

SHIVAJI UNIVERSITY, KOLHAPUR.



Accredited By NAAC with 'A' Grade
CHOICE BASED CREDIT SYSTEM

Syllabus For

B.Sc. Part - I

Environment Science (Entire)

SEMESTER I AND II

(Syllabus to be implemented from 2022-23 onwards)

B.Sc. Part - I
Environment Science (Entire)

SEMESTER I AND II

(Syllabus to be implemented from 2022-2023 onwards.)

- ❖ Guidelines shall be as per B. Sc. Regular Programme
- ❖ Rules and Regulations shall be as per B.Sc. Regular Programme except CBCS .B.Sc.3 Structure of Programme and List of Courses.

❖ Preamble:

This syllabus is framed to give sound knowledge with understanding of 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 Environment Science popular, interesting and encouraging students for higher studies including research.

Programme Outcome:

1. This programme will lay strong foundation of environmental concepts for posts graduate education and research.
2. Helps students in capacity building, developing environmental programmes /projects based 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 of Program and List of Courses are as follows:

Structure of B. Sc. Environment Science (Entire) Programme Semester I & II

Structure-I

S E M E S T E R – I (Duration – 6 Months)													
Sr. No.	Course (Subject) Title	TEACHING SCHEME						EXAMINATION SCHEME					
		THEORY			PRACTICAL			THEORY				PRACTICAL	
		Credits	No. of lectures	Hours	Credits	No. of lectures	Hours	Hours	Max	Total Marks	Min	Hours	Max
1	DSC-A1	2	5	4	2	4	3.2	2	50	100	35	PRACTICAL EXAMINATION IS ANNUAL	
2	DSC-A2	2						2	50				
3	DSC-A3	2	5	4	2	4	3.2	2	50	100	35		
4	DSC-A4	2						2	50				
5	DSC-A5	2	5	4	2	4	3.2	2	50	100	35		
6	DSC-A6	2						2	50				
7	DSC-A7	2	5	4	2	4	3.2	2	50	100	35		
8	DSC-A8	2						2	50				
9	AECC-A	2	4	3.2	-----	-----	-----	2	50	50	18		
Total		18	24	19.2	8	16	12.8	-		450			
S E M E S T E R – II (Duration – 6 Months)													
1	DSC-B1	2	5	4	2	4	3.2	2	50	100	35	As per BOS Guide-lines	
2	DSC-B2	2						2	50				
3	DSC-B3	2	5	4	2	4	3.2	2	50	100	35		
4	DSC-B4	2						2	50				
5	DSC-B5	2	5	4	2	4	3.2	2	50	100	35		
6	DSC-B6	2						2	50				
7	DSC-B7	2	5	4	2	4	3.2	2	50	100	35		
8	DSC-B8	2						2	50				
9	AECC-B	2	4	3.2	-----	-----	-----	2	50	50	18		
Total		18	24	19.2	8	16	12.8	-		450		200	
Grand Total		36	48	38.4	16	32	25.6			900			
Student contact hours per week : 32 Hours (Min.)						Total Marks for B.Sc.-I (Including English) : 1100							
• Theory and Practical Lectures : 48 Minutes Each						• Total Credits for B.Sc.-I (Semester I & II) : 52							
DSC – Discipline Specific Core course: All papers are compulsory.													
• AECC – Ability Enhancement Compulsory Course (A & B)- English													
• Practical Examination will be conducted annually for 50 Marks per course (subject).													
• There shall be separate passing for theory and practical courses.													
(A) Non-Credit Self Study Course : Compulsory Civic Courses (CCC)For Sem I: CCC – I : Democracy, Elections and Good Governance													
(B) Non-Credit Self Study Course : Skill Development Courses (SDC)For Sem II: SDC – I : Any one from following (i) to (v)													
i) Business Communication & Presentation ii) Event management iii) Personality Development, iv) Yoga & Physical Management v)Resume, Report & proposal writing													

Choice based Credit System with Multiple Entry and Multiple Exit Options
Academic Year 2022-23
First Year Bachelor of Science (Level-5) Program Structure (NEP-2020 PATTERN)
CBCS B. Sc.: Environment Science (Entire):
List of courses: B. Sc. Environment Science:

Part 1 (Sem I & II)

Sr. No.	Sem I	Sr. No.	Sem II
DSC- A1	Fundamentals of Environmental Science -I	DSC- B1	Biodiversity and Wild life management-I
DSC- A2	Fundamentals of Environmental Science -II	DSC- B2	Biodiversity and Wild life management-II
DSC- A3	Natural resource-I	DSC- B3	Sustainable development and environmental issues I
DSC- A4	Natural resource-II	DSC- B4	Sustainable development and environmental issues II
DSC- A5	Ecology -I	DSC- B5	Waste management -I
DSC- A6	Ecology -II	DSC- B6	Waste management -II
DSC- A7	Environmental pollution-I	DSC- B7	Environmental pollution-III
DSC- A8	Environmental pollution-II	DSC- B8	Environmental pollution-IV
AECC-A	English -I	AECC-B	English-II
SEC- I	Good laboratory practices	SEC -II	Communication skills
VBC –I	Sports	VBC-II	NSS

Practical

DSC-P1	Lab Course I	DSC-P3	Lab Course III
DSC –P2	Lab Course II	DSC-P4	Lab Course IV

Semester I

DSC-A1 Fundamentals of Environmental Science-I

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Get acquainted with interaction between man and environment.
2. Awareness about various environmental issues such as global warming, ozone depletion, deforestation etc.

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-horizon, nutrients in soil, nitrogen pathways and biosphere	7
B: : Ecosystem structure Concept of ecosystem, Functions of ecosystem Types of ecosystem- Terrestrial, fresh water, marine Trophic levels in ecosystem	8
Unit II	15
C: Concept and Scope of Environmental Chemistry Introduction – Concept and Scope of environmental chemistry, Gibb's energy, Segments of environmental and various interactive reaction occurring between these segments. Laws of thermodynamics, heat transfer methods, mass energy transfer across various interfaces, materials balance.	8
D Meteorological Parameters Meteorological Parameters i.e. pressure, temperature, precipitation, humidity and its types, radiation & wind velocity and their units, instruments used for measurement	7

SUGGESTED BOOKS:

1. Environmental Chemistry – II Edition by A.K. De
2. Principles of Environmental Science by Watt, K.E.F. (1973), McGraw-Hill Book Company
3. Environmental Science by Nobel, B.J. and Kormandy, E.J. (1981), The Way the World Works, Prentice-Hall Inc., N.J.
4. Environmental Science by Turk A., Turk, J. Wittes J.T. and Wittes, R.E. (1978)
5. Ecology & Environment by P.D.Sharma
6. Environmental Science : An Introduction by G. T. Miller-1991

7. Environmental Science by S.C. Santra
8. Basic Concepts in Environmental Management by Mackenthun and Kenneth M.
9. Environmental studies by Joseph, Benny
10. Perspectives in Environmental studies by Kaushik, Anubha
11. Introduction to Environmental Management by Bal, Anand S.
12. Environmental studies by Uberoi N. K.

Semester I

DSC-A2 Fundamentals of Environmental Science-II

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Get acquainted with interaction between man and environment.
2. Awareness about various environmental issues such as global warming, ozone depletion, deforestation etc.

Unit	Lecture Hours
Unit I	15
A: Fundamentals of Geoscience Origin of Earth, Structure and soil composition, Energy budget of earth, Albedo, Heat island Lapse rate, Types-ELR, DALR & WALR Temperature inversion; Types-radiation, advection, frontal, subsidence, turbulence	7
B: Environmental Biogeochemical cycles Introduction, Endogenic and Exogenic Cycles, Carbon cycle ,Nitrogen cycle, Sulphur cycle, Oxygen cycle, Phosphorus cycle and Water cycle and green Chemistry	8
Unit II	15
A: Principles of Analytical Methods Environmental Analysis – Solution Concentration, (Normality, Molarity, ppm, equivalent weight etc.) Titrimetric method: Types of titration and titration curve Gravimetric method: Types of gravimetric method Chromatography method: classification and application of chromatography method,	7
B: Environmental Analysis and Instrumentation Instrumentation pH meter, conductivity meter, spectrophotometer: Principle & working ,major classes, types and application UV-visible spectrophotometer, Atomic Absorption spectrophotometer flame photometer: Principle & working ,major classes, types and application Gas Chromatography: Principle & working ,major classes, types and application High Performance Liquid Chromatography (HPLC)	8

SUGGESTED BOOKS:

1. Environmental Chemistry – II Edition by A.K. De
2. Principles of Environmental Science by Watt, K.E.F. (1973), McGraw-Hill Book Company
3. Environmental Science by Nobel, B.J. and Kormandy, E.J. (1981), The Way the World Works, Prentice-Hall Inc., N.J.
4. Environmental Science by Turk A., Turk, J. Wittes J.T. and Wittes, R.E. (1978)
5. Ecology & Environment by P.D.Sharma

6. Environmental Science : An Introduction by G. T. Miller-1991
7. Environmental Science by S.C. Santra
8. Basic Concepts in Environmental Management by Mackenthun and Kenneth M.
9. Environmental studies by Joseph, Benny
10. Perspectives in Environmental studies by Kaushik, Anubha
11. Introduction to Environmental Management by Bal, Anand S.
12. Environmental studies by Uberoi N. K.

Semester I

DSC- A3 Natural Resources-I

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Introduction to the concept of natural resources and its classification.
2. Understanding natural resources of India.

Unit	Lecture Hours
Unit I	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.	7
B: Conventional Energy Sources and Non-conventional resources Conventional Energy Sources and Technology: Coal, petroleum; natural gas, nuclear energy, Non-conventional resources; solar, water, wind, tidal, geothermal resources, biomass energy Natural resources and development.	8
Unit II	15
A: Mineral and biological resources Mineral Resources: Utilization of metallic minerals and non-metallic minerals, Floral and faunal resources, overuse, conservation measures, alternative technologies	7
B: Energy Resources: Energy resources: Coal; petroleum; natural gas; nuclear energy-Fusion & Fission. 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.	8

SUGGESTED BOOKS:

1. Cabbage, Frederick, Jay O'Laughlin, and Nils Peterson. 2015 (in preparation). Natural Resource Policy. Waveland Press. Chapters available on-line at NC State University electronic reserves.
2. Chaudhuri AB and Sarkar DD (2003) Megadiversity Conservation, Flora, Fauna and Medicinal Plants of India's Hotspots. Daya Publishing House, New Delhi.
3. Environmental Resources by Mathur
4. Singh MP, Singh BS and Soma S. Dey (2004) Conservation of Biodiversity and Natural Resources. Daya Publishing House, New Delhi.
5. Singh, B. K. 2004: Biodiversity Conservation and Management, Mangaldeep Publications, Jaipur
6. 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
7. Sarma, P. K.: Forest Resources and their Utilization in India, Mittal Publishers, New

Delhi

8. Agrawal, V. P.: Forestsin India, Oxford & IBH, New Delhi
9. Tyner, W.E.: Energy Resources and Economic Development in India, Allied Pub. Pvt. Ltd.
10. Mital, K.M. 1997: Non-conventional Energy System, Wheeler Publishers, New Delhi
11. Pachauri, R. K.: Energy, Environment and Development, Vol. I & II, HarAnand Pub. Pvt. Ltd

Semester I

DSC-A4 Natural Resources-II

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

- Introduction to the concept of natural resources and its classification.
- Understanding natural resources of India.

Unit	Lecture Hours
Unit I	15
A: Land resources Uses, land degradation , soil erosion, soil conservation, Food resources , growing food demand, changing in agriculture pattern, advantages and disadvantages of modern agriculture	7
B: Natural Resources of India Natural resources of India with Reference to : occurrence, distribution and utilization Major and minor resources in India, percentage of resources in India with reference to global availability	8
Unit II	15
A: Forest and Wildlife Resources Forest and wildlife resources: Concepts, Forest resources: Forest vegetation, status and distribution of forest and wildlife resources, contribution as resource. forest cover and types, Major and minor forest products	8
B: Conservation measures Earths carrying capacity, Conservation measures of natural resources – individual practices and social practices , latest technologies , case studies for conservation of natural resources	7

SUGGESTED BOOKS:

1. Cabbage, Frederick, Jay O’Laughlin, and Nils Peterson. 2015 (in preparation). Natural Resource Policy. Waveland Press. Chapters available on-line at NC State University electronic reserves.
2. Chaudhuri AB and Sarkar DD (2003) Megadiversity Conservation, Flora, Fauna and Medicinal Plants of India’s Hotspots. Daya Publishing House, New Delhi.
3. Environmental Resources by Mathur
4. Singh MP, Singh BS and Soma S. Dey (2004) Conservation of Biodiversity and Natural Resources. Daya Publishing House, New Delhi.

5. Singh, B. K. 2004: Biodiversity Conservation and Management, Mangaldeep Publications, Jaipur
6. Mital, K. M. 1997: Non-conventional Energy System, Wheeler Publishers, New Delhi
7. Singh, A. K. 1987: Forest Resources, Ecology and Environment, Concept Publishing Co., New Delhi
8. Sarma, P. K.: Forest Resources and their Utilization in India, Mittal Publishers, New Delhi
9. Agrawal, V. P.: Forests in India, Oxford & IBH, New Delhi
10. Tyner, W.E.: Energy Resources and Economic Development in India, Allied Pub. Pvt.Ltd.
11. Mital, K.M. 1997: Non-conventional Energy System, Wheeler Publishers, New Delhi
12. Pachauri, R. K.: Energy, Environment and Development, Vol. I & II, HarAnand Pub. Pvt.L

Semester I

DSC- A5 Ecology-I

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Understand the basic concepts regarding ecology and ecosystem.
2. Get acquainted with biogeochemical cycles and succession.

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, proto cooperation Positive and negative interactions among populations – competition, predation, parasitism,	8

SUGGESTED BOOKS:

1. Muller-Dombois, 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, India.
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

Semester I

DSC-A6 Ecology-II

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Understand the basic concepts regarding ecology and ecosystem.
2. Get acquainted with biogeochemical cycles 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, Arctic 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, metapopulation and life table	7

SUGGESTED BOOKS:

7. Muller-Dombois, D. and Ellenberg, H. (1974). Aims and Methods of Vegetation Ecology, Wiley, New York.
8. Odum, E.P. (1983), Basic Ecology, Sanders, Philadelphia.
9. Robert Ricklefs (2001). The Ecology of Nature. Fifth Edition. W.H. Freeman and Company.
10. Singh K.P. and J.S. Singh (1992). Tropical Ecosystems: Ecology and Management. Wiley Eastern Limited, Lucknow, India.
11. Singh, J.S. (ed.) 1993. Restoration of Degraded Land: Concepts and Strategies. Rastogi Publications, Meerut.
12. Smith, R.L. (1996). Ecology and Field Biology, Harper Collins, New York

Semester I

DSC-A7 Environmental Pollution-I

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Explain water pollution, its types and effects on living organisms and environment.
2. Analyse physico-chemical parameters in relation to water.

Unit	Lecture Hours
Unit I	15
A: Introduction Definition of pollution, Concept of pollution, pollutant, types of pollutants- solid, liquid, gaseous, characteristics of pollutants, Hazardous pollutants	7
B: Sources of pollution Natural sources- flood, volcanic eruption, landslide, forest fires etc. Man- made sources- industrialization, urbanization, domestic waste, modern agriculture practices, transportation etc.	8
Unit II	15
A: Types of pollution and impact Water pollution , air pollution, noise pollution, plastic pollution, space pollution, soil pollution, thermal pollution	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. Venkataramannan, G. sastry, B.p. Joshi

Semester I

DSC-A8 Environmental Pollution-II

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Explain water pollution, its types and effects on living organisms and environment.
2. Analyze physico-chemical parameters in relation to water.

Unit	Lecture Hours
Unit I	15
A: Water Pollution, Classification and Impacts Definition, classification of water pollution-groundwater pollution, surface water pollution, marine pollution Pollutant , Sources of water pollution-point and non-point sources, causes and effects of pollution.	8
B: Aquatic Environment Aquatic Environment, Types of water Pollutants: Organic, Inorganic, Sediments, Radioactive materials and Thermal Pollutants. Coral-reef Crisis Impacts of water pollution on human, plants & animals	7
Unit II	15
A: Water Quality Parameters 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
B: Mitigation measures Water pollution act , awareness program, government schemes, case studies of water conservation programs, treatments for water	7

SUGGESTED BOOKS:

10. Environmental Pollution of Cadmium by Rohatgi
11. Chemical and Biological Methods for Water Pollution Studies by Trivedy and Goel
12. Water Pollution and Management by C.K. Vershney
13. Responses to Oil and Chemical Marine Pollution by Cormack D. (1993), Applied Science Publishers, New York
14. Soil and Water Conservation Engineering by Schwab, SD, Frevert, RK, Edminster, TW and Barns, KK, John Wiley and Sons.
15. Water Pollution – Causes, Effects & Control by : P.K.Goel-1997
16. Elements of Environmental science and Engineering by Meenakshi P.
17. Manual of Environmental Analysis by Aery NC
18. Fundamentals of water Pollution by De Arnab Kumar

Semester II

DSC-B1 – Biodiversity and Wildlife management

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Understand various anthropogenic reasons responsible for land 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 of Value of biodiversity – food, timber, Medicinal & ornamental. Threats to wild life: Natural and anthropogenic reasons, Habitat destruction and fragmentation, urbanization, industrialization, agricultural expansion, change in habitat, 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: 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
A: 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 II

Biodiversity and Wildlife management -2

Credits 2 (Marks 50) Hours 30, 37.5 Lecture

Course Outcome:

1. Understand various anthropogenic reasons responsible for land degradation.
2. To study various wildlife management 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. Restoration of Endangered Species by Bowles M.L. and Whelan C.J.
9. Understanding Biodiversity- Life, sustainability and Equity by Ashish Kothari

Semester II

DSC-B3 Sustainable development and environmental issues-I

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

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 it's 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 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 II

DSC- B4 Sustainable development and environmental issues-II

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

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: Global Environment Issues Environmental Education and awareness: Objectives, guiding principles, education programmed, environmental awareness Global Environmental problems: Ozone layer depletion, sea level rise, Acid rain , global warming, 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

DSC- B5 Waste management-I

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

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

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 Hart. 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 II

DSC B6 Waste management-II

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Study the fundamentals of solid and hazardous 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. 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

DSC- B7 Environmental pollution –III

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Study the sources and effects of air and noise pollution.
2. Explain the working of air pollution controlling devices and institutions working for the cause of environment.

Unit	Lecture Hours
Unit I	15
A: Properties of Atmosphere Physical and chemical properties of 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 Greenhouses 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: 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	7

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. TheRoyal Society of Chemistry Cambridge (1995)
5. Environmental Chemistry: A Global Perspective By: Gary W vanLoon& Stephen JDuffy. 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. JaicoPublisheingHouse, 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

DSC B8 Environmental Pollution-IV

Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. Study the sources and effects of soil pollution.
2. Explain the working of soil pollution controlling devices and institutions working for the cause of environment.

Unit	Lecture Hours
Unit I	15
A: Soil Formation and Soil Profile Definition of soil, Classification, Types, Soil formation, Physical, chemical & biological weathering Soil Profile – Horizon A, B, C & D Soil Types in India	7
B: Soil Properties and Pollution Physical properties of soil – Texture, Structure & other chemical, Physical & biological properties Soil Microbes, Types & their role in soil fertility Soil pollution, types, sources & effects on plants and animals	8
Unit II	15
A: Soil Chemistry and Bioremediation Soil Chemistry – Acidic & alkaline soils, organic manures & green manures, bio fertilizers its types and advantages Effects of fertilizers on soil properties Bioremediation, soil erosion, types of agents & effects	7
B: Soil Conservation Soil conservation : methods, practices, land treatment Need & practices for agricultural lands, physical, mechanical & biological practices Points to be considered for choice of conservation practice Bunding, terracing, plantations and other practices, it's advantages	8

SUGGESTED BOOKS:

1. Land Pollution, Causes and Control by Harrusson and Laxon
2. Soil and Water Conservation Engineering by Schwab, SD, Frevert, RK, Edminster, TW and Barns, KK, John Wiley and Sons.
3. Manual of Soil & water Conservation Practices by Carmel singh, C.Venkataramamnan, G. sastry, B.p. Joshi
4. Principle of Soil Science by Rai M. M.
5. Basic Concepts in Soil Science by Kolay A. K.
6. Watershed Management by Murty J. V. S.

Practical's

DSC-P1	Lab Course I
Sr. No.	Name of Experiment
1	Good laboratory Practices
2	List of important glassware's required for sample analysis
3	Instrument's for sterilization and bacterial growth
4	Instruments for monitoring water/wastewater/ soil
5	Identification of various plant species in campus area
6	Determination of chlorophyll content of given plant material
7	Determination of frequency of species in ecosystem
8	Determination of species density in nearby ecosystem
9	Determination of Species Diversity Index
10	Estimation of biomass of trees
11	Study of Phytoplankton's and Zooplanktons
12	Visit
13	

DSC – P2	Lab Course II
Sr. No.	Name of Experiment
1	Water Sampling and Preservation
2	Determination of pH of given sample
3	Determination of Electrical Conductivity of water sample
4	Determination of colour of water sample
4	Determination of Dissolved Oxygen in water sample
5	Determination of Free Carbon Dioxide in water sample
6	Determination of Biochemical Oxygen Demand of water sample
7	Determination of Chemical Oxygen Demand of water sample
8	Determination of Total Dissolved Solids and Total Suspended Solids
9	Estimation of Total Hardness of geiven water sample
10	Determination of Calcium and Magnesium hardness of given water sample
11	Determination of Alkalinity in water sample
12	Determination of Acidity in water sample
13	Estimation of GPP, NPP and RR
14	Measurement of noise levels at silence, residential and commercial zone
16	Visit

DSC-P3	Lab Course III
Sr. No.	Name of Experiment
1	Soil Preparation -Soil sampling, Drying, Air-dried soil samples, Air-dried fine soil samples
2	Determination of water holding capacity and moisture content of soil sample
3	Determination of pH of soil sample
4	Determination of Bulk Density of soil sample
5	Determination of porosity of soil sample
6	Determination of organic carbon and organic matter of soil sample
7	Estimation of Total Nitrogen in soil sample
8	Estimation of Total phosphorus in soil sample
9	Estimation of Total potassium in soil sample
10	Preparation of wind rose diagram
11	Study of instruments used for measurement of meteorological parameters
12	Paper Chromatography
13	Demonstration of Fire Extinguisher
14	Visit
15	

DSC-P4	Lab Course IV
Sr. No.	Name of Experiment
1	Study working of High-Volume Sampler
2	Study of Microscopy
3	Interpretation of aerial photographs
4	Determination of scale of aerial photograph
5	Determine optimum dose of Alum required for given water sample
6	Determine residual chlorine from given water sample
7	Determine phosphate from given water sample
8	Determination of turbidity of given water sample
9	Estimation of MLSS, MLVSS and SVI
10	Wood Pyrolysis
11	Determination of Volatile Fatty Acids
12	Determination of Chloride, Carbonates Bicarbonates in Water
13	Site Selection for Air Pollution Monitoring
14	Determination of Physical and Chemical Characteristics of MSW
15	Visit

