

**KAVAYITRI BAHINABAI CHAUDHARI
NORTH MAHARASHTRA UNIVERSITY, JALGAON**

॥अंतरी पेटवू ज्ञानज्योत॥



'A' Grade
NAAC Re-Accredited
(3rd Cycle)

SYLLABUS STRUCTURE OF

F.Y.B.Sc.

[Environmental Science]

UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

Semester-I & II

[w.e.f. June 2022]

**KAVAYITRI BAHINABAI CHAUDHARI
NORTH MAHARASHTRA UNIVERSITY, JALGAON**

Faculty of Science & Technology

**Syllabus for Core Subject
Environmental Science**

**As per the UGC Guidelines based on
Choice Base Credit System (CBCS)**

**At
F.Y.B.Sc.
Semester wise Syllabus
Theory and Practicals**

Semester-I

Envi-101: Introduction to Environment -I
Envi-102: Natural Resources-I
Envi-103: Laboratory Course based on Theory Papers

Semester-II

Envi-201: Paper-I Introduction to Environment -II
Envi-202: Natural Resources-II
Envi-203: Laboratory Course based on Theory Papers

[w.e.f. June 2022]

➤ **Objectives:**

1. To acquire the deep knowledge in Environmental Science subject at undergraduate 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.

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

w. e. f. June 2022

| Sem | Core Course | Structure | Code & Title of Paper | Marks | | Credits | No. of Hours |
|--|-------------|-----------|--|-------|------|---------|--------------|
| | | | | Ext. | Int. | | |
| I | CC A-I | Theory | Envi-101: Introduction to Environment –I | 60 | 40 | 02 | 30 |
| | | | Envi-102: Natural Resources-I | 60 | 40 | 02 | 30 |
| | | Practical | Envi-103: Laboratory Course based on Theory Papers | 60 | 40 | 02 | 60 |
| II | CC A-II | Theory | Envi-201: Introduction to Environment –II | 60 | 40 | 02 | 30 |
| | | | Envi-202: Natural Resources-II | 60 | 40 | 02 | 30 |
| | | Practical | Envi-203: Laboratory Course based on Theory Papers | 60 | 40 | 02 | 60 |
| Total Credits Sem. I & Sem. II = 12 | | | | | | | |

.SEMESTER –I

CC A-1: Paper I

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

TOTAL HOURS: 30

CREDITS: 2

| Unit No. | Title | Topics | Hours |
|-------------------------|---|--|--------------|
| Course Objective | 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">• Understand about the concept of environment, their structure & types, different components and their functions.• Understand about the different components of Environment.• Aware about social environment, understanding the relation between man & environment.• Aware about global environmental issues and possible solution associated for the same. | | |
| I | Basic Concept of Environment | <ul style="list-style-type: none">• Meaning of Environment: Concept, Definition, Scope, Importance• Structure of Environment : Lithosphere, Hydrosphere, Atmosphere and Biosphere• Types of Environments: Physical Environment, Biological Environment, Social or Cultural Environment.• Global Environmental Problems and their effects (Acid Rain, Green House Effects, Global Warming, Ozone Layer Depletion, Ozone Hole etc.) | 8 |
| II | Environmental Components | <ul style="list-style-type: none">• Introduction• Lithosphere: Concept, Definition, Interior Structure of earth, Importance• Atmosphere: Concept, Structure, Importance, Reaction involved in atmosphere associated with gaseous pollutants.• Hydrosphere: Concept, structure of water, properties of water, types of water-Ground Water, Surface Water• Biosphere: Concept, Definition, Importance | 10 |

| | | | |
|------------|---------------------------------|--|----------|
| III | Basic concept of Ecology | <ul style="list-style-type: none"> • Introduction • Ecology: Concept, Definition, Scope of Ecology, Subdivisions of Ecology • Ecosystem: Concept, Definition, Types of Ecosystems, Forest Ecosystem, Grassland Ecosystem, Deserts Ecosystem • Structure and functioning of Ecosystem | 8 |
| IV | Social Environment | <ul style="list-style-type: none"> • Man and Environment Interaction • Environment and Human Health • Environmental Ethics • Environmental Crisis | 4 |

CC A I: Paper II

Envi-102: Natural Resources-I (Theory)

TOTAL HOURS: 30

CREDITS: 2

| Unit No. | Title | Topics | Hours |
|-------------------------|--|--|-----------|
| Course Objective | To acquaint students with basic concepts of Natural resources & their importance | | |
| Learning outcome | <p>On completion of the course, students are able to:</p> <ul style="list-style-type: none"> • Understand the concepts of natural resources, their types and importance • Understand the detailed information about biogeochemical cycles, their role & function in the environment with a-biotic and biotic components. • Aware about mining activity and their impact on environment through some case studies. • Understand the concepts of lithosphere, soil, soil formation, soil profile, ecosystems. • Aware about importance of soil formation and conservation, food chain, food web and productivity. | | |
| I | Introduction to Natural resources | <ul style="list-style-type: none"> • Introduction, Definition, Concept of Natural Resources • Classification of Natural Resources • Exhaustible & Non-exhaustible Natural Resources • Renewable resources • Non-renewable resources | 4 |
| II | Mineral resources & Bio-geochemical Cycle | <ul style="list-style-type: none"> • Mineral resources: Introduction, Importance • Use and exploitation of Mineral resource • Environmental effects of extracting and using Mineral resources • Bio-geochemical Cycle: Definition and concept of biogeochemical cycles • Carbon cycle • Nitrogen cycle • Sulphur cycle • Oxygen cycle • Phosphorous cycle | 10 |
| III | Soil Resources | <ul style="list-style-type: none"> • Introduction • Composition of Soil, • Soil Formation • Soil type in India • Soil profile • Soil Conservation | 8 |

| | | | |
|-----------|-------------------|---|----------|
| IV | FoodEnergy | <ul style="list-style-type: none">• Energy• Productivity in an ecosystem:-<ol style="list-style-type: none">1) Primary Production.2) Secondary Production.• Food chain and its types• Food webs• Trophic Levels• Energy Flow• Energy pyramids• Types of animals based on food habits• First & Second law of thermodynamics | 8 |
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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">• Understand the concepts of water sampling with preservation techniques• Understand the physical, chemical and biological properties of water samples with water quality standards.• To determine the pH, electrical conductivity of water as well as soil which help to understand the nature of particular water and soil.• Estimate the solids from water to evaluate their effects on humans.• To determine Dissolved oxygen from water body which help to understand the function of water body | |
| 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 II: Paper I

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

TOTAL HOURS: 30

CREDITS: 2

| Unit No. | Title | Topics | Hours |
|-------------------------|---|--|----------|
| Course Objective | 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">• Understand the concepts Earth Process, classification and formation of rocks, their movements beneath the earth with tectonic plates and their effects on lithosphere.• Understand the concepts of environmental pollution, their sources and effects on biotic and abiotic community.• Aware about environmental issues and their monitoring for minimizing the environmental pollution• Understand the concept of environmental education, its need and importance.• Aware about objectives and principles of environmental education. | | |
| I | Earth Process | <ul style="list-style-type: none">• Rock: Introduction, Definition• Classification of rocks• Formation of rocks- Igneous, Sedimentary and Metamorphic rocks• Weathering of rocks• Erosion of rocks• Plate tectonics, Sea floor spreading• Mountain building and rock deformation | 8 |
| II | Environmental Pollution | <ul style="list-style-type: none">• Introduction.• Concepts and Definition of Environmental Pollution• Pollutants: Definition, Sources, Nature and Types of Pollutants• Types of Environmental Pollution: Air pollution, Water pollution, Soil pollution, Noise pollution, Solid Waste pollution, Thermal Pollution, Plastic pollution. | 8 |

| | | | |
|------------|--|--|----------|
| III | Current Environmental Issues | <ul style="list-style-type: none"> • Introduction to Global Environmental Problems • Green House gases and its impacts • Climate Changes • Green Houses Gases • Global Warming & Sea Level rise • Ozone Depletion & Ozone Hole • Deforestation • Desertification | 8 |
| IV | Environment Education & Awareness | <ul style="list-style-type: none"> • Introduction • Need of Environmental Education & Awareness • Goals of Environmental Education • Objectives Environmental Education • Principles of Environmental Education • Environmental Education in India | 6 |

CC A II: Paper II
Envi-202: Natural Resources-II (Theory)

TOTAL HOURS: 30

CREDITS: 2

| Unit No. | Title | Topics | Hours |
|-------------------------|---|---|-----------|
| Course Objective | To acquaint students with basic concepts of Renewable & Non-renewable resources | | |
| Learning outcome | On completion of the course, students are able to: <ul style="list-style-type: none"> • Understand the concepts of Water, Land forest and Energy resources. • Aware about over utilization of surface & ground water, benefit and problem associated with water availability, conflicts over water. • Understand about the use and over exploitation of forest, causes and effects of forest, timber extraction and mining. • Aware about importance of natural resource through some case studies like “Chipko Movements” and “Sardar Sarovar Project”. • Understand the concept of equitable use of natural resources for sustainable lifestyle. | | |
| I | Water Resources | <ul style="list-style-type: none"> • Use and over utilization of surface and ground water • Floods and droughts • Conflict over water • Significance of Water • Water problems • Sardar Sarovar Dam – Case Study | 6 |
| II | Land Resources | <ul style="list-style-type: none"> • Land as resource • Soil Erosion • Land Degradation • Landslides • Desertification | 6 |
| III | Forest Resources | <ul style="list-style-type: none"> • Use & over exploitation • Deforestation • Chipko Movement – Case Study • Timber extraction and mining • Dams & their effects on forest & tribal people • Equitable use of natural resources for sustainable lifestyles • Role of an individual in conservation of natural resources | 10 |

| | | | |
|-----------|-------------------------|--|----------|
| IV | Energy Resources | <ul style="list-style-type: none"> • Growing energy needs • Renewable and non-renewable energy resources • Natural resources and associated problems • Use of alternate energy sources • Solar energy, Wind Energy, Hydro energy, Tidal Energy, Geothermal Energy, Biomass energy, Biogas and Bio-fuels | 8 |
|-----------|-------------------------|--|----------|

CC A II: 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">To determine the chemical properties of water like acidity, alkalinity, turbidity, hardness to evaluate their impacts on biotic community.Understand the physical, chemical and biological properties of water samples with water quality standards.To determine the pH, electrical conductivity of water as well as soil which help to understand the nature of particular water and soil.Estimate the solids from water to evaluate their effects on humans. | |
| 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. N. Arumugam et.al. (2005) Environment Studies –Saras Publication, Kanyakumari
4. P.S.Verma and V.K. Agrawal (1998) Environmental Biology (Principles of ecology), S.Chand and company Ltd, New Delhi
5. H.V. Jadhav (1994): Principles of Environmental Sciences, Himalaya Publishing House
6. Savindra Singh (2002): Environmental Geography, Prayag Pustak Bhavan, Allahabad
7. Erach Bharucha(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. Wastewater 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 Subbayya, Divyajyoti Prakashan, Jodhpur (1989)
7. Air Pollution: V.P. Kudesia, Pragati Prakashan, New Delhi (1997)
8. Noise Pollution and Management: G. Gaur, Sarup and Sons, New Delhi (1997)

Table of Equivalence for F.Y.B.Sc. CBCS (Environmental Science)

| Semester | Old Syllabus w.e.f. June 2018 | New Syllabus w.e.f. June 2022 |
|-----------------|--|--|
| I | Envi-101: Introduction to Environment -I | Envi-101: Introduction to Environment -I |
| | Envi-102: Natural Resources-I | Envi-102: Natural Resources-I |
| | Envi-103: Laboratory Course based on Theory Papers | Envi-103: Laboratory Course based on Theory Papers |
| II | Envi-201: Paper-I Introduction to Environment -II | Envi-201: Paper-I Introduction to Environment -II |
| | Envi-202: Natural Resources-II | Envi-202: Natural Resources-II |
| | Envi-203: Laboratory Course based on Theory Papers | Envi-203: Laboratory Course based on Theory Papers |