Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR
416 004, MAHARASHTRA
PHONE : EPABX – 2609000, BOS Section – 0231-2609094, 2609487
Web : www.unishivaji.ac.in Email: bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर ४१६ ००४, महाराष्ट्र
दूरध्वनी - इपीबीएक्स - २०६०९०००, अभ्यासमंडळे विभाग : ०२३१- २६०९०९४, २६०९४८७
वेबसाईट : www.unishivaji.ac.in ईमेल : bos@unishivaji.ac.in

SU/BOS/Sci & Tech/ 581 **Date: 20 /09/2025**

To,

The Principal,
All Concerned Affiliated College/ Institutions,
Shivaji University, Kolhapur.

Subject: Regarding Minor Change in syllabus of B.Sc. Part –I (Sem. I & II) as per NEP – 2020 (2.0) degree programme under the Faculty of Science and Technology.

Ref : 1. SU/BOS/Science/877 date : 26/12/2023
2. SU/BOS/Science/349 date : 24/06/2024

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the Minor Change in syllabi, Nature of Question paper and equivalence of B.Sc. Part-I (SemI&II) as per NEP 2020 (2.0) degree programme under the Faculty of Science and Technology.

B.Sc. Part-I (SemI&II) as per NEP 2020 (2.0)	
1.	B.Sc. Biotechnology (Entire)
2	B. Sc. Environmental Science (Entire)

This Syllabus, nature of question and equivalence shall be implemented from the academic year **2025-26** onwards. A soft copy containing the syllabus is attached herewith and it is available on university website www.unishivaji.ac.in NEP-2020@suk (Online Syllabus).

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October/ November 2025 & March / April 2026. These chances are available for repeater students, if any

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

(Dr. S. M. Kubal)
Dy. Registrar

Copy to:

1	I/c Dean, Faculty of Science & Technology	7	Appointment Section A & B
2	Director, Board of Examinations & Evaluation	8	Affiliation Section (T.1) (T.2)
3	The Chairpersan, Respective Board of Studies	9	P.G.Admission Section,
4	B.Sc. Exam Section	10	Computer Centre / IT Cell
5	Eligibility Section	11	Internal Quality Assorance Cell (IQAC)
6	P.G Seminar Section		

SHIVAJI UNIVERSITY, KOLHAPUR.

Established: 1962

A^{++} Accredited By NAAC (2021)
with CGPA 3.52

New Syllabus For

Bachelor of Science

B.Sc. Environment Science (Entire)

SEMESTER I AND II

STRUCTURE AND SYLLABUS IN ACCORDANCE WITH

NATIONAL EDUCATION POLICY-2020

WITH MULTIPLE ENTRY AND MULTIPLE EXIT OPTIONS

(TO BE IMPLEMENTED FROM ACADEMIC YEAR 2024-25 ONWARDS)

Syllabus of B.Sc. Part - I Environment Science (Entire)
SEMESTER I AND II
(NEP 2020)
Syllabus to be implemented from academic year 2024-2025 onwards

- Guidelines shall be as per B. Sc. Regular Programme
- Rules and Regulations shall be as per B.Sc. Regular Programme
- **Preamble:**

  This syllabus is framed to give sound knowledge with understandingof Environment science to undergraduate students of B.Sc. Environment Science (Entire) Programme. Students will learn Environment Science as a separate course (subject) from B. Sc. I. The goal of the syllabus is to make the study of EnvironmentScience popular, interesting and encouraging students for higherstudies including research.

Programme Outcome:

1. This programme will lay strong foundation of environmental concepts for postsgraduate education and research.
2. Helps students in capacity building, developing environmental programmes /projectsbased on sound technical, environmental and policy matters of Government of India.
3. Develop ability to carry out experiments and provide efficient conclusions.
4. Develop an approach to work for needs of society regarding environment, health,safety considerations.

Programme Specific Outcome:

1. This programme will make students to understand the concept of sustainable development.
2. This programme will provide in-depth knowledge to the students in

respect of current environmental and safety problems faced by human society and to develop amongst students' scientific attitude based on interdisciplinary approach to enable them to take holistic view in decision taking.

Structure
B.Sc. (Environment Science) I Entire
To be implemented from academic year 2024-25 onwards

Level	Semester				3-OE	4-SEC	5-AEC,VEC,IKS	6-OJT,FP,CEP,CC,RP			Total Credits
					IDC/ MDC/ OE/ GE			CC	Summer Internship/ Field Project/ OJT	Research Project/ Dissertation	
		Subject-1	Subject-1I	Subject-1II	OE						
4.5	I	**DSC-I** Introduction to environmental science and natural resources-I **(2)** **DSC-II** Environmental Pollution-I **(2)** **DSC-Pract.-I** Lab course I (2)	**DSC-I** Ecology-I **(2)** **DSC-II** Sustainable Development and Environmental Issues-I **(2)** **DSC-Pract.-I** Lab Course II(2)	**DSC-I** Biodiversity and Wild life management-I **(2)** **DSC-II** Waste Management-I (2) **DSC-Pract.-I** Lab course III (2)	**OE-I** Will be selected from basket **(2)**		**IKS-I(2)** Introduction to IKS			-	
	Credits	**4+2=6**	**4+2=6**	**4+2=6**	**2+0=2**	**-**	**2**	**-**	**-**	**-**	**22**

	II	**DSC-III** Introduction to environmental science and natural resources-II **(2)** **DSC-IV (2)** Environmental Pollution-II **(2)** **DSC-Pract II** Lab course IV **(2)**	**DSC-III** Ecology-I **(2)** **DSC-IV** Sustainable Development and Environmental Issues-II **(2)** **DSC-Pract II** Lab course V **(2)**	**DSC-III** Biodiversity and Wild life management-II **(2)** **DSC-IV** Waste Management-II **(2)** **DSC-Pract II** Lab course VI **(2)**	**OE-II** Will be selected from basket **(2)**		**VEC-I(2)** Democracy, Election and Constitution			-	
	Credits	**4+2=6**	**4+2=6**	**4+2=6**	**0+2=2**	**-**	**2**	**-**	**-**	**-**	**22**
1st Year Cum Credits		**12**	**12**	**12**	**4**	**-**	**4**				**44**
Exit option: Award of UG Certificate with 44 credits and an additional 4 credits core NSQF course/Internship OR Continue with Major and Minor											

Semester I
Introduction to Environmental Science and Natural Resources-I (DSC-I)
Credits-2

Course Outcomes:

1. Get acquainted with interaction between man and environment.
2. Introduction to the concept of natural resources and its classification.

Unit	Lecture Hours
Unit I	**15**
A: Concept of Environmental Science Definition, Principles & Scope of environmental science. Structure and composition of atmosphere- troposphere, stratosphere, mesosphere and thermosphere; Hydrosphere, lithosphere, biosphere	**7**
B: Meteorological Parameters Meteorological Parameters i.e. pressure, temperature, precipitation, humidity and its types, wind velocity and their units, instruments used for measurement Energy budget of earth, Albedo, Heat island Lapse rate, Types-ELR, DALR & WALR Temperature inversion; Types-radiation, advection, frontal, subsidence, turbulence	**8**
Unit II	**15**
A: Introduction to Natural Resource: Definition, Concept of natural resources and classification of resources-Renewable and non-renewable resources, Advantages and disadvantages of Renewable and non-renewable resources. Conventional Energy Sources: Coal, petroleum, natural gas Non-conventional resources; solar, water, wind, tidal, geothermal resources, biomass energy, nuclear energy,	**8**
B: Mineral and land resources Mineral Resources: Utilization of metallic minerals and non-metallic minerals overuse, conservation measures, alternative technologies Land resources, Uses, land degradation, soil erosion, soil conservation, changing in agriculture pattern, advantages and disadvantages of modern agriculture	**7**

SUGGESTED BOOKS:

1. Principles of Environmental Science by Watt, K.E.F. (1973), McGraw-Hill Book Company
2. Environmental Science by Nobel, B.J. and Kormandy, E.J. (1981), The Way the World Works, Prentice-Hall Inc., N.J.

3. Environmental Science by Turk A., Turk, J. Wittes J.T. and Wittes, R.E. (1978)
4. Ecology & Environment by P.D.Sharma
5. Environmental Science : An Introduction by G. T. Miller-1991
6. Environmental Resources by Mathur
7. Singh MP, Singh BS and Soma S. Dey (2004) Conservation of Biodiversity and Natural Resources. Daya Publishing House, New Delhi.
8. Singh, B. K. 2004: Biodiversity Conservation and Management, Mangaldeep Publications, Jaipur
9. Mital, K. M. 1997: Non-conventional Energy System, Wheeler Publishers, New Delhi Singh, A. K. 1987: Forest Resources, Ecology and Environment, Concept Publishing Co., New Delhi
10. Sarma, P. K.: Forest Resources and their Utilization in India, Mittal Publishers, New Delhi
11. Agrawal, V. P.: Forests in India, Oxford & IBH, New Delhi
12. Tyner, W.E.: Energy Resources and Economic Development in India, Allied Pub. Pvt. Ltd.

Semester I
Environmental Pollution-I (DSC-II)
Credits 2

Course Outcome:

1. Understand sources, types and impacts of environmental pollution.
2. Understand role of various agencies to mitigate pollution.

Unit	Lecture Hours
Unit I	**15**
A: Introduction Definition of pollution, Concept of pollution, pollutant, types of pollutants-Water pollution, air pollution, noise pollution, plastic pollution, space pollution, soil pollution, thermal pollution Natural sources- flood, volcanic eruption, landslide, forest fires etc. Man- made sources- industrialization, urbanization, domestic waste, modern agriculture practices, transportation etc.	**7**
B: Water Pollution, Classification and Impacts Definition, classification of water pollution, sources of water pollution Impacts of water pollution on human, plants & animals Introduction to various water quality parameters and their measurement i.e. pH, EC, Turbidity, TDS, hardness, chloride, Salinity, DO, BOD, COD and contaminants, WQI. Sampling methods: Purpose of sampling, different types of samples, collection methods.	**8**
Unit II	**15**
A: Air Pollution and Sources Air Pollution, Definition, terminology, Sources of air pollution, Classification of air pollutants, National Ambient Air Quality Monitoring Standards Aerosols: Sources, classification, size, adverse effects, cloud seeding	**8**
B: Mitigation measures Mitigation measures for pollution, individual practices, awareness programs, role NGOs and government, case studies of pollution in India	**7**

SUGGESTED BOOKS:

1. Environmental Pollution of Cadmium by Rohatgi
2. Chemical and Biological Methods for Water Pollution Studies by Trivedy and Goel
3. Water Pollution and Management by C.K. Vershney

4. Air Pollution By: Arthur C Stern. 3rd Edn. Vol. I, II, VI, VII, Academic Press (1986)
5. Air Quality By: Thad Godish, 3rd Edition, Lewis Publishers, New York (1997)
6. Understanding Environmental Pollution By: Marquita K Hill. Cambridge University Press (1997)
7. Land Pollution, Causes and Control by Harrusson and Laxon
8. Soil and Water Conservation Engineering by Schwab, SD, Frevert, RK, Edminster, TW and Barns, KK, John Wiley and Sons
9. Manual of Soil & water Conservation Practices by Carmel singh, C. Venkataramamnan, G. sastry, B.p. Joshi

Semester I
Laboratory Course-I (DSC Practical I)
Credits-2

DSC-Pract 1	**Lab Course I**
Sr. No.	Name of Experiment
1	Study of rocks and minerals
2	Demonstration of instruments used to measure meteorological parameters.
3	Water Sampling and Preservation
4	Determination of pH of water sample
5	Determination of Electrical Conductivity of water sample
6	Determination of Dissolved Oxygen in water sample
7	Determination of Biochemical Oxygen Demand of water sample
8	Determination of Chemical Oxygen Demand of water sample
9	Determination of Total Dissolved Solids and Total Suspended Solids
10	Determination of colour and turbidity of water sample
11	Preparation of wind rose diagram

Semester I
Ecology-I (DSC-I)
Credits-2

Course Outcomes:

1.Understand the basic concepts regarding ecology and ecosystem.
2.Get acquainted with major biomes and relationship among organisms.

Unit	Lecture Hours
Unit I	**15**
A: Ecology Definition, Scope and basic principles of ecology and environment, history of ecology, subdivision of ecology, Biological levels of organization, population, community, ecosystem and biosphere. Climatic factors - Light, temperature, water and precipitation.	**7**
B: Biomes Major biomes of the world. Characteristics of terrestrial, fresh water and marine ecosystems with reference of plant and animal diversity, Forests, grasslands, lake, river and marine ecosystems of India.	**8**
Unit II	**15**
A. Autecology of Species Introduction, biological clock, seed output, seed dispersal, viability of seed, seed dormancy, seed germination and reproductive capacity	**7**
B: biotic factor Relationship among organisms, symbiosis, mutualism, commensalism, protocooperation, Positive and negative interactions among populations – competition, predation, parasitism,	**8**

SUGGESTED BOOKS:

1. Muller-Dombols D and Ellenberg H (1974), Aims and Methods of Vegetation Ecology, Wiley, New York
2. Odum, E.P. (1983), Basic Ecology, Sanders, Philadelphia
3. Robert Ricklefs (2001). The Ecology of Nature.Fifth Edition. W.H. Freeman and Company
4. Singh K.P. and J.S. Singh (1992). Tropical Ecosystems: Ecology and Management Wiley Eastern Limited, Lucknow
5. Singh, J.S. (ed.) 1993. Restoration of Degraded Land: Concepts and Strategies. Rastogi Publications, Meerut
6. Smith, R.L. (1996). Ecology and Field Biology, Harper Collins, New York
7. Ecology & Environment by P.D.Sharma

Semester I
Sustainable Development and Environmental Issues (DSC-II)
Credit -2

Course Outcomes:

1. Study the causes and effects of global environmental issues in relation to global warming and ozone depletion.
2. Inculcate the concept of sustainable development and practices.

Unit	Lecture Hours
Unit I	**15**
A: Sustainable Development Definition, Concept and strategies of sustainable development, United Nation Conference on Environment and Development with special reference to agenda 21, CSR and sustainability, Clean development mechanism, Commission on sustainable development, The world summit on sustainable development, threats to sustainable development, principles of sustainable development	**8**
B: Sustainable Development Practices in India: Major issues in sustaining growth and development in India, Interlinking of rivers, desertification and its control, Environmental priorities in India, Role of India in environmental treaties, urban and rural planning	**7**
Unit II	**15**
A: State of India's Environment Sustainable Development Goals and characteristics, Environmental Challenges in India and other countries, Sustainable Development in India, International efforts on Sustainable Development, renewable resources and sustainability	**8**
B: Major Environmental Issues Global Warming, Ozone Depletion,Desertification, pollution, soil erosion, waste lands, chemical pesticide and fertilizers, modern life style practices	**7**

SUGGESTED BOOKS:

1. Ecology & Environment by P.D.Sharma
2. Environmental Science by S. C. Santra
3. Atmosphere, Weather and Climate by Barry R. G.
4. Climate Change: Causes, Effects and Solutions by Hardy J. T.
5. Climate and Global Climate Change by Harvey D
6. Climate Change: The Science of Global Warming and Our Energy Future by Mathez E. A.
7. Climate Change and India by Mitra A. P., Sharma S., Bhattacharya S., Garg A., Devotta S. and Sen K.

Semester I
Laboratory Course-II (DSC Practical I)
Credits-2

DSC-Pract-1	**Lab Course I**
Sr. No.	Name of Experiment
1	Identification of various plant species in campus area
2	Measurement of girth and diameter of trees in campus
3	Determination of chlorophyll content of given plant material
4	Determination of frequency of species in ecosystem
5	Determination of species density in nearby ecosystem
6	Estimation of GPP, NPP and RR
7	Estimation of biomass of trees
8	Study of Phytoplankton's and Zooplanktons
9	Preparation of compost
10	Preparation of life table

Semester I
Biodiversity and Wildlife Management (DSC-I)
Credits-2

Course Outcome:

1. Understand various reasons responsible for loss of wildlife degradation
2. To study various wildlife management measures.

Unit	Lecture Hours
Unit I	**15**
A: Biodiversity Concept and Disciplines Biodiversity concept, definition, need for assessment, scope Value of biodiversity – food, timber, medicinal & ornamental. Threats to wild life: Natural and anthropogenic reasons, Habitat destruction and fragmentation, urbanization, industrialization, agricultural expansion, effects of climate change, Human wildlife conflict, exploitation of wildlife by hunting and poaching	**8**
B: Biodiversity management Centers of diversity, concept of endemism, types & endemic species With example. Loss of biodiversity, Founder Effects, Demographic bottlenecks, Genetic Drift, Inbreeding Depression, Effects and examples of exploitation of plants and animals	**7**
Unit II	**15**
A: Introduction to wildlife and habitats Wildlife: concept and need for conservation, Types of habitats: Aquatic habitats- freshwater, marine and brackish Terrestrial habitats-forest, arid zones, grassland, agricultural lands, deserts	**8**
B: Conservation projects for wildlife: IUCN Threatened species Categories Project tiger, project elephant, crocodile conservation project, UNDP sea turtle project, project hangul, Project snow leopard, Tiger task force	**7**

SUGGESTED BOOKS:

1. Chaudhuri AB and Sarkar DD (2003) Megadiversity Conservation, Flora, Fauna and Medicinal Plants of India's Hotspots. Daya Publishing House, New Delhi.
2. Singh, B. K. 2004: Biodiversity Conservation and Management, Mangaldeep Publications, Jaipur
3. Krishnamurthy, K.V. 2003. An Advanced Textbook on Biodiversity – Principles and Practice, Oxford and IBH Publishing, New Delhi

4. Kotwal, P.C. and S. Banerjee. Biodiversity Conservation – In Managed forest and Protected areas, (2002). Agrobios, India
5. Animal Ecology and Environmental Biology by H. R. Singh
6. Plant Diversity Hotspots in India – An Overview by Hajra P.K. and V. Mudgal
7. Plant Ecology by John E. Weaver and F.E. Clement
8. Restoration of Endangered Species by Bowles M.L. and Whelan C.J.
9. Understanding Biodiversity- Life, sustainability and Equity by Ashish Kothari

Semester I
Waste management-I (DSC-II)
Credits 2

Course Outcome:

1. Study the fundamentals of solid and hazardous waste management.
2. Understanding methods and scenario of solid waste management.

Unit	Lecture Hours
Unit I	**15**
A: Introduction to Solid Waste Solid waste: Introduction and definition, classification of solid waste, sources of solid waste generation, components in solid waste, Collection and volume reduction prior to disposal, Physio-chemical properties of solid waste	**7**
B: Solid Waste Management Systems Solid Waste Management, advantages Factors affecting solid waste management system Indian Scenario of Solid Waste Management Case studies for solid waste management Traditional methods, eco-friendly methods-conversion of solid waste to energy/manure, other techniques for solid waste management Constraints in solid waste management	**8**
Unit II	**15**
A: Introduction to Hazardous Waste Hazardous waste definition, characteristics, types-biomedical, radioactive and other wastes, source of hazardous waste, handling and storage of hazardous waste, Health risks associated with hazardous waste,	**7**
B: Waste Management Methods Waste minimization, Waste treatment methods: Incineration, Stabilization, Secure Landfill, Disinfection, Irradiation, Pyrolysis Disposal of radioactive waste	**8**

SUGGESTED BOOKS:

1. Integrated Solid Waste Management – Engineering Principles & Management By: Issues by George Tchobanoglous, Hilary Theisen& Samuel A Vigil. McGraw-Hill International Editions, New York (1993)
2. Solid Waste Management in Developing Countries By: AD Bhide& BB Sunderesan. Indian National Scientific Documentation Centre, New Delhi (1983)
3. Solid Waste Engineering By: PA Vesilind, William Worrell & R. Thomas Brooks/Cole, Australia (2002)
4. Basics of Solid and Hazardous Waste Management Technology By: K.L Shah. Prentice Hall, Ohio (2000)

5. Industrial and Hazardous Wastes – Health Impacts & Management Plans By: Rajiv K Sinha& Sunil Heart. Pointer Publishers, Jaipur (2004)
6. Prospects and Perspectives of Solid Waste Management Hazardous Waste management by M. LaGrega and others, McGraw-Hill Publication
7. Biomedical (handling and management) rules, 2008

Semester I
Laboratory Course-III (DSC Practical I)
Credits-2

DSC-Pract-1	**Lab Course I**
Sr. No.	Name of Experiment
1	Study of pugmark
2	Estimation of MLSS, MLVSS and SVI
3	Wood Pyrolysis
4	Study of human wildlife conflict in local area through field visit
5	Study of population census by transect and camera trapping
6	Visit to botanical garden
7	Visit to wetland area
8	Study of bio-indicators in local area
9	Determination of crown density of trees

Semester-I
Open Elective I
Credits 2

OE I will be selected from basket of other faculties

Semester II
Introduction to Environmental Science and Natural Resources-II (DSC-III)
Credits-2

Course Outcomes:

1. To study various theories related to origin of earth and geochemical differentiation.
2. Understanding natural resources of India.

Unit	Lecture Hours
Unit I	**15**
A: Biogeochemical cycles: Introduction to biogeochemical cycles, Endogenic and Exogenic Cycles, Carbon cycle, Nitrogen cycle, Sulphur cycle, Oxygen cycle, Phosphorus cycle and Water cycle .	**7**
B: Fundamentals of Geoscience Origin of Earth-Theories of origin of earth Structure and composition of earth, Primary geochemical differentiation, Theories of Evolution- Wagener's Continental drift Theory, Plate tectonic Theory	**8**
Unit II	**15**
A: Forest and Wildlife Resources Forest and wildlife resources: Forest vegetation, status and distribution of forest and wildlife resources, contribution as resource. forest cover and types, Major and minor forest products Natural resources of India with Reference to occurrence, distribution and utilization Major and minor resources in India	**7**
B: Conservation of Energy Resources: Environmental impacts of large-scale exploitation of renewable and non-renewable energy resources. Growing energy needs. Energy scenario at national level, global level and its impacts on environment. Conservation measures of natural resources – individual practices and social practices, latest technologies	**8**

SUGGESTED BOOKS:

1. Principles of Environmental Science by Watt, K.E.F. (1973), McGraw-Hill Book Company
2. Environmental Science by Nobel, B.J. and Kormandy, E.J. (1981), The Way the World Works, Prentice-Hall Inc., N.J
3. Ecology & Environment by P.D.Sharma
4. Environmental Science: An Introduction by G. T. Miller,1991
5. Perspectives in Environmental studies by Kaushik, Anubhav
6. Introduction to Environmental Management by Bal, Anand S.

7. Singh MP, Singh BS and Soma S. Dey (2004) Conservation of Biodiversity and Natural Resources. Daya Publishing House, New Delhi
8. Mital, K. M. 1997: Non-conventional Energy System, Wheeler Publishers, New Delhi 9. Sarma, P. K.: Forest Resources and their Utilization in India, Mittal Publishers, New Delhi
10. Tyner, W.E.: Energy Resources and Economic Development in India, Allied Pub. Pvt. Ltd.
11. Pachauri, R. K.: Energy, Environment and Development, Vol. I & II, HarAnand Pub. Pvt. Ltd.

Semester-II
Environmental pollution –II (DSC-IV)
Credits 2

Course Outcome:

1. Explain the sources and effects of air and noise pollution.
2. Study about various pollution controlling devices and institutions.

Unit	Lecture Hours
Unit I	**15**
A: Properties of Atmosphere Physical and chemical properties off atmosphere, Solar radiation – Solar spectrum Insolation, Factors affecting insolation Atmospheric stability: concept and types, Pasqual stability classification Mixing heights, plume behavior, Dispersion of pollutants in atmosphere	**8**
B: Air Pollution and Sources Air Pollution, Definition, terminology, Sources of air pollution, Classification of air pollutants, National Ambient Air Quality Monitoring Standards Aerosols: Sources, classification, size, adverse effects, cloud seeding	**7**
Unit II	**15**
A: Pollution Controlling Devices and Institutions Air pollution control: stationary sources – settling chamber, cyclone, Wet collector, Fabric filter and Electro Static Precipitators Greenhouse's effect (Global Warming), Ozone layer depletion Acid Rain, Effect of air pollution and acid rain on plants, animals and property IPCC (Intergovernmental Panel on Climate Change), UNFCCC (United Nations Framework Convention on Climate Change), Kyoto Protocol	**8**
B: Soil and Noise Pollution Noise pollution, definition, sources Effects of noise pollution on human beings and animals Noise control measures Characteristics of sound waves- Sound Level, Frequency, Wavelength, Sound pressure Soil pollution, types, sources & effects on plants and animals	**7**

SUGGESTED BOOKS:

1. Pollution: Causes, Effects & Control Edited By: Roy M Harrison. 2nd Edn. The Royal Society of Chemistry Cambridge (1995)
2. Environmental Chemistry: A Global Perspective By: Gary W van Loon & Stephen J Duffy. Oxford University Press (2000)
3. Handbook of Pollution Control Processes By: Robert Noyes. Jaico Publisheing House, Mumbai (2001)
4. An Introduction to Air Pollution By: RK Trivedy& PK Goel. ABD Publishers Jaipur, India (2003)
5. Air Pollution By MN Rao& HVN Rao. Tata McGraw-Hill Publishing company Ltd., New Delhi (1994)
6. The Atmosphere by Tarbuch and Lutgen
7. Introduction to Atmospheric Chemistry by Hoobs, Peter V
8. Land Pollution, Causes and Control by Harrusson and Laxon
9. Soil and Water Conservation Engineering by Schwab, SD, Frevert, RK, Edminster, TW and Barns, KK, John Wiley and Sons.
10. Manual of Soil & water Conservation Practices by Carmel singh, C. Venkataramamnan, G. sastry, B.p. Joshi

Semester II
Laboratory Course-IV (DSC Practical II)
Credits-2

DSC-Pract- II	**Lab Course I**
Sr. No.	Name of Experiment
1	Study working of High-Volume Sampler
2	Estimation of Total Hardness of given water sample
3	Determination of Alkalinity in water sample
4	Determination of Acidity in water sample
5	Determination of Carbonates and Bicarbonates in Water
6	Determination of of PM10 in ambient air
7	Analysis of Sulphur Dioxide in ambient air
8	Analysis of Nitrogen Oxides in ambient air
9	Determination of free CO_2 in water
10	Measurement of noise levels at silence, residential and commercial zone

Semester II
Ecology-II (DSC-III)
Credits 2

Course Outcome:

1.Understand structure and function of ecosystem.

2.Get acquainted with population ecology and succession.

Unit	Lecture Hours
Unit I	**15**
Ecosystems Ecosystem: Basic concepts, components of ecosystem. Trophic levels, food chains and food webs. Ecological pyramids, ecosystem functions. Energy flow in ecological systems, energy efficiencies .	**7**
B. Fragile Ecosystem Introduction, coral reef ecosystem, mangroves, wetlands, Antarctica, Artic ecosystem, mountain environment with reference of plant and animal diversity	**8**
Unit II	**15**
A: Succession Succession: Concepts of succession, Types of Succession, causes of succession, process of succession	**8**
B: Ecology of population Population density, natality,mortality,age distribution, biotic potential of population, the growth form of population, metapopulational and life table	**7**

SUGGESTED BOOKS:

1. Muller-Dombols, D. and Ellenberg, H. (1974). Aims and Methods of Vegetation Ecology, Wiley, New York.
2. Odum, E.P. (1983), Basic Ecology, Sanders, Philadelphia.
3. Robert Ricklefs (2001). The Ecology of Nature.Fifth Edition. W.H. Freeman and Company.
4. Singh K.P. and J.S. Singh (1992). Tropical Ecosystems: Ecology andManagement. Wiley Eastern Limited, Lucknow, India.
5. Singh, J.S. (ed.) 1993. Restoration of Degraded Land: Concepts andStrategies.Rastogi Publications, Meerut.
6. Smith, R.L. (1996). Ecology and Field Biology, Harper Collins, New York

Semester II
Sustainable development and environmental issues-II (DSC-IV)
Credits 2

Course Outcome:

1. Inculcate the values related to environmental education.
2. Inculcate the concept of sustainable development and practices.

Unit	Lecture Hours
Unit I	**15**
A: Global Environment Issues Environmental Education and awareness: Objectives, guiding principles, education programmed, environmental awareness Global Environmental problems: sea level rise, Acid rain , Forest fire	**8**
B: Climate Change and Policies International agreements regarding climate change, Montreal protocol, Kyoto protocol, Carbon credit and carbon trading, Mitigation strategies for climate change, Paris agreement, United Nations Framework on Climate Change, Vienna Convention	**7**
Unit II	**15**
A: human and environment Impact of Human activities on environment, case studies in India, role of environment in humans, economy and environment, environment and human health, social and cultural importance of environment	**7**
B: Awareness for environmental issue Government policies, rules and regulation for environment, campaigns, training programs, environmental education, awareness through media, agreement's for environmental conservations	**8**

SUGGESTED BOOKS:

1. Ecology & Environment by P.D.Sharma
2. Environmental Science by S. C. Santra
3. Atmosphere, Weather and Climate by Barry R. G,
4. Climate Change: Causes, Effects and Solutions by Hardy J. T
5. Climate and Global Climate Change by Harvey D
6. Climate Change: The Science of Global Warming and Our Energy Future by Mathez E. A
7. Climate Change and India by Mitra A. P., Sharma S., Bhattacharya S., Garg A.Devotta S. and Sen K

Semester II
Laboratory Course-V (DSC Practical II)
Credits-2

DSC-P1	**Lab Course I**
Sr. No.	Name of Experiment
1	Determination of Species Diversity Index
2	Determination of species density in nearby ecosystem
3	Estimation of biomass of plants
4	Study of Phytoplankton's and Zooplanktons
5	Preparation of vermicompost
6	Demonstration of rain water harvesting techniques
7	Study of eco-tourism activities in local area
8	Determination of fertility, natality and mortality rate of given population

Semester II
Biodiversity and Wildlife management II (DSC-III)
Credits 2

Course Outcome:

1. Understand various anthropogenic reasons responsible for biodiversity loss.
2. To get acquainted with various wildlife conservation measures.

Unit	Lecture Hours
Unit I	**15**
A: Conservation Measures Necessity of biodiversity conservation, Methods of biodiversity Conservation: In situ (Biosphere reserves and national parks) & ex Situ (Germplasm collection, botanical garden, seed banks, pollen Banks, DNA banks) conservation, Conservation of genetic diversity, Species diversity and ecosystem diversity	**8**
B: hotspot in India Concept of hotspot, major hotspot in world India as mega – biodiversity country, need & awareness, biogeographical regions of India Corridors for wildlife conservation State symbols (animals and plants)	**7**
Unit II	**15**
A: Wildlife management: Population census techniques: Transects, point counts, pug mark, camera trapping, Assessment of diversity: determination of sampling area, transects, quadrats, point center method, diversity indices and its application Habitat conservation	**7**
B: **Organization involved in biodiversity conservation** IUCN, UNEP, UNESCO, WWF, ICSU, FAO, WCMC, ISBI. Introduction, International Biodiversity Law. Convention on Biological Diversity, National Legislation: Environmental Protection Act 1986, Biodiversity Act, Wildlife protection act- merits and demerits MoEF CC,	**8**

SUGGESTED BOOKS:

1. Chaudhuri AB and Sarkar DD (2003) Megadiversity Conservation, Flora, Fauna and Medicinal Plants of India's Hotspots. Daya Publishing House, New Delhi
2. Singh, B. K. 2004: Biodiversity Conservation and Management, Mangaldeep Publications, Jaipur
3. Krishnamurthy, K.V. 2003. An Advanced Textbook on Biodiversity – Principles and Practice, Oxford and IBH Publishing, New Delhi
4. Kotwal, P.C. and S. Banerjee. Biodiversity Conservation – In Managed forest and Protected areas, (2002). Agrobios, India
5. Animal Ecology and Environmental Biology by H. R. Singh
6. Plant Diversity Hotspots in India – An Overview by Hajra P.K. and V. Mudgal
7. Plant Ecology by John E. Weaver and F.E. Clement
8. Understanding Biodiversity- Life, sustainability and Equity by Ashish Kothari

Semester II
Waste management-II (DSC-IV)
Credits 2

Course Outcome:

1. Study the fundamentals of E-waste management.
2. Learning the rules and regulations of solid and hazardous waste.

Unit	Lecture Hours
Unit I	**15**
A: E- Waste Management Introduction, Components of E-Waste, Hazards Associated with E-waste, Existing legislation, E-waste management Treatment and disposal methods, status of E-waste management in India	**7**
B: landfill techniques and associated problems Introduction, construction, decomposition of land fill, advantages and disadvantages, recovery and use of land fill gas, leachates, leachate control technique, Impact of landfill technique on health and environment	**8**
Unit II	**15**
A: waste management strategies in India Introduction, situation analysis, future scenario, private sector participation in waste management, important contractual issues, initiatives by government for waste management, case studies	**7**
B: Laws and Regulation for Waste Management Introduction, municipal solid waste (Management and Handling) Rules,2000 Biomedical waste (Management and Handling) Rules,2011 Electronic Waste (Management and Handling) Rules,2011 Hazardous waste (management, handling and transboundary movement) rules of 2008 Liquid waste management rules	**8**

SUGGESTED BOOKS:

1. Air Pollution By: Arthur C Stern. 3rd Edn. Vol. I, II, VI, VII, Academic Press (1986)
2. Air Quality By: Thad Godish, 3rd Edition, Lewis Publishers, New York (1997)
3. Understanding Environmental Pollution By: Marquita K Hill. Cambridge University Press (1997)

4. Pollution: Causes, Effects & Control Edited By: Roy M Harrison. 2nd Edn. The Royal Society of Chemistry Cambridge (1995)
5. Environmental Chemistry: A Global Perspective By: Gary W vanLoon& Stephen J Duffy. Oxford University Press (2000)
6. Handbook of Air Pollution Control Engineering & Technology By: John C Mycock, John D McKenna & Louis Theodore. Lewis Publishers, CRC London (1995)
7. Handbook of Pollution Control Processes By: Robert Noyes. JaicoPublisheing House, Mumbai (2001)
8. An Introduction to Air Pollution By: RK Trivedy& PK Goel. ABD Publishers Jaipur, India (2003)
9. Air Pollution By MN Rao& HVN Rao. Tata McGraw-Hill Publishing company Ltd., New Delhi (1994)
10. The Atmosphere by Tarbuch and Lutgen
11. Introduction to Atmospheric Chemistry by Hoobs, Peter V

Semester II
Laboratory Course-VI (DSC Practical II)
Credits-2

DSC-P1	**Lab Course I**
Sr. No.	Name of Experiment
1	Study of physical and chemical characteristics of Municipal Solid Waste
2	Determination of moisture content of solid waste
3	Study of electricity generation from solid waste through field visit
4	Visit to NGO working for wildlife conservation
5	Visit to Sewage Treatment Plant and Effluent Treatment Plant
6	Determine biodiversity through bird watching
7	Study in-situ conservation measures through visit to wildlife sanctuary
8	Preparation of herbarium

Semester-II
Open Elective II
Credits 2

OE II will be selected from basket of other faculties