

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
S.Y.B.Sc. Environmental Science

Implemented from
Academic Year
2024-25

1. Introduction to 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

1. 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. 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 practical courses in Environmental science.
- Students will understand about how the subject knowledge helps in solving various 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

S.Y.B.Sc. Environmental science (Major)
SKELETON

Sr. No.	Year	Semester	Level	Course Type	Course Code	Title	Credits
1.	II	III	5.0	DSC-6	BS-EN231T	Environment and Ecology	03
2.	II	III	5.0	DSC-7	BS-EN232T	Natural Resources Conservation and Management	03
3.	II	III	5.0	DSC-8	BS-EN233P	Practical based on EN-231 and EN232	02
4.	II	III	5.0	SEC-3	BS-EN234P	Bio-fertilizer and Bio-pesticides	02
5.	II	III	5.0	FP-01	BS-EN235P	Assessment of aquatic bodies	02
6.	II	IV	5.0	DSC-9	BS-EN241T	Biodiversity and its conservation	03
7.	II	IV	5.0	DSC-10	BS-EN242T	Environmental Pollution Control Technology	03
8.	II	IV	5.0	DSC-11	BS-EN243P	Practical based on EN-242 and EN243	02
9.	II	IV	5.0	VSC-2	BS-EN244P	Systematic Ecological Mapping	02
10.	II	IV	5.0	CEP-01	BS-EN-245T	Understanding of Watershed management Practices	02

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

Title of the Course: Environment and Ecology								
Year: II				Semester: III				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-6	BS-EN231T	03	00	03	45	30	70	100

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 population ecology and community ecology.

Course Outcomes (Cos): -

1. To Understand the theories and fundamental concepts of ecology and ecosystem.
2. Students Acquire knowledge about interaction between living and non-living things.
3. Students understand the ecological importance.

Detailed Syllabus:

Unit. No.	Name of The Unit	Course contents	No of lectures
1.	Introduction of Ecology	<ul style="list-style-type: none"> • Introduction • Principles • Objectives • Scope and Classification, • Levels of Organization • Interdisciplinary nature of Ecology, 	05
2.	Ecosystem	<ul style="list-style-type: none"> • Introduction to ecosystem • Significance, • Ecosystem Components and Functioning • Types of Ecosystems 	05
3.	Ecosystem Function	<ul style="list-style-type: none"> • Food Chain and Food Web, • Ecological Pyramids, • Ecological Energy Flow- SingleChannel and Y shaped model, • Biomass of Productivity energy – i)Primary Production. ii) Secondary Production. 	07

		<ul style="list-style-type: none"> • Biomagnifications, • Homeostasis, • Ecological Niche. 	
4	Nutrient Cycling	<ul style="list-style-type: none"> • Biogeochemical Cycles- • Gaseous Phase: - Carbon Cycle, Oxygen Cycle, Nitrogen Cycle, • Sedimentary Phase: - Sulphur cycle and phosphorous cycle. • Hydrological/Water Cycle • Ecosystem Nutrient Cycling Model – Intra-system Cycling and Extra-system Transfers 	07
5	Biosphere	<ul style="list-style-type: none"> • Extent of the Biosphere • Working of the Biosphere • Importance of the Biosphere • Biomes • Global Biomes • Major Biomes of the World • WWF Classification of Biomes • Indian Biomes 	07
6	Population and Environment	<ul style="list-style-type: none"> • Introduction to population • Population Characteristics, • Population Growth curves and structures • Population and Distribution, Population dynamics and models • The Concept of Carrying Capacity 	07
7	Community Ecology and Succession	<ul style="list-style-type: none"> • The structure and Function of Communities, • Characteristics of Community, • Inter-specific and Intra-specific Relationships, • Succession – • Types: - Primary Succession and Secondary Succession, • Causes, • Mechanism and Models 	07
Total			45

Reference Books -

1. Understanding Environment; Chokkar K. B., Pandya M. and Raghunathan M.; Centre for Environment Education; Sage Publication, New Delhi.
2. An Advanced Textbook on Biodiversity – Principles and Practice; Krishnamurthy K.V.; Oxford and IBH Publishing Co. Pvt. Ltd.; New Delhi.
3. Ecology-Principles and Applications; Chapman J. L. and Reiss M. J., Cambridge University Press.
4. Fundamentals of Ecology; Odum P.E.; Natraj Publishers; Dehradun; 3 Edt..
5. Ecology, Environment and Resource Conservation; Singh J.S., Singh S.P. and Gupta S.R.; Annamaya Publishers; New Delhi.
6. Ecology and Environment; Sharma P.D.; Rastogi Publication; Meerut; 11 Rev. Edt..
7. Environment Science; Tyler M.G.; Wadsworth Publishing Co.; 1997.
8. Environmental Science; Santra S.C.; New Central Book Agency (P) Ltd.; 2 Edt..
9. Perspectives in Environmental Studies ; Anubha Kaushik and C.P. Kaushik; New Age International Publishers., New Delhi
10. A Textbook of Plant Ecology; Shukla R.S. and Chandel P.S. , S. Chand and Company LTD. Publishers, New Delhi.
11. Ecology and Environmental Science ; S.V.S. Rana 5th Edition, PHI Learning private Limited , New Delhi.

Title of the Course: Natural Resources Conservation and Management								
Year: II				Semester: III				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-7	BS-EN232T	03	00	03	45	30	70	100

Learning Objectives:

1. To Know the Concept of Natural resources.
2. The knowledge about the types, use and management of natural resources.
3. Importance of various interactive reactions in environment.

Course Outcomes (COs):

- Understand the fundamentals concepts of Natural Resources
- Understand best agricultural practices
- Give knowledge about sustainable practices

Detailed Syllabus:

Unit No.	Name of the Unit	Course contents	Number of lectures
1	Natural Resources	<ul style="list-style-type: none"> • Definition, Classification, • Importance and use of Resources, • Regenerative and Assimilative Capacity, • Man's Interaction and problems with Natural Resources. 	06
2	Land and Mineral Resources	<ul style="list-style-type: none"> • Soil Degradation, Soil Erosion, • Consequences, Conservation of Soil, • Mineral Resources: Origin, Need, Overexploitation, Conservation, • Effects of Mining on Ecosystem with case studies. 	06
3	Water Resources	<ul style="list-style-type: none"> • Surface Water and Ground Water, • Use and over-utilization, • Ground water pollution, Water Crisis, • Conflicts over water, • Conservation and Management, • Rain-water Harvesting, • Watershed Management, • Flood plain management 	08

4	Food and Agricultural Resources	<ul style="list-style-type: none"> • World Food Demand, Malnutrition, • The Green Revolution in India, • Genetically Modified Crops and Regulations in India, • Traditional and Modern Practices for Sustainable Agriculture Development, • Fertilizer-Pesticide Problems. 	06
5	Forest Resources	<ul style="list-style-type: none"> • Definition, Function and importance of Forest Resources • forest vegetation, status and distribution, • major forest types and their characteristics. Use and over-exploitation, deforestation 	08
6	Management of Common International Resources	<ul style="list-style-type: none"> • Ocean, climate, international fisheries and management commissions; • Antarctica: the evolution of an international resource management regime. 	05
7	Case studies	<ul style="list-style-type: none"> • Resource management in mountain ecosystem, • Dry-land ecosystem • The management of marine and coastal resources • Case study of shifting cultivation • Mangrove ecosystem and their management 	06
Total			45

Reference Books –

1. Understanding Environment; Chokkar K. B., Pandya M. and Raghunathan M.; Centre for Environment Education; Sage Publication, New Delhi.
2. An Advanced Textbook on Biodiversity – Principles and Practice; Krishnamurthy K.V.; Oxford and IBH Publishing Co. Pvt. Ltd.; New Delhi.
3. Ecology – Principles and Applications; Chapman J. L. and Reiss M. J.; Cambridge University Press.
4. Fundamentals of Ecology; Odum P.E.; Natraj Publishers; Dehradun; 3 Edt..
5. Ecology, Environment and Resource Conservation; Singh J.S., Singh S.P. and Gupta S.R.; Annamaya Publishers; New Delhi.
6. Ecology and Environment; Sharma P.D.; Rastogi Publication; Meerut; 11 Rev. Edt..
7. Environment Science; Tyler M.G.; Wadsworth Publishing Co.; 1997.
8. Environmental Science; Santra S.C.; New Central Book Agency (P) Ltd.; 2 Edt..
9. Environmental Studies -A text book, Dr. D.K. Asthana and Dr. Asthana Meera 2006 , S – Chand and Company Limited, New Delhi.

Title of the Course: Practical based on EN-231 and EN232								
Year: II				Semester: III				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-8	BS-EN233P	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 methods to study soil parameters.

Course Outcomes (COs):

- Monitor parameters of forest and grassland ecosystem.
- Learn field techniques related vegetation and bird sampling and analysis.
- Perform assessment of soil nutrient with the help of standard instruments.
- Visit and understand working of district soil survey department.
- Observe and interpret the data related to Ecosystems.

Detailed Syllabus:

Unit No.	Course contents	Number of Practicals
1.	To study the Different types of Quadrat method- Point Frame Method, Transect (Line and Belt)	01
2.	Determination of Frequency and Abundance of species across terrestrial or aquatic ecosystem transitional zone, by Line and Belt Transect Method	01
3.	Study of vegetation by List Count Quadrat Method to determine the Frequency, Density and Abundance.	01
4.	Measurement of Primary Productivity of grassland by Harvest Method	01
5.	Estimation of Chlorophyll (A, B and Total) from Clean and Polluted Environment area plants.	01
6.	To Study Ecological and Economical importance of ecological resources.	01
7.	Estimation of Animal Population Size by Mark-Recapture Method.	01
8.	Study of soil sampling Technique	01
9.	Estimation of available nitrogen from given soil sample.	01
10.	Estimation of available phosphorous in given soil sample.	01
11.	Estimation of potassium in given soil sample.	01
12.	Estimation of organic carbon from given soil sample.	01
13.	Identification of advanced Agricultural equipment in the Local market	01
14.	Visit to Soil Survey Department	01

Title of the Course: Bio-fertilizer and Bio-Pesticides								
Year: II				Semester: III				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
SEC-3	BS-EN234P	02	00	02	30	15	35	50

Learning Objectives:

1. To learn fundamental concepts of Biofertilizer and Biopesticides.
2. To isolate and identify the microorganism .
3. To Gain knowledge about actual on field applications.

Course Outcomes (Cos): -

1. To Understand the role of microbial biofertilizers in various kind of metabolism.
2. Students will expert in handling and isolation of microorganisms
3. Students understand the isolation, purification and mass production of biofertilizers and biopesticides.

Detailed Syllabus:

UNIT NO	COURSE CONTENT	NO.OF PRACTICAL
1.	Basic rules of microbiology laboratory.	1
2.	Basic requirements of microbiology laboratory.	1
3.	Isolation of algae from soil.	1
4.	Identification of algae.	1
5.	Isolation of <i>Rhizobium</i> from soil/root nodules.	1
6.	Isolation of <i>Azotobacter</i> from garden soil.	1
7.	Isolation of <i>Azospirillum</i> from soil/root.	1
8.	Isolation of VAM spores from soil.	1
9.	Staining of VAM fungi.	1
10.	To study special features of algae.	1
11.	To study special features of <i>Rhizobium.Sp.</i>	1
12.	To study special features of <i>Azospirillum Sp..</i>	1
13.	To study special features of <i>Azotobacter Sp.</i>	1
14.	To study special features of <i>Pseudomonas Sp..</i>	1

Reference books:-

1. M T Madigan, and J M Martinko, 2014. Biology of Microorganisms 14th Edn.
2. Pearson.M J Pelczar, 1998. Microbiology 5 th Edn. Tata McGraw Hill Education Pvt. Ltd.
3. Strainer, R, 1987. General Microbiology. Palgrave Macmillan.Edward Alchano, 2002. Introduction to Microbiology. Jones and Bartlett hearing.

Title of the Course: Assessment of Aquatic resources								
Year: II				Semester: III				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
FP-01	BS-FP-01P	02	00	02	30	15	35	50

Learning Objectives:

1. To acquire the information related with the aquatic ecosystem and analytical techniques
2. To know the sources and its importance
3. To collect and analyze the various contaminated and non-contaminated samples

Course Outcomes (Cos)

1. The students will learn the basic concept and types of aquatic ecosystem.
2. The students will learn quantitative and qualitative analytical techniques used in environmental science.
3. Student will analyze and interpret the data

Detailed Syllabus:

Unit No.	Course contents	No of lectures
1	<ul style="list-style-type: none"> • Aquatic environment/ecosystem – components, structure and functions; • Types of aquatic ecosystem. • Concepts of habitat and ecological niche • Productivity and carrying capacity • Trophic relationships, energy flow and nutrient cycling • Ecological Stability 	06
2	<ul style="list-style-type: none"> • Ecological restoration principle and techniques • Case study 	04
3	Collection of Water sample from, dug well, bore well pond, lake , and river	02
4	Field analysis of the physical water parameter analysis (PH, Temp, TDS, SS, EC)	02
5.	Collection, Preservation, Storage and Labelling Techniques used for Water Samples	01
6	Chemical analysis of major Water parameters	02
7.	Phyto and zooplankton analysis of water sample	01
08.	Statistical interpretation of the data collected (Mean, Mode, SD, and Regression)	01
09	Graphical presentation of the data and Submission	01

Reference Books:-

1. Ecology and Environment by P D Sharma, Rastogi publication.

2. Fundamentals of Aquatic Ecology by RSK Barnes and KH Mann, Wiley
 3. Water and waste water Analysis – R.K. Trivedi
 4. Biological and Chemical analysis of Water and waste water – P.K. Goel
 5. Practical manual Of Water Analysis – NEERI, Nagpur
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Semester-IV

Title of the Course: Biodiversity and it's conservation.								
Year: II				Semester: IV				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-09	BS-EN241T	03	00	03	45	30	70	100

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. Understand the Diversity of Biology
2. Understand the acquire knowledge about its distribution and importance
3. Gain knowledge about distribution of life in earth
4. Understand and develop the skills of identification of plants and animals in diversity, itsdistribution
5. Understand the importance of conservation
6. Acquire knowledge about skill of conservation method

Detailed Syllabus:

Unit. No.	Name of the Unit	Course contents	No of lectures
1	Ecosystem Diversity	<ul style="list-style-type: none"> • Definition, Importance, • Types and Classification of Ecosystem Diversity • Hotspots in India, • Endemic, Extinct and Rare species, IUCN and Red Data book 	08
2	Species Diversity	<ul style="list-style-type: none"> • Definition, Characteristics of species diversity, • Measuring Species Diversity, • Species diversity index, Extinction, • Keystone species • Species diversity in India, 	08
3	Genetic Diversity	<ul style="list-style-type: none"> • Definition, • Genetic Variability and Variations, Importance Genetic Biodiversity, • Factors affecting Genetic Diversity- Mutation, Genetic drift, Gene flow, Natural Selection, • Genetic diversity in India, 	09
4	Significance and Threat to Biodiversity	<ul style="list-style-type: none"> • Significances – Ecological Significances, and Values of biodiversity, • Threats- Habitat Destruction and Fragmentation, Forestry Practices, Invasion, Over-exploitation, Environment Pollution, 	10

		Global Climate Change, Loss of Traditional Knowledge, Human Wildlife Conflict.	
5	Biodiversity Conservation	<ul style="list-style-type: none"> • Goals of biodiversity conservation • Types of Conservation Methods – <i>In-situ, Ex-situ</i>, • Protected Areas and Sacred Grooves, • National and International Conservation Organization, • Biodiversity Act 2000, • Ramsar Convention, • Role and Function of National and state biodiversity conservation board / policy 	10
Total			45

Reference Books

1. Ecology – Principles and Applications; Chapman J. L. and Reiss M. J.; Cambridge University Press.
 2. Fundamentals of Ecology; Odum P.E.; Natraj Publishers; Dehradun; 3 Edt..
 3. Ecology, Environment and Resource Conservation; Singh J.S., Singh S.P. and Gupta S.R.; Annamaya Publishers; New Delhi.
 4. Ecology and Environment; Sharma P.D.; Rastogi Publication; Meerut; 11 Rev. Edt..
 5. Environment Science; Tyler M.G.; Wadsworth Publishing Co.; 1997.
 6. Perspective in Environmental Studies; Kaushik and Kaushik; New Age International Pvt.Ltd. Publishers.
 7. Environmental Science; Santra S.C.; New Central Book Agency (P) Ltd.; 2 Edt..
 8. Biodiversity ; Fatik Mandal and Nepal Nandi ; 2nd edition , Asian Books Private Limited, New Delhi.
 9. Perspectives in Environmental Studies ; Anubha Kaushik and C.P. Kaushik; New Age International Publishers., New Delhi
 10. A Textbook of Plant Ecology; Shukla R.S. and Chandel P.S. , S. Chand and Company LTD. Publishers, New Delhi.
 11. Ecology and Environmental Science ; S.V.S. Rana 5th Edition, PHI Learning private Limited , New Delhi.
 12. Environmental Biology ; Verma P.S. and Agarwal V.K. ; S.Chand Company LTD. Publishers, New Delhi.
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Title of the Course: Environmental Pollution Control Technology								
Year: II				Semester: IV				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-10	BS-EN242T	03	00	03	45	30	70	100

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. To Study Different Aspects of Environmental Contamination, which have adverse effects on Human Health.
2. Understanding mechanisms of pollutants impacting on human health.
3. Developing an understanding of different types of pollutants, their sources and mitigation measures.

Detailed Syllabus:

Unit No.	Name of the Unit	Course contents	No of lectures
1	Air Quality and Noise Parameters and Monitoring	<ul style="list-style-type: none"> • Sampling, site selection, collection, preservation and labeling of sample. • Analytical Technique used for Co₂, SO_x, NO_x, SPM (suspended particulate Matter) Analysis. • National standards for ambient air quality. Stack gases monitoring technique, Plume behavior • Noise: Definition, standards, assessment and effects • Monitoring instruments of air and Noise 	07
2	Water Quality Monitoring	<ul style="list-style-type: none"> • Purpose/objectives of monitoring • Water Quality Monitoring Protocol • WHO, BIS and ICMR National Standards for water quality. 	07
3	Waste Water Treatment	<ul style="list-style-type: none"> • Primary Treatment – Screening, Grit removal, Sedimentation • Secondary Treatment- Aerobic Method and Anaerobic Method • Tertiary Treatment- Disinfection (Chlorination) 	08
4	Soil Quality Monitoring	<ul style="list-style-type: none"> • Objectives, Sampling technique, site selection <ul style="list-style-type: none"> ○, preservation and labeling of soil sample • Soil Analysis- Physical, Chemical-Biological Methods • Use of Bio fertilizers and Bio pesticides 	08

		<ul style="list-style-type: none"> • Integrated Nutrient Management (INM) • Double Cropping, • Mixed Cropping, • croprotation, • Biological Pest Management, • Organic Farming. 	
5	Radioactive Pollution	<ul style="list-style-type: none"> • Definition, Sources - Natural and Anthropogenic • Effects of microwave, radio frequency radiation on man and plant. • Biological and genetic effect of radiation. • ICRP guidelines for disposal of radioactive waste • Safety standards and guidelines for handling • storage and disposal 	08
6	Thermal pollution	<ul style="list-style-type: none"> • Concept, • Sources • Effects on living and non-living things. • Control Measures – Cooling ponds, Cooling towers, Artificial Lake, Spray Ponds. 	07
Total			45

Reference Books-

1. Understanding Environment; Chokkar K. B., Pandya M. and Raghunathan M.; Centre for Environment Education; Sage Publication, New Delhi.
2. An Advanced Textbook on Biodiversity – Principles and Practice; Krishnamurthy K. V.; Oxford and IBH Publishing Co. Pvt. Ltd.; New Delhi.
3. Ecology – Principles and Applications; Chapman J. L. and Reiss M. J.; Cambridge University Press.
4. Fundamentals of Ecology; Odum P.E.; Natraj Publishers; Dehradun; 3 Edt..
5. Ecology, Environment and Resource Conservation; Singh J.S., Singh S.P. and Gupta S.R.; Annamaya Publishers; New Delhi.
6. Ecology and Environment; Sharma P.D.; Rastogi Publication; Meerut; 11 Rev. Edt..
7. Environment Science; Tyler M.G.; Wadsworth Publishing Co.; 1997.
8. Perspective in Environmental Studies; Kaushik and Kaushik; New Age International Pvt.Ltd. Publishers.
9. Environmental Science; Santra S.C.; New Central Book Agency (P) Ltd.; 2 Edt..
10. Environmental Chemistry, Dey A. K.; New Age International Publishers; 6 Edt..
11. Air Pollution; Rao M.N. and Rao H.V.N.; Tata McGraw Hill; New Delhi; 1989.
12. Environmental Pollution Control and Environmental Engineering; Rao C. S.; Tata McGraw

Hill; New Delhi; 1994.

13. Pollution Management; Agarwal S.K.
 14. Environmental Science; Daniel Chiras.
 15. Waste Water Engineering, Treatment, Disposal and Reuse; Metcalf and Eddy.
 16. Manual for Field Ecology; Mishra R
 17. Handbook of Methods in Environmental Studies Vol-I andII; Maiti S.K.; ABD Publishers; Jaipur.
 18. Physico-Chemical Examination of Water, Sewage and Industrial Effluents; Manivasakam N.; Pragati Prakashan; Meerut; 1984
 19. Chemical and Biological Methods for Water Pollution Studies; Trivedi R.K. and Goel P.K.; Environmental Publications; Karad; 1986.
 20. Instrumental Methods of Analysis; Willard; cbspd; 7 Edt..
 21. Pollution Management; Agarwal S.K.
 22. Waste Water Engineering, Treatment, Disposal and Reuse; Metcalf and Eddy
 23. Advanced Air and Noise Pollution Control – L.K Wang and N.C Pereira
 24. Textbook of Noise Pollution and Its Control – S.C. Bhatia
 25. Waste Water Engineering, Treatment, Disposal and Reuse; Metcalf and Eddy
 26. Environmental Pollution Control and Environmental Engineering; Rao C. S.; TataMcGraw Hill; New Delhi; 1994.
 27. Air Pollution; Rao M.N. and Rao H.V.N.; Tata McGraw Hill; New Delhi; 1989
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Title of the Course: Practical based on EN-242 and EN243								
Year: II				Semester: IV				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-11	BS-EN243P	00	02	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. Understand and evaluate parameters of diversity
2. Understand the conservation of method
3. CO2 Monitor and audit natural resources like water, energy, etc.
4. Analyze important resources through various instruments
5. CO4 Visit various institutes working in the field of natural resource management

Detailed Syllabus:

Sr.No.	Name of The Practical	No. of allotment
1.	Estimation of AGB, BGB and Carbon from sampling of trees	01
2.	Enlist of Endangered and Endemic species common plants of in local study areas	01
3.	Study Biodiversity Conservation method (In-situ and Ex-situ	01
4.	Identification of traditional Importance of Medicinal and Aromatic plants	01
5.	Study Ex – situ conservation of endangered plant species (Seed collection)	01
6.	Analysis of Suspended Particulate Matter (SPM)	01
7.	Determination of Nitrate from water (Calorimeter)	01
8.	Determination of Phosphate from water. (Colorimeter)	01
9.	Determination of Residual Chlorine from water sample	01
10.	Analysis of Soil texture	01
11.	Determination of Calcium from soil sample	01
12.	Determination of micronutrient – Copper/ Iron/ zinc from Soil.	01
13.	Measurement of sounds by DB meter / SLM in silent, industrial, residential and commercial zones and Analysis	01
14.	Visit to Nurseries/ National Park / Biosphere Reserves/ Wetland/ Botanical Garden/ Zoological Park/ Soil Survey Department	01
15.	To locate the hotspots, phyto geographical regions and distribution of endemic plants in the map of India.	01

Title of the Course: Organic Fertilizes								
Year: II				Semester: IV				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
VSC-02	BS-EN244P	02	00	02	30	15	35	50

Learning Objectives:

- Learning to prepare organic manure pit
- Attain advanced knowledge in estimation of organic manure.
- Enrich the skills by preparing and monitoring the organic manure experimental set up.
- Enhance practical approaches for application

Course Outcomes:

- Know the importance of organic manure.
- Develop the skill for preparation of Compost
- Observe the enrichment of soil and importance of it.

Unit No.	Course contents	No of lectures
1	Identification of manures & compost	01
2	Preparation of Pit for composting	01
3	Preparation of Pit for vermicompost	01
4	Organic Fertilizers Analysis : PH and WHC	01
5	Estimation of Organic Carbon	01
6	Estimation of Nitrogen from compost and vermicompost	01
7	Estimation of Phosphate of Compost manure	01
8	Estimation of microbial count of Compost	02
9	Field visit and report	01
10	Oral and submission	01

Title of the Course: Understanding of watershed Management Practices								
Year: II				Semester: IV				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
CEP-01	BS-EN 245T	02	---	02	30	15	35	50

Learning Objectives:

1. Student will learn the importance of watershed management
2. Will acquire the knowledge of characteristics and principle of erosion
3. Learn the various structure are used in watershed management

Course Outcomes (Cos):-

- Field visit to Enrich the student
- To know the importance of Agriculture and watershed management
- A good sustainability practice to be adopted at village level

Detailed Syllabus:

Unit. No.	Name of the Unit	Course contents	No of lectures
1.	Introduction:	Concept of watershed development, objectives of watershed development, need for watershed development, Integrated and multidisciplinary approach for watershed management.	6
2.	Characteristics of Watersheds	Size, shape, physiographic, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds	6
3	Principles of Erosion	Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion- Universal soil loss equation	6
4.	Measures to Control Erosion	Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, check dams , rock-fill dams, brushwood dam, Gabion, cement tank.	6
5	Land Management:	Land use and Land capability classification, management of forest, agricultural, grassland and wild land, land grading operation, Reclamation of saline and alkaline soils	6

Reference Book :

1. Singh RV. 2000. (Ed.) Watershed planning and management. Yash Publishing House, Bikaner, Rajasthan, India.
2. Government of India. 1994. Guidelines for Watershed Development. New Delhi, India: Department of Land Resources, Ministry of Rural Development, Government of India.
3. Government of India. 2008. Common Guidelines for Watershed Development Projects. National Rain-fed Area Authority, Ministry of Land Resources, Government of Andhra Pradesh, India. 57 pp.
4. Chow, V.T. "Handbook of applied Hydrology: a compendium of water- resource technology", Vol 1 1964. Mc Graw Hill.
5. Darghouth, S., Ward, C., Gambarelli, G., Styger, E., & Roux, J. "Watershed Management Approaches,

Policies, and Operations: Lessons for Scaling Up''. Water Sector Board Discussion Paper Series No.11, 2008. The World Bank, Washington DC.

6. Gandhi, V.P. "A Conceptual Framework for Studying Institutions in Watershed Development", W.P. No. 2010-11-04, 2010. IIM Ahmedabad
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