

**NORTH MAHARASHTRA UNIVERSITY,  
JALGAON**



'A' Grade  
NAAC Re-Accredited  
(3<sup>rd</sup> Cycle)

**SYLLABUS STRUCTURE OF  
B. Sc.  
[Environmental Sciences]  
F.Y.B.Sc.**

**UNDER CHOICE BASED CREDIT SYSTEM (CBCS)**

**[2018-19]**

## **PREAMBLE**

The syllabus has been prepared anticipating the requirements of B.Sc. Environmental Sciences students under Choice Based Credit System (CBCS) Pattern. The contents have been drawn to accommodate the widening horizons of the Environmental Sciences discipline and reflect the changing needs of the students. The detailed syllabus for each paper is appended with a list of suggested readings.

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.

The present syllabus is restructured anticipating the future needs of Environmental Sciences with more emphasis on imparting hands-on skills. The main thrust is laid on making syllabus compatible with developments in Education, Research and Industrial sectors. The Theory and Practical course in new restructured course will lead to impart skill-set essentials to further Environmental Sciences.

Hence, the committee constituted for preparation of structure of B. Sc. in Environmental Science in its meeting held on 23/07/2018 resolved to accept the revised syllabus for F. Y. B. Sc. (Environmental Science) based on Choice Based Credit System (CBCS) of UGC guidelines.

➤ **Objectives**

1. To acquire the deep knowledge in Environmental Science subject at under graduate level.
2. To impart the ability to understand and analyze the environmental issues related to environmental components.
3. To develop responsibility among students for protection, preservation and conservation of environment.
4. To create conscious regarding rational utilization of Natural resources.
5. To develop practical skills on environment and Natural Resources analysis for their better management.

**Scheme of B. Sc. program (Faculty of Science and Technology)**

		First Year				Second Year				Third Year				Total Credit value
		Semester I		Semester II		Semester III		Semester IV		Semester V		Semester VI		
1	Core courses (16)	Credits each	Courses	Credits each	Courses	Credits each	Courses	Credits each	Courses	Credits each	Courses	Credits each	Courses	
	(i) Theory	4	4	4	4	4	3	4	3					4 X14=56
	(ii) Practical	2	4	2	4	2	3	2	3					2X14=28
2	Ability enhancement compulsory course(AECC) (2)	2	1	2	1									2X2=04
3	Skill Enhancement Course (SEC) (4)					2	1	2	1	2	1	2	1	2 X4= 16
4	Discipline Specific Elective DSE (6)													
	(i) Theory									4	3	4	3	4X6=24
	(ii) Practical									2	3	2	3	2X6 =12
	<b>Total Credit value (Credit x No. of Courses )</b>	<b>26</b>		<b>26</b>		<b>20</b>		<b>20</b>		<b>20</b>		<b>20</b>		<b>132</b>

➤ **Course Structure:**

**Duration:** The duration of B.Sc. (Environmental Sciences) degree program shall be three years.

**Medium of instruction:** The medium of instruction for the course shall be **English**.

The present syllabus has been prepared to:

1. Accommodate the advanced topic on the Environmental Sciences discipline

- ii. Build the basic science knowledge at the level of first year of Environmental Sciences
- iii. Reflect the changing needs of the students. The detailed syllabus for each paper is appended with a list of suggested readings.

At first year of under-graduation, students are given exposure to basic science to build the foundation of advance Environmental Sciences. For this purpose, more focus on relevant experimentation on the topics is included in practical course. In practical course, students will be trained in preparing laboratory manuals, standard operating practices and log books.

At second year under-graduation, students will be introduced to different areas necessary to form the basis of Environmental Microbiology. The relevant practical are included to enrich their knowledge.

At third year under-graduation, six theory and three practical papers each for two semesters are included to uncover all applied areas of Environmental Sciences.

The courses codes and titles for the courses are as given below: **Envi-Environmental Sciences, Core Courses [DSC] (12 Courses)**

➤ **Core Courses [DSC] (12 Courses, 4 Environmental Sciences + 8 subsidiary subjects)**

Sem	CC A & B	Paper Code	Paper Name	Paper Code	Paper Name	Practical Paper Code	Practical Paper Name
I	CC A I	Envi-101	Introduction to Environment -I	Envi-102	Natural Resources-I	Envi-103	Laboratory Course based on Theory Paper-I
II	CC A II	Envi-201	Introduction to Environment -II	Envi-202	Natural Resources-II	Envi-203	Laboratory Course based on Theory Paper-II
III	CC A III	Envi-301	Ecology	Envi-302	Environmental Microbiology	Envi-303	Laboratory Course based on Theory Paper-III
IV	CC A IV	Envi-401	Social Environment & Their Conservation	Envi-402	Applied & Industrial Microbiology	Envi-403	Laboratory Course based on Theory Paper-IV

➤ **Discipline Specific Elective [DSE]**

(Six Theory and Three Practical Papers each semester)

Sem	DSE	Paper Code	Paper Name	Paper Code	Paper Name	Practical Paper Code	Practical Paper Name
V	A I	Envi-501	Environmental Pollution – I	Envi-502	Biodiversity and its Conservation – I	Envi-503	Laboratory Course based on Theory Paper-V
	A II	Envi-504	Basic Concept in Environmental Toxicology – I	Envi-505	Remote Sensing & GIS – I	Envi-506	Laboratory Course based on Theory Paper-VI
	A III	Envi-507	Instrumental Techniques in Environmental Analysis –I	Envi-508	Environmental Biotechnology – I	Envi-509	Laboratory Course based on Theory Paper-VII
VI	A IV	Envi-601	Environmental Pollution – II	Envi-602	Biodiversity and its Conservation – II	Envi-603	Laboratory Course based on Theory Paper-VIII
	A V	Envi-604	Basic Concept in Environmental Toxicology – II	Envi-605	Remote Sensing & GIS – II	Envi-606	Laboratory Course based on Theory Paper-IX
	A VI	Envi-607	Instrumental Techniques in Environmental Analysis –II	Envi-608	Environmental Biotechnology – II	Envi-609	Laboratory Course based on Theory Paper-X

➤ **More Options to Discipline Specific Elective**

DSE	Paper I	Paper II	Practical Paper
DSE 4	Environmental Chemistry	Fundamentals of Ecology& Ecosystem	Practical Paper
DSE 5	Water & water Resources	Soil Conservation & Management	Practical Paper
DSE 6	Industrial Safety&Hygene	Environmental Management System	Practical Paper
DSE 7	Dissertation		

➤ **Skill enhancement courses (SEC) (any Four):**

Student has choice to study any four courses from respective semester subject to the availability of particular course at respective college

Semester	SEC	Course Title	SEC	Course Title
III	SEC I	Basic in preparation of Microbial Media	SEC II	Fundamental of Sample & Solution preparation
IV	SEC III	Microbial Isolation & Identification Techniques	SEC IV	Staining Techniques
V	SEC V	Laboratory Hazard & Safety Measures	SEC VI	Air Monitoring Techniques
VI	SEC VII	Noise & Illumination Monitoring Techniques	SEC VIII	Water Monitoring Techniques

**Scheme of F. Y. B. Sc. (Environmental Sciences)**

Semester	CORE COURSE				Ability Enhancement Compulsory Course (AECC)		
	DSC		Credits	Lectures		Credits	Lectures
I	DSC- 1 A: Core Course I: <b>Environmental Sciences(Sp)</b>	Paper I	2	30	AECC 1: English/ Marathi/ Communication	2	60
		Paper II	2	30			
		Practical Paper	2	60			
	DSC- 2 A: Core Course II	Paper I	2	30			
		Paper II	2	30			
		Practical Paper	2	60			
II	DSC- 3 A: Core Course III	Paper I	2	30	AECC2: Environmental Science	2	60
		Paper II	2	30			
		Practical Paper	2	60			
	DSC- 4 A: Core Course IV	Paper I	2	30			
		Paper II	2	30			
		Practical Paper	2	60			
II	DSC- 1 B Core Course I <b>:Environmental Sciences (Sp)</b>	Paper I	2	30	AECC2: Environmental Science	2	60
		Paper II	2	30			
		Practical Paper	2	60			
		Paper I	2	30			
		Paper II	2	30			
		Practical Paper	2	60			
II	DSC- 3 B: Core Course III	Paper I	2	30			
		Paper II	2	30			
		Practical Paper	2	60			
		Paper I	2	30			
		Paper II	2	30			
		Practical Paper	2	60			

Student has choice to study three subsidiary subjects from **DSC 2, DSC 3 and DSE 4** among Chemistry/ Botany/ Zoology /Geography/Geo-informatics/Information Technology/Mathematics during I, II, III and IV semester; subject to availability of course at respective college.

➤ **Duration of lecture:** 30 Lectures of 60 minutes or 36 Lectures of 50 min or 60 Lectures of 60 minutes or 72 Lectures of 50 min.

➤ **Examination Pattern**

Each theory and practical course will be of 100 marks comprising of 40 marks internal (20 marks of 2 internal examinations) and 60 marks external examination.

- **External Examination:** Theory examination (60 marks) will be of three hours duration for each theory course. There shall be 5 questions each carrying equal marks (12 marks each). The pattern of question papers shall be:
  - Question 1 (12 marks): 9 sub-questions, each of 2 marks; answerable in 2 -3 line and based on entire syllabus, attempt any 6 out of 9 questions.
  - Question 2, 3 and 4 (12 marks each): based from Unit I, II, and III, respectively, each question has 3 sub-questions of 6 marks each and answer only 2 sub-questions from each Q2, Q3, and Q4 in brief.
  - Question 5 (12 marks): answer only 3 out of 5 in brief, based from all 3 units, Each 4 marks.
- **Internal examination (40 marks each semester):** Internal assessment of the student by respective teacher will be comprehensive and continuous, based on written test. The written test shall comprise of both objective and subjective type questions.
- **Practical Examination:** Practical examination shall be conducted by the respective college at the end of the semester. Practical examination will be of minimum 5 – 6 hours duration and shall be conducted as per schedule (10 am to 5 pm on schedule date. There shall be 5 marks for laboratory log book and well written journal, 10 marks for viva-voce and minimum three experiments (major and minor). Certified journal is compulsory to appear for practical examination. There shall be one expert and two examiners (external and internal) per batch for the practical examination.

### F. Y. B. Sc. (Environmental Sciences) Semester – I

Sem	CC A & B	Paper Code	Paper Name	Paper Code	Paper Name	Practical Paper Code	Practical Paper Name
I	CC A I	Envi-101	Introduction to Environment -I	Envi-102	Natural Resources-I	Envi-103	Laboratory Course based on Theory Paper-I
II	CC A II	Envi-201	Introduction to Environment -II	Envi-202	Natural Resources-II	Envi-203	Laboratory Course based on Theory Paper-II

### Structure of F. Y. B. Sc. (Environmental Sciences) under CBCS

**w. e. f. June, 2018**

Year	Sem	Code	Title	Marks		Credits	No of Hours
				Ext.	Int.		
I	I	Envi-101	Introduction to Environment -I	60	40	02	30
		Envi-102	Natural Resources-I	60	40	02	30
		Envi-103	Laboratory Course based on Theory Papers	60	40	02	60
	II	Envi-201	Introduction to Environment -II	60	40	02	30
		Envi-202	Natural Resources-II	60	40	02	30
		Envi-203	Laboratory Course based on Theory Papers	60	40	02	60



## SEMESTER –I

### CC A-1: Paper I

#### Envi-101: Introduction to Environment-I (Theory)

TOTAL HOURS: 30

CREDITS: 2

Unit No.	Title	Topics	Hours
<b>Course Objective</b>	To acquaint students with basic concepts of Environment & their components		
Learning outcome	On completion of the course, students are able to: <ul style="list-style-type: none"><li>• Understand about the concept of environment, their structure &amp; types, different components and their functions.</li><li>• Understand about the evolution theories of universe, elements, origin of life and life forms.</li><li>• Aware about social environment, understanding the relation between man &amp; environment.</li><li>• Aware about global environmental issues and possible solution associated for the same.</li></ul>		
<b>I</b>	<b>Basic Concept of Environment</b>	<ul style="list-style-type: none"><li>• Meaning of Environment (Concept, Definition, Scope, Importance)</li><li>• Structure and Types of Environment (Structure: Lithosphere, Hydrosphere, Atmosphere and Biosphere, Types: Physical Environment, Biological Environment, Social or Cultural Environment)</li><li>• Global Environmental Problems and their effects (Acid Rain, Green House Effects, Global Warming, Ozone Layer Depletion, Ozone Hole etc.)</li><li>• Environmental Conferences (Stockholm Conference, Earth Summit, Earth Summit 2002, United Nations Climate Change Conference)</li></ul>	<b>6</b>
<b>II</b>	<b>Evolution</b>	<ul style="list-style-type: none"><li>• Introduction</li><li>• Evolution of universe</li><li>• Evolution of elements</li><li>• Origin of life and evolution of life forms: fossils</li><li>• Origin of life: Chemical basis</li><li>• Evolution of life forms through ages</li></ul>	<b>8</b>
<b>III</b>	<b>Environmental Components</b>	<ul style="list-style-type: none"><li>• Introduction</li><li>• Lithosphere</li></ul>	<b>10</b>

		(Concept, Definition, Interior Structure of earth, Importance) <ul style="list-style-type: none"> <li>• Atmosphere (Concept, Structure, Importance, Reaction involved in atmosphere associated with gaseous pollutants)</li> <li>• Hydrosphere (Concept, structure of water, characteristic property of water, types of water-Ground Water, Surface Water, Fresh Water, Marine Water, Well &amp; Types of Wells)</li> <li>• Biosphere (Concept, Definition, Importance)</li> </ul>	
	<b>Social Environment</b>	<ul style="list-style-type: none"> <li>• Man and Environment Interaction</li> <li>• Environmental Ethics</li> <li>• Earth's Carrying Capacity</li> <li>• Environment Crisis</li> </ul>	<b>6</b>

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## CC A I: Paper II

### Envi-102: Natural Resources-I (Theory)

**TOTAL HOURS: 30**

**CREDITS: 2**

Unit No.	Title	Topics	Hours
<b>Course Objective</b>	To acquaint students with basic concepts of Natural resources & their importance		
Learning outcome	On completion of the course, students are able to: <ul style="list-style-type: none"> <li>• Understand the concepts of natural resources, their types and importance</li> <li>• Understand the detailed information about biogeochemical cycles, their role &amp; function in the environment with a-biotic and biotic components.</li> <li>• Aware about mining activity and their impact on environment through some case studies.</li> <li>• Understand the role and function of O<sub>2</sub>&amp; CO<sub>2</sub> with complete mechanism through oxygen cycle, carbon cycle, photosynthesis, GHG and ozone layer depletion.</li> <li>• Understand the concepts of lithosphere, soil, soil formation, soil profile, ecosystems.</li> <li>• Aware about soil erosion, importance of soil conservation, food chain, food web and productivity.</li> </ul>		
<b>I</b>	<b>Introduction to Natural resources</b>	<ul style="list-style-type: none"> <li>• Introduction, Definition, Concept of Natural Resources</li> <li>• Classification of Natural Resources</li> <li>• Exhaustible &amp; Non-exhaustible Natural Resources</li> <li>• Renewable resources</li> </ul>	<b>4</b>

		<ul style="list-style-type: none"> <li>• Non-renewable resources</li> </ul>	
<b>II</b>	<b>Mineral resources &amp; Bio-geochemical Cycle</b>	<ul style="list-style-type: none"> <li>• Mineral resources: Introduction, Importance</li> <li>• Use and exploitation of Mineral resource</li> <li>• Environmental effects of extracting and using Mineral resources</li> <li>• Case studies related to Mineral resources</li> <li>• Bio-geochemical Cycle: Definition and concept of biogeochemical cycles</li> <li>• Carbon cycle</li> <li>• Nitrogen cycle</li> <li>• Sulphur cycle</li> <li>• Phosphorous cycle</li> <li>• Hydrological cycle</li> </ul>	<b>6</b>
<b>III</b>	<b>Oxygen &amp; Carbon dioxide</b>	<ul style="list-style-type: none"> <li>• Introduction &amp; Definition</li> <li>• Chemical activity of oxygen</li> <li>• Oxygen cycle</li> <li>• Carbon dioxide</li> <li>• Photosynthesis</li> <li>• Sources of CO<sub>2</sub> and forest denudation</li> <li>• Green House Gases</li> <li>• Ozone Layer</li> </ul>	<b>10</b>
<b>IV</b>	<b>Soil &amp; Food Energy</b>	<ul style="list-style-type: none"> <li>• Introduction</li> <li>• Composition of Soil, Soil Formation</li> <li>• Soil type in India</li> <li>• Soil profile</li> <li>• Soil Conservation</li> <li>• Food chain and its types</li> <li>• Food webs &amp; Energy pyramids</li> <li>• Types of animals based on food habits</li> <li>• Productivity in an ecosystem</li> <li>• First &amp; Second law of thermodynamics</li> </ul>	<b>10</b>

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## CC A-1 : Practical Paper - I

### Envi-103: Laboratory Course based on Theory Papers

**TOTAL HOURS: 60**

**CREDITS: 2**

Sr. No.	Title of the Practical	Hours
Course Objective	To acquaint with various laboratory techniques used in Environmental Science	
Learning Outcome	On completion of the course, students are able to: <ul style="list-style-type: none"><li>• Understand the concepts of water sampling with preservation techniques</li><li>• Understand the physical, chemical and biological properties of water samples with water quality standards.</li><li>• To determine the pH, electrical conductivity of water as well as soil which help to understand the nature of particular water and soil.</li><li>• Estimate the solids from water to evaluate their effects on humans.</li><li>• To determine Dissolved oxygen from water body which help to understand the function of water body</li></ul>	
1	To study the Safety Measures with in the Laboratory	4
2	Collection of Water Sample	4
3	Preservation of Water Sample	4
4	To study the physical properties of water sample.	4
5	Study of Water Quality Standards	4
6	To study the methods of Sterilization	4
7	To study the principle, working operation and application of pH & EC Meter	4
8	To study the principle, working operation and application of Turbidity Meter	4
9	To determine pH of given water sample	4
10	To determine the pH of given soil sample	4
11	To determine the electrical conductivity of given water sample	4
12	To determine the electrical conductivity of given soil sample	4
13	To determine the total solids from provided water sample	4
14	To determine the total dissolved solids from water sample	4
15	Estimation of dissolved oxygen present in water sample by Winkler's method	4

## SEMESTER –II

### CC A I: Paper I

#### Envi-201: Introduction to Environment-II (Theory)

TOTAL HOURS: 30

CREDITS: 2

Unit No.	Title	Topics	Hours
<b>Course Objective</b>	To acquaint students with concepts of Earth formation & Environmental issues.		
Learning outcome	On completion of the course, students are able to: <ul style="list-style-type: none"><li>• Understand the concepts Earth Process, classification and formation of rocks, their movements beneath the earth with tectonic plates and their effects on lithosphere.</li><li>• Understand the concepts of environmental pollution, their sources and effects on biotic community.</li><li>• Aware about environmental issues and their monitoring for minimizing the environmental pollution</li><li>• Understand the concept of environmental education, its need and importance.</li><li>• Aware about objectives and principles of environmental education.</li></ul>		
<b>I</b>	<b>Earth Process</b>	<ul style="list-style-type: none"><li>• Rock: Introduction, Definition</li><li>• Classification of rocks</li><li>• Formation of rocks- Igneous, Sedimentary and Metamorphic rocks</li><li>• Weathering of rocks</li><li>• Erosion of rocks</li><li>• Transportation &amp; deposition of earth materials by running water &amp; glaciers</li><li>• Plate tectonics, Sea floor spreading</li><li>• Mountain building and rock deformation</li></ul>	<b>8</b>
<b>II</b>	<b>Environmental Pollution</b>	<ul style="list-style-type: none"><li>• Introduction and Concepts, Definition of Environmental Pollution</li><li>• Pollutants: Definition, Sources, Nature and Types of Pollutants</li><li>• Types of Environmental Pollution: Air pollution, Water pollution, Soil pollution, Noise pollution, Solid Waste pollution, Marine water pollution</li><li>• Pollution Monitoring</li></ul>	<b>10</b>

<b>III</b>	<b>Current Environmental Issues</b>	<ul style="list-style-type: none"> <li>• Introduction to Global Environmental Problems</li> <li>• Climate Changes</li> <li>• Green House Effect</li> <li>• Acid Rain</li> <li>• Deforestation</li> <li>• Desertification</li> <li>• Global Warming &amp; Sea Level rise</li> <li>• Ozone Depletion &amp; Ozone Hole</li> </ul>	<b>8</b>
<b>IV</b>	<b>Environment Education &amp; Awareness</b>	<ul style="list-style-type: none"> <li>• Introduction</li> <li>• Need of Environmental Education &amp; Awareness</li> <li>• Objectives &amp; Principles of E.E. at various levels</li> <li>• E.E. in India, Role of NGO's in Environmental awareness</li> </ul>	<b>4</b>

### CC A I: Paper II

### Envi-202: Natural Resources-II (Theory)

**TOTAL HOURS: 30**

**CREDITS: 2**

<b>Unit No.</b>	<b>Title</b>	<b>Topics</b>	<b>Hours</b>
<b>Course Objective</b>	To acquaint students with basic concepts of Renewable & Non-renewable resources		
<b>Learning outcome</b>	On completion of the course, students are able to: <ul style="list-style-type: none"> <li>• Understand the concepts of Water, Land forest and Energy resources.</li> <li>• Aware about over utilization of surface &amp; ground water, benefit and problem associated with water availability, conflicts over water.</li> <li>• Understand about the use and over exploitation of forest, causes and effects of forest, timber extraction and mining.</li> <li>• Aware about importance of natural resource through some case studies like “Chipko Movements” and “SardarSarovarPaobject”</li> <li>• Understand the concept of equitable use of natural resources for sustainable lifestyle</li> </ul>		
<b>I</b>	<b>Water Resources</b>	<ul style="list-style-type: none"> <li>• Use and over utilization of surface and ground water</li> <li>• Floods and droughts</li> <li>• Conflict over water</li> <li>• Benefits and problems related to water</li> <li>• SardarSarovar Dam – Case Study</li> </ul>	<b>6</b>

<b>II</b>	<b>Land Resources</b>	<ul style="list-style-type: none"> <li>• Land as resource</li> <li>• Land Degradation</li> <li>• Man induced landslide</li> <li>• Soil Erosion</li> <li>• Desertification</li> </ul>	<b>6</b>
<b>III</b>	<b>Forest Resources</b>	<ul style="list-style-type: none"> <li>• Use &amp; over exploitation</li> <li>• Deforestation</li> <li>• Chipko Movement – Case Study</li> <li>• Timber extraction and mining</li> <li>• Dams &amp; their effects on forest &amp; tribal people</li> <li>• Role of an individual in conservation of natural resources</li> <li>• Equitable use of natural resources for sustainable lifestyles</li> </ul>	<b>10</b>
<b>IV</b>	<b>Energy Resources</b>	<ul style="list-style-type: none"> <li>• Growing energy needs</li> <li>• Renewable and non-renewable energy resources</li> <li>• Natural resources and associated problems</li> <li>• Use of alternate energy sources</li> <li>• Solar energy, Wind Energy, Hydro energy, Tidal Energy, Geothermal Energy, Biomass energy, Biogas and Bio-fuels</li> </ul>	<b>8</b>

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## CC A I: Paper II

### Envi-203: Laboratory Course based on Theory Papers

Sr. No.	Title of the Practical	Hours
Course Objective	To acquaint with various laboratory techniques used in Environmental Science for water & soil analysis	
Learning Outcome	On completion of the course, students are able to: <ul style="list-style-type: none"><li>To determine the chemical properties of water like acidity, alkalinity, turbidity, hardness to evaluate their impacts on biotic community.</li><li>Understand the physical, chemical and biological properties of water samples with water quality standards.</li><li>To determine the pH, electrical conductivity of water as well as soil which help to understand the nature of particular water and soil.</li><li>Estimate the solids from water to evaluate their effects on humans.</li></ul>	
1	Study of quality criteria of Air and Noise pollutions	4
2	To determine the Acidity of given water sample	4
3	To determine the Alkalinity of given water sample	4
4	Determination of Total Hardness of given water sample	4
5	Determination of Ca & Mg Hardness of given water sample	4
6	To determine the Turbidity by Turbidometry method	4
7	To determine soil temperature by soil thermometer	4
8	Determination of soil bulk density	4
9	To determine Organic Matter from soil (Ignition method)	4
10	To determine the water holding capacity of the soil sample.	4
11	Study of Microscope	4
12	Study of phytoplankton	4
13	Study of Zooplanktons	4
14	To examine the organisms present in the water sample by hanging Drop technique	4
15	Classification of Rocks	4



## Reference Books for Semester I & II (F. Y. B. Sc. – Environmental Sciences)

### ❖ Envi-101 & 201 - Introduction to environment-I & II

1. P.D.Sharma (2006) : Ecology and Environment – Rastogi Publications, Meerut
2. S.T.Ingle et al. (2005) Environment Studies – Prashant Publication House, Pune
3. P.S.Verma and V.K.Agrawal (1998) Environmental Biology (Principles of ecology), S. Chand and company ltd, New Delhi
4. H.V.Jadhav (1994): Principles of Environmental Sciences, Himalaya Publishing House
5. Savindra Singh (2002): Environmental Geography, PrayagPustak Bhavan, Allahabad
6. ErachBharucha(2005): Textbook of Environmental Studies for Undergraduate Courses, Universities Press, Hyderabad.

### ❖ Envi- 102 & 202 - Natural Resources – I & II

1. P.D.Sharma (2006) : Ecology and Environment – Rastogi Publications, Meerut
2. S.T.ingle et al. (2005) Environment Studies – Prashant Publication House, Pune
3. P.S.Verma and V.K.Agrawal (1998) Environmental Biology (Principles of ecology), S. Chand and company ltd, New Delhi
4. H.V.Jadhav (1994): Principles of Environmental Sciences, Himalaya Publishing House
5. Dr. A. M. Deshmukh (1996): Outlines of Microbiology, Krishnai Publication, Karad
6. P.C. Dubey, D.K. Maheshwari (1993): A Textbook of biotechnology, S.Chand and Co.Ltd, New Delhi
7. S.C.Santra (2001) : Environmental Sciences, New Central Book Agency (P) Ltd, Kolkata

### ❖ Envi-103 & 203 – Laboratory Course based on Theory Papers

1. Waste Water Engineering: Metcalf & Eddy, Tata Mc-Graw Hill Publishers, III Edition (1995)
2. Water Supply and Sanitary Engineering: S. C. Rangwala, Charotar publishing house, Anand (1992)
3. Water and Wastewater Technology: Mark J Hammer & Mark J Hammer Jr., Prentice Hall of India, IV Edition (2002)
4. Environmental Pollution Control Engineering: C.S.Rao,New Age International (P) Ltd. (1991)
5. Sewage Disposal and Air pollution engineering: S. K. Garg, Khanna publishers, New Delhi (1998)
6. Air Pollution and Control: Mowli and Subbaya, DivyajyotiPrakashan, Jodhpur (1989)
7. Air Pollution: V.P. Kudesia, PragatiPrakashan, New Delhi (1997)
8. Noise Pollution and Management: G. Gaur, Sarup and Sons, New Delhi (1997)