

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)

Board of studies in Environmental Science

Sr. No.	Name	Designation
1.	Dr. Satish D.Kulkarni	Chairman
2.	Prof.Dr. N.R.Bandella	Academic Council Nominee
3.	Dr. Nilesh Wagh	Academic Council Nominee
4.	Dr, Deepali Nimbalkar	Vice-Chancellor Nominee
5.	Dr. D. D.Ahire	Member
6.	Dr. A.P.Pandit	Member
7.	Prof.Dr. D.C. Meshram	Member (co-opt)
8.	Dr. Ashish V.Mane	Member (co-opt)
9.	Mr. Kaliprasad Ningurkar	Alumni
10.	Dr. Prakash Mundhe	Industry Expert

Prologue/ Introduction of the programme:

The course curriculum for undergraduate studies under choice based credit system (CBCS) 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) (B.Sc. Environmental Science)

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 selfemployment 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 obligations

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Syllabus of F. Y. B. Sc. Environmental Science
(Under Faculty of Science)
Semester-I

Semester -I	Paper -I
Course Code: BSC-EN-111	Title of the Course: Fundamental of Environmental Biology
Credits: 02	Teaching Hours: 30

Course Outcomes (Cos):

1. Understand the theories and fundamental concepts of environmental biology .
2. Understand origin of life on planet earth and related theories
3. Gain knowledge about distribution of life on earth
4. Understand the theories and fundamental concepts of plant and animal taxonomy
5. Acquire knowledge about Bio resources availability , its distribution and importance
6. Develop the skills of identification of native plants and animals

Detailed Syllabus:

Semester – I, Paper –I

B.Sc.EN–101 Fundamental of Environmental Biology

Credits – 02

Hours– 30

Unit. No.	Name of the Unit	Course contents	Number of lectures
1	Introduction To Biology	<ul style="list-style-type: none"> • Introduction to Biology, Branches, Scope and Importance in today's context from environmental point of view. • Biological diversity of India – Major genera, species, sub-species of flora and fauna. • Major ecological types of India 	3
2	Origin of Life	<ul style="list-style-type: none"> • The origin of Life; Evolution of Life through the geological time i.e. – Eras, Periods, Epochs; Events of (Evolutionary) 'Explosions' and 'Mass Extinctions' & Paleontological Evidences for these. • The current 'Mass Extinction' with reference to rate of extinction, factors responsible and possible remedies 	5
3	Biogeography	<ul style="list-style-type: none"> • A glimpse of the present day distribution of Life on Earth; The factors responsible – 	8

		<ul style="list-style-type: none"> i) Geological - Continental Drift- ii) Climatic - Barriers and Bridges iii) Evolutionary - Speciation etc. • Biogeography – The meaning; Biographical profile of the world; and India 	
4	Taxonomy	<ul style="list-style-type: none"> • Taxonomic Principles - aim, objectives, hierarchy, kingdoms. • History; Linnaeus system of classification; Bentham & Hooker system of classification. • Components of systematic - characterization, classification, identification & nomenclature. • The concept of species- morphological, biological, phylogenetic, ecological etc. 	8
5	Characteristics of Ecology and Bio-resources	<ul style="list-style-type: none"> • Ecological Adaptations under various environmental conditions – i) In plants - hydrophytes, mesophytes, epiphytes, xerophytes & halophytes ii) In animals - mimicry, vestigiality etc. • Bio-resources- <ul style="list-style-type: none"> i) Forests- major types of the world & India ii) Agricultural crops - major food plants of the world & India iii) Livestock- major varieties of the world & India iv) Fisheries resources - saline & fresh water • Significances / use of the Bioresources; Extraction of Bioresources by traditional & modern methods; Threat to local bioresources - overexploitation, habitat loss, invasive species etc. 	6
			Total 30

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, 3rdEdtn.

11) Holmes' Principles of Physical Geology, Edt. By P. McL. D. Duff, ELBS with Chapman & Hall, 4thEdtn.

12) An Advanced textbook on Biodiversity – Principles & Practice, K. V.

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**Syllabus of F. Y. B. Sc. Environmental Science
(Under Faculty of Science)
Semester-I**

Semester -I	Paper -II
Course Code: BSC-EN-112	Title of the Course: Fundamental of Environmental Chemistry & Physics
Credits: 02	Teaching Hours: 30

Course Outcomes (Cos):

1. Importance of various interactive reactions in atmosphere.
2. Understand the concept of Green chemistry
3. Understand the structure and composition of atmosphere
4. Effect and impact of Soap, detergent and chemical food adulteration in nature
5. Acquire knowledge about the analysis techniques of various parameters of air and water samples

Semester – I, Paper –II

B.Sc.-EN–102 Fundamental of Environmental Chemistry and Physics
Credits – 02 Hours– 30

Unit. No.	Name of the Unit	Course contents	Number of lectures
1	Definition and Scope	<ul style="list-style-type: none"> • Segments of Environment and various interactive reactions occurring between these segments. • Chemical Aspects of Bio-geo-chemical cycles • Green Chemistry 	5
2	Chemical Composition of Atmosphere	<ul style="list-style-type: none"> • Characteristic of the Chemical Reactions involved in atmosphere. Pollutants in Atmosphere • Oxides of Nitrogen ,Oxides of Sulphur, Oxides of Carbon • Climate Change in Atmosphere 	7
3	Chemistry of some Heavy Metal	<ul style="list-style-type: none"> • Chemistry of Pb, Hg, Cd and As • Physical and chemical properties • Human exposure-absorption and influence 	6

		<ul style="list-style-type: none"> • Prevention and Control measures of these heavy metals • Case studies related to above heavy metals 	
4	Chemistry of Surfactants and chemicals in food	<ul style="list-style-type: none"> • Soaps and Detergents, Need, Classification, Characteristic and Composition • Environmental Impacts and Toxicity of Soaps and Detergents • Food Additives and Contaminants (Preservatives, Flavoring and coloring agents) <ul style="list-style-type: none"> i) Adulterants – Properties and their effects ii) Tests and Examples of food adulterations, 	6
5	Environmental Analysis and Environmental Physics	<ul style="list-style-type: none"> • Solution concentration (Normality, Molarity, Molality, ppm, Equivalent weight etc.) • Titrimetric, colorimetric and spectro-photometric methods. • Basic Principle and working of pH meter and conductivity meter. • Basic Principle and working of colorimetric and spectro-photometer • Transport and Exchange of Heat • Mass and Energy in environment • Types of radiations in the Environment • Gibbs Energy Equation 	6
			30

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 Edtn.
- 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 Edtn.
- 10) Water Pollution, P.K. Goel, New Age International, 2006 Revised Ed

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**Syllabus of F. Y. B. Sc. Environmental Science
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Semester-I**

Semester -I	Paper -III
Course Code: BSC-EN-113	Title of the Course: Practicals in Environmental science
Credits: 1.5	Total Practicals :15

Course Outcomes (Cos):

- To understand the preparation of chemicals , normality, molarity etc
- Collection , preservation and analysis of water sample
- Collection , preservation and analysis of air sample
- Understand native plants for plantation with respect to Geography and Climate
- Acquire knowledge about working of PUC machine-Gas Analyser
- Study of Plant Adaptations under various environmental conditions

Semester – I,

Paper –III

B.Sc.-EN–103 Practical- I

Credits – 02

Lectures – 30

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

	mesophytes, epiphytes, halophytes & xerophytes).	
15.	Visit to study different Fishery resources in the local market	1

****Perform any 15 practicals**

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**Syllabus of F. Y. B. Sc. Environmental Science
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Semester-II**

Semester -II	Paper -I
Course Code: BSC-EN-201	Title of the Course: Fundamental of Environmental Geosciences
Credits: 02	Teaching Hours: 30

Course Outcomes (Cos):

- Understand the internal structure of the planet earth and related theories
- Acquire knowledge related with types, properties and structures of rocks and minerals
- Understand the composition and structure of atmosphere
- To know about the temperature distribution patterns in atmosphere
- Basic information related hydrological cycle and various forms of water in atmosphere and its behavior.
- Understand the various types of natural disaster its causes and effects

Detailed Syllabus:

Semester – II,

Paper –I

B.Sc.-EN–201 Fundamental of Environmental Geosciences

Credits – 02

Hours– 30

Unit. No.	Name of the Unit	Course contents	Number of lectures
1	Introduction Earth & it's Structural Components	<ul style="list-style-type: none"> • Internal Structure of Earth • Theories of geological evolution – Wager's • Continental Drift Theory, Plate Tectonic Theory • Types of Rocks – Igneous, Sedimentary, Metamorphic • Rock cycle • Mineral:-Definition, Characteristics of mineral, Types of Minerals, Properties of minerals, Examples of minerals • Rock forming minerals – quartz, feldspar, micas, Clay minerals, calcite, dolomite etc. 	5
2	Soil	<ul style="list-style-type: none"> • Formation – weathering processes (types), • biomass addition 	5

		<ul style="list-style-type: none"> Physical & chemical properties; composition; macro & micro plant nutrients Soil Profile Soil classification Soils of India – with respect to their agriculture significances Soil Survey & their types Soil fauna and Soil flora; , Soil erosion and its type 	
3	Earth's Atmosphere and Atmospheric temperature	<p>Definition of Biosphere; Components of biosphere.</p> <ul style="list-style-type: none"> Introduction, general properties Atmosphere: Definition, Composition of air; Physico-chemical structure of atmosphere: Troposphere, Stratosphere, Mesosphere, Ionosphere, And Exosphere. Vertical & horizontal structures Chemical composition – in each of the vertical layers; Significance of Atmosphere Atmospheric temperature measurement – Instruments; Methods (maximum, minimum, mean temperature, temperature range); Factors regulating atmospheric temperature Lapse rate; Types – ELR, DALR & WALR 	8
4	Hydrological Cycle & Atmospheric pressure	<ul style="list-style-type: none"> Hydrological cycle – Introduction & significance <p>i) Evaporation; Factors affecting the rate of Evaporation</p> <p>ii) Condensation; Factors affecting the rate of forms of condensation – dew, frost, fog & cloud.</p> <p>iii) Precipitation; Factors affecting precipitation; Forms of precipitation – rain, drizzle, snow, hail, sleet etc.</p> <ul style="list-style-type: none"> Atmospheric pressure – Introduction; Measurement; Factors affecting the atmospheric pressure, Spatial & Temporal variations ,Atmospheric pressure & Generation of winds; Factors affecting winds 	8
5	Natural Calamities & Resources	<ul style="list-style-type: none"> Natural Calamities – Volcanoes, Earthquakes, Landslides, Cyclones, Floods & Droughts; Causes; Planning & Management to prevent/ mitigate their effects; Case studies for each. Introduction of Resources, Classification of Resources Significance of wind, geothermal & solar energy as alternative energy resources 	4
			Total 30

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; 4thEdtn.
 - 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; 2ndEdtn.
 - 6) Environmental Geology; Kellar E.A. (2011); Prentice Hall, 624 p; 9thEdtn.
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Syllabus of F. Y. B. Sc. Environmental Science
(Under Faculty of Science)
Semester-II

Semester -II	Paper -II
Course Code: BSC-EN-202	Title of the Course: Fundamental of Environmental Pollution
Credits: 02	Teaching Hours: 30

Course Outcomes (Cos):

- Understand the types and definition of pollution
- Understand the causes and effects of air pollutants on biological life
- Collect the information related with major air pollution related disasters
- Understand the radioactive pollution with examples
- Understand Water pollution with examples
- Understand Noise pollution ,causes and effects with examples

Semester – II,

Paper –II

B.Sc. EN–202 Fundamental of Environmental Pollution

Credits – 02

Hours– 30

Unit. No.	Name of the Unit	Course contents	Number of lectures
1	Introduction	<ul style="list-style-type: none"> • Pollution –Definition; • Types of –Air, Water Soil, Noise,Thermal, Radioactive and Solid waste • Sources :Natural and Anthropogenic 	5
2	Air and Radioactive Pollution	<ul style="list-style-type: none"> • Major air pollutants and their sources; • Effects – On Biological system – Animals, humans & plants • On Non Biological systems –material; physical environment • Green House Effect, Ozone depletion, Smog, Acid Rain, Global warming • Case studies – London smog; Los Angeles smog; Bhopal Gas Tragedy ,Taj-Mahal. • Radioactive pollution- Definition, Sources and Effects • Chernobyl disaster 	5

3	Water and Thermal pollution	<ul style="list-style-type: none"> • Definition, Types (Ground, Surface and Marine) Sources, Effects & control measures • Eutrophication • Bioaccumulation and biomagnifications of pollutants • Case studies – Itai- Itai & Minamata (Japan); Arsenic poisoning (West Bengal) Fluorides in ground water. • Thermal Pollution - Definition, Sources and Effects 	8
4	Soil and Noise Pollution	<ul style="list-style-type: none"> • Definition; Sources • Effects of soil pollution: soil quality, productivity, Acidification, Alkalization, Salinization, Desertification etc. • Effect on - Biological system, soil microorganisms and plants. • Control measures/ Alternatives– • Bio fertilizers & biological pest management; • Organic farming & other agricultural interventions. 	8
5	Noise Pollution –	<ul style="list-style-type: none"> • Definition, Sources • Effects of noise: Reactions to noise- auditory effects, acoustic trauma, psychological effects- speech interference, annoyance, sleep interference, effects on performance, subjective response • Noise control at source: Sound path receiver concept, control by design, control, personal protection devices 	4
			Total 30

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.
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**Syllabus of F. Y. B. Sc. Environmental Science
(Under Faculty of Science)
Semester-II**

Semester -I	a
Course Code: BSC-EN-203	Title of the Course: Practical based on EN- 201 and EN-202
Credits: 1.5	Teaching Hours: 30

Course outcome (Cos):

- To understand noise level meter calibration and measurement techniques
- To identify the pollution indicators in fields and its significance
- Acquire the knowledge regarding characteristics and types of rock and mineral samples
- Field experience of in situ and ex situ conservation of wildlife
- Industrial visits enrich the water and wastewater treatment aspects
- Collection preservation, labeling and analysis of field soil samples

Semester – II,

Paper –III

B.Sc.-EN-203 Practical--II Practical based on EN- 201 and en-202

Credits – 02

Lectures – 30

Sr. No.	Description	Practical Sessions
1	Measurement of Noise using Sound Level Meter (Field Practical).	01
2	Collection and characterization of planktons as bio-indicators from Eutrophic lake(Field Practical).	02
3	Identification of different Mineral specimens from their physical properties	01
4	Identification of different Rock specimens from their physical properties.	01
5	Visit to a Natural Area/ Wildlife Sanctuary/ National Park	01
6	Visit to Weather Station.	01
7	Determination of Turbidity in water by Secchi disc (Field practical).	01

8	Reading Topographic Maps and Symbols	01
9	Plotting Climatological data on graph papers using toposheet maps	01
10	Visit to Industrial Site/ ETP/ STP	01
11	Visit to garbage Disposal site	01
12	Study of soil properties – Temperature, texture and particle size	01
13	Study of various Soils found in India	01
14	Estimation of the Moisture Content & Water Holding Capacity of soil	01
15	Estimation of Gypsum required for Alkaline soil.	01
16	Use of social media for e-networking and dissemination of ideas on environmental issues.	01
17	Estimation of Lapse Rate	01

****Perform any 15 practical**