

SHIVAJI UNIVERSITY, KOLHAPUR.



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

Syllabus For

B.Sc. Part - III

Environment Science (Entire)

SEMESTER V AND VI

(Syllabus to be implemented from June, 2021 onwards)

Structure of Program and List of Courses are as follows:

Structure of B. Sc. Environment science (Entire) Programme Sem V & VI Structure – III

SEMESTER – V (Duration – 6 Months)																
Sr. No.	Subject Title	TEACHING SCHEME						EXAMINATION SCHEME								
		THEORY			PRACTICAL			THEORY				PRACTICAL			PRACTICAL EXAMINATION IS ANNUAL	
		Credits	No. of lectures	Hours	Credits	No. of lectures	Hours	Hours	Theory	Internal	Min Marks	Hours	Max Marks	Min Marks		
1	DSE-E1	2	3	2.4	2	5	4	2	40	10	14+4=18	PRACTICAL EXAMINATION IS ANNUAL				
2	DSE-E2	2	3	2.4	2	5	4	2	40	10	14+4=18					
3	DSE-E3	2	3	2.4	2	5	4	2	40	10	14+4=18					
4	DSE-E4	2	3	2.4	2	5	4	2	40	10	14+4=18					
5	AECC-E	2	4	3.2	---	---	---	2	40	10	14+4=18					
TOTAL		10	16	12.8	8	20	16	200	50	---						
SEMESTER – VI (Duration – 6 Months)																
1	DSE-F1	2	3	2.4	2	5	4	2	40	10	14+4=18	As per BOS Guidelines	50	18		
2	DSE-F2	2	3	2.4	2	5	4	2	40	10	14+4=18		50	18		
3	DSE-F3	2	3	2.4	2	5	4	2	40	10	14+4=18		50	18		
4	DSE-F4	2	3	2.4	2	5	4	2	40	10	14+4=18		50	18		
5	AECC-F	2	4	3.2	---	---	---	2	40	10	14+4=18		---	---	---	
TOTAL		10	16	12.8	8	20	16	200	50	---						
GRAND TOTAL		20	32	25.6	16	40	32	400	100	--	---	200				
<ul style="list-style-type: none"> • Student contact hours per week : 32 Hours (Min) • Theory and Practical Lectures : 48 Min. Each • DSE- Discipline Specific Elective : All papers are compulsory. • AECC- Ability Enhancement Compulsory Course (E & F) : English • Practical Examination will be conducted annually for 200 Marks. • <i>There shall be separate passing for theory, internal and practical.</i> 																
<p>(A) Non-Credit Self Study Course : Compulsory Civic Courses (CCC) For Sem V: CCC – II : Constitution of India and Local Self Government</p>																
<p>(B) Non-Credit Self Study Course :Skill Development Courses (SDC) For Sem VI: SDC – II: Any one from following (vi) to (x) vi) Interview & Personal Presentation Skill, vii) Entrepreneurship Development Skill, viii) Travel & Tourism, ix) E-Banking & Financial Services, x) RTI & Human Right Education (HRE), IPR & Patents</p>																

i) **B. Sc. Environment Science:Part 3 (Sem V & VI)**

Course code	Name of Course	Course code	Name of Course
Sem V		Sem VI	
DSE-E1	Land and water management- I	DSE-F1	Environmental Toxicology- I
	Land and water management- II		Environmental Toxicology- II
DSE-E2	Wildlife Management- I	DSE-F2	Ecorestoration- I
	Wildlife Management- II		Ecorestoration- II
AECC – E	English – III	AECC – F	English – IV

Practical

DSC-P8	Lab Course IX (Based on DSC-E1, DSC-E2)	DSC-P10	Lab Course XI (Based on DSC-F1, DSC- F2)
DSC -P9	Lab Course X (Based on DSC-E3, DSC-E4)	DSC-P11	Lab Course XII (Based on DSC-F3, DSC- F4)

Semester V
Land and Water Management – I
(DSC-E1 – Land and Water Management I)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. To study the concept of water balance and types of irrigation systems.
2. Understand about distribution and use of water and land resources.

Unit	Lecture Hours
Unit I	15
A: Land resources Significance of top most layer Distribution of land resources in India Topography-Concept and importance, Importance of land resources for economy, Types of land resources, land use groups, uses of land resources	8
B: Role of agriculture, horticulture and forestry Agroforestry, social forestry, extension forestry: concept, objectives, benefits, Agriculture and Horticulture- concept, objectives and benefits Regeneration methods, Conservation through improved practices	7
Unit II	15
A:Water resources Sources: Surface and subsurface sources, occurrence and distribution Conflicts over water in India and world, Water pollution and scarcity: causes and mitigation measures, Uses of water resources Hydrology: concept and scope	8
B: Irrigation practices and water balance: Concept and scope of water balance, Types of irrigation systems- surface and subsurface irrigation, quality of irrigation water, Water logging, salinity: causes, effects and control measures Integrated approach towards water management	7

Semester V
Land and Water Management – II
(DSC-E1 – Land and Water Management II)
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 watershed management measures.

Unit	Lecture Hours
Unit I	15
A: Land degradation Degradation of land-causes and effects, Problems related to waste lands, khar land and wet lands, Desertification: Causes, effects and reclamation measures Soil erosion: causes and effects, types of soil erosion and mitigation measures	8
B: Conservation of land resources: Measures for land management: Integrated pest management, Integrated plant nutrient management, Conservation measures for arable lands: tillage practices, vegetative ridges, mechanical measures, biological measure, vegetative waterways	7
Unit II	15
A: Conservation of water resources: National water policy, integrated approach towards water management, water management strategies and problems, Mitigation measures for water pollution, Rain water harvesting and groundwater recharge, Traditional methods of water conservation	8
B: Watershed management: Introduction to watershed management, characteristics of watershed: permeability, size, shape, slope, topography, relief Need of watershed planning, rural and integrated watershed development, watershed based farming system, livestock production, energy plants and sericulture	7

References:

1. Cunningham W.P, 1994, Understanding our environment: An introduction, W.C. Brown Publishers, Oxford
2. Khan et. Al, Wasteland Development
3. Dr. Rajvir Singh, Watershed planning and management, 2nd edition, Yash Publishing House, Bikaner, India
4. R.Suresh, Soil and Watershed Conservation engineering, 2nd edition, standard Publication Distributors, Delhi

5. G.O.Schwab, Soil and Water conservation engineering, 4th edition, John Wiley and sons
6. Manual of soil and water conservation practices, ICAR, GOI
7. Bharat Kakade, Watershed Manual, BAIF publications
8. S.S. Negi, Forest Management in India, Published by Bishen Singh Mahendra Pal Singh
9. Madan K. Jha, V.V.N. Murty, Land and Water Management Engineering, 2013
10. Daji J.A., Textbook of soil science, 2005, Media Promotors and Publishers, New Delhi
11. Mandal R.B., Land utilization: Theory Concept Publishing house

Semester V
Wildlife Management– I
(DSC-E2 Wildlife Management–I)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. To study population census techniques of wildlife.
2. Study of human-wildlife conflict and measures to avoid it.

Unit	Lecture Hours
Unit I	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, Trophic levels and energy flow in these habitats	8
B: Threats to wild life: Natural and anthropogenic reasons, Habitat destruction and fragmentation, urbanization, industrialization, agricultural expansion, Human wildlife conflict, exploitation of wildlife by hunting and poaching, Effects and examples of exploitation of plants and animals	7
Unit II	15
A: Biodiversity hotspots: Biodiversity hotspots: concept and need, biodiversity hotspots in india, India as a megadiversity nation, Wetlands: need for wetland conservation, Ramsar convention Mangroves: importance of mangroves, species diversity in mangroves, role of mangroves in ecosystem conservation	8
B: Wildlife management: Population census techniques: Transects, point counts, pug mark, camera trapping, Assessment of diversity: determination of sampling area, transects, quadrats, point centre method, diversity indices and its application Habitat conservation	7

Semester V
Wildlife Management – II
(DSC-E2 –Wildlife Management II)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. To study need and measures of wildlife conservation.
2. To study various conservation measures undertaken by government organisations and NGO.

Unit	Lecture Hours
Unit I	15
A: Wildlife conservation: Need of wildlife conservation, Methods of conservation: ex-situ and in-situ measures, Uses of wildlife, Initiatives for wildlife conservation, Ecotourism: Concept and objectives, merits and demerits, limitations of ecotourism, challenges	8
B: Efforts for wildlife conservation: International efforts for conservation: role of WWF and IUCN, role of other organizations, Role of government, international conventions and protocols, Role of Non-government organizations for wildlife conservations: green peace, BNHS	7
Unit II	15
A: Conservation projects for wildlife: Project tiger, project elephant, crocodile conservation project, UNDP sea turtle project, project hangul, Project snow leopard, Tiger task force, Corridors for wildlife conservation State symbols (animals and plants)	8
B: Legal aspects related to wildlife: Wildlife protection act- merits and demerits MoEFCC, Central Pollution Control Boards, State Pollution Control Boards, Interaction between government institutions and NGO's	7

References:

1. Wildlife management and conservation, Contemporary principles and practices, Paul R. Krausman, James w. Cane

2. Fundamentals of wildlife management, Rajesh Gopal, Natraj Publishers
3. Concept in wildlife management, B.B. Hosetti, Daya Publishing House, 2nd edition

Semester VI

Environmental Toxicology– I

(DSC-F1 – Environmental Toxicology I)

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

Course Outcome:

1. To study types of toxic substances and their effects.
2. To study methods useful for analysis of toxicants.

Unit	Lecture Hours
Unit I	15
A: Introduction to toxicology: Concept and scope, toxic substances, principles of toxicology, Intake of toxic substances: Eye absorption, inhalation, ingestion Responses to toxic substances, duration and frequency of exposure, dose response relation Carcinogens, teratogens, mutagens	8
B: Ecotoxicology and epidemiology: Introduction to ecotoxicology, types of toxic substances, factors affecting effect of toxic substances, Phyto-toxins and animal toxins Introduction to epidemiology, pandemic and endemic diseases, zoonosis	7
Unit II	15
A: Toxic substances: Introduction to toxic substances, source and effects, impact of ecosystem on fate and transport of toxicant and means of transportation, Introduction to bioaccumulation, biotransformation and bioaccumulation and effects on people and environment	8
B: Analysis of toxicants and sanitation: Lethal and sub-lethal concentration, Analysis of NOEL, Analysis of LD 50 and LC50, Detoxication mechanisms, Sanitation and human health, sanitation practices and problems WHO and other organizations and their role in sanitation	7

Semester VI
Environmental Toxicology– II
(DSC-F1 – Environmental Toxicology II)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. To study various organ specific toxicities.
2. To study negative impacts of pesticides and xenobiotics.

Unit	Lecture Hours
Unit I	15
A: Genotoxicity and organ specific toxicity: Genotoxicity: mutation, mutagens, toxic agents in environment-industrial chemicals, food additives, safety regulations and legal control Organ specific toxicity studies- neurotoxicity, nephrotoxicity, hepatotoxicity, reproductive toxicity	8
B: Soil toxicology: Organic chemicals: fertilizers and pesticides and their impacts on soil, water and human health, Metals, plant nutrients, salts, acids and bases, Impacts of Barium, Arsenic, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Mercury, Nickel, zinc	7
Unit II	15
A: Pesticide toxicology: Types of pesticides- organochlorine, Organophosphate, Carbamates, pesticide and human health, Exposure to ionizing radiations, genetic effects, acute radiation syndrome, toxic residue, residual analytical methods, Factors affecting toxicity, evaluation of toxicity	8
B: Xenobiotics: Xenobiotics: concept, absorption and distribution, Chemical safety evaluation of toxicants, environmental hazards and environmental risk assessment, Environmental contamination and pollution, effects of xenobiotics	7

References

1. Environmental Sanitation, Ehlers, V.M. , McGraw Hill book Co.
2. Toxic chemicals, health and environment, Lave L.B., 1987, The Hopkin press Ltd., London
3. Basic environmental toxicology, Lorriss G., CRC press
4. Introduction to environmental toxicology, Wayne G. Landi Ming Ho Yu
5. Toxicology-the basic science of poisons, Louis J Cassarate, Mc Millan Publishing Co. Inc. New York
6. Principle and practices in toxicology in Public health, Ira s. Richard Jones and Bartlett Publishers

Semester VI
Eco-restoration – I
(DSC-F2 –Eco-restoration-I)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. To study concept and need of eco-restoration.
2. To understand about sustainable use of resources.

Unit	Lecture Hours
Unit I	15
A: Introduction to eco-restoration Concept and scope of eco-restoration, role of restoration ecology, Necessity of eco-restoration, types of restoration, holistic approach in restoration, Physical, chemical and biological restoration, Indigenous knowledge of restoration	8
B: Soil conservation Mining and its impact on soil quality, Rehabilitation of mine soils and salt affected soils Soil conservation: biological reclamation techniques Afforestation, Eco-development and environmental friendly products and technologies,	7
Unit II	15
A: Restoration of aquatic ecosystems: Role of plants and microbes in ecosystem restoration, wastewater treatments using wetlands, restoration of coastal ecosystems National environmental policy Sustainable management of resources, Role of pioneer species in restoration	8
B: Eco-restoration of air and hazard hit areas: Restoration of contaminated air, planting air pollutants absorbing plant, potential of carbon sequestration, planning and designing of green belt, role of local biodiversity conservation management committee for restoration, Eco-restoration of cyclonic hit areas, restoration of earthquake hit areas, volcanoes, landslides and flood affected areas	7

Semester VI
Eco-restoration II
(DSC-F2 –Eco-restoration II)
Credits 2 (Marks 50) Hours 30, 37.5 Lectures of 48 minutes

Course Outcome:

1. To study role of government, NGO's and media in eco-restoration.
2. Understand the role of social institutions in eco-restoration.

Unit	Lecture Hours
Unit I	15
A: Strategies of eco-restoration: Long term and short term strategies, Role of government agencies and NGO,s in restoration, Public participation in restoration Approaches for environmental awareness and education Role of media in environmental awareness Role of women in environmental awareness	8
B: Methods of eco-restoration: Restoration monitoring indicators, components of eco-restoration, seed collection and processes involved in nursey management, selection of plant species, Ecological restoration of degraded ecosystem and wastelands, Bio-scrubbers, control measures for leachate	7
Unit II	15
A: Restoration of natural resources and biodiversity: Restoration of forest lands and range lands, restoration of restoration of wild animals, Role of forest research institute in restoration, gene pool campaign Reintroduction of biota, acceleration of ecological succession, restoration of wetlands by mangroves	8
B: Social institutions for eco-restoration: Self-help groups for women, gram panchayat, watershed development committee Benefits of restoration to local inhabitants, socioeconomic issues related to declaration of wildlife sanctuary, Ecotourism: benefits to local villagers	7

References:

1. Managing cover crops profitably, Handbook series book, Published by Sustainable agricultural research and education programme
2. A whole farm approach to managing pest, sustainable agriculture research and education programme
3. Ecological restoration, A practical approach, Steven I, Apfelbaum applied ecological services
4. Restoration of degraded lands, Singh J.S., Rastogi publications, Meerut
5. Ecology, Environment and resource conservation, Singh J.S., Singh S.P., Anamaya Publishers, New Delhi

DSC-P8 -LAB COURSE (Semester V)

Sr. No.	Name of Experiment
1	Determination of grain composition and field capacity of soil
2	Study of rain water harvesting techniques
3	Study of irrigation techniques
4	Study of hydroponics
5	Study of afforestation movements in India
6	Study of land use in industry
7	Study of utilization of waste land
8	Study various watershed management techniques
9	Preparation of compost
10	Field visit

DSC-P9 -LAB COURSE (Semester V)

Sr. No.	Name of Experiment
1	Study of census by capture and recapture method
2	Estimation of biomass of trees
3	Estimation of GPP, NPP and RR
4	Study of pugmark
5	Bird watching
6	Visit to wildlife sanctuary
7	Study of human wildlife conflict in local area
8	Study of population census by transect and camera trapping method
9	Study of ecotourism activities in local area
10	Visit to NGO working for wildlife conservation

DSC-P10 -LAB COURSE (Semester VI)

Sr. No.	Name of Experiment
1	Preparation of media
2	Preparation of slants, plates aseptically
3	Estimation of protein
4	Estimation of Calcium oxide
5	Estimation of copper from pesticide
6	Estimation of magnesium and talcum powder
7	Study of oligodynamic effect on micro-organisms
8	Study of carcinogens and teratogens
9	Study of bioassay techniques
10	Study of LD50 and LC50
11	Study of bioremediation technique
12	Study of neurotoxins and nephrotoxins

DSC-P10 -LAB COURSE (Semester VI)

Sr. No.	Name of Experiment
1	Study of measures to restore fertility of soil
2	Preparation of vermicompost
3	Study of bio-indicators in local area
4	Study of nitrogen fixing bacteria
5	Study of measures for restoration of saline soils
6	Study of erosion control techniques
7	Demonstration of nursery management practices
8	Analysis of waste lands for fertility studies
9	Study of carbon sequestration
10	Study of carbon footprints
11	Preparation of herbarium