvesting system

4. Water balance study and measures of water harvesting structures

### Detailed Syllabus:

Unit. No.	Course contents	Number of Practicals
1.	Importance Concept and need of Rainwater Harvesting	1
2.	Techniques of Rainwater Harvesting	1
3.	Measures of Evaporation and Seepage Control	1
4.	Site Selection and cost estimation of Earthen Nala and Cement Nala Bund	2
5.	Site Selection and cost estimation of gabion Bund	1
6.	Site Selection, Design and cost estimation of Farm ponds	1
7.	Design & cost estimation of roof top water harvesting System	1
8	Site Selection, Design and cost estimation of Contour trenching	1
9	Water balance study and measures of water harvesting structures	1
10	Monitoring, evaluation & impact of rain water harvesting methods.	1