

### M. C. E. Society's Abeda Inamdar Senior College

Of Arts, Science and Commerce, Camp, Pune-1 (Autonomous) Affiliated to Savitribai Phule Pune University NAAC accredited 'A' Grade

#### **Program Objectives:**

- 1. To develop conscience towards social responsibility, human values and sustainable development through curriculum delivery and extra-curricular activities
- 2. To develop scientific temperament with strong fundamental knowledge of the subject
- 3. To develop analytical thinking and problem-solving skills needed for various entrance and competitive examinations and Post Graduate Studies
- 4. To train students in laboratory skills and handling equipment along with soft skills needed for placement
- 5. To inculcate the values of and scope of Ecology, Resource conservation and various green technologies as a part of sustainable development.

#### **Program Outcomes:**

- 1) The students will graduate with holistic development.
- 2) The students will be qualified to continue higher studies in their subject.
- 3) The students will be eligible to appear for various competitive examinations and pursue higher education and will be able to apply for the jobs with a minimum requirement of B. Sc. Program.
- 4) The students will understand about various pollution control technologies, green technologies of recent as a part of sustainable development goal.
- 5) The students will acquire knowledge about new innovations for future scope

#### **Program Specific Objectives and Outcomes**

#### **Program Specific Objectives:**

- The B.Sc. Environmental Science Program will enable the students;
- **PSOB-1.** To develop basic understanding of Fundamentals of Environmental Science as a discipline.
- **PSOB-2.** To bring sensitization towards the environment and also increase student competency and employability.
- **PSOB-3**. To inculcate a sense of responsibility among students about various principles and laws of environment

**PSOB-4.** To encourage students about applicability of knowledge and Interdisciplinary approach in day todays life.

#### **Program Specific Outcomes:**

After successful completion of B.Sc. Environmental Science Course, student will have:

- **PSOC-1**. Fundamental and Advanced knowledge of theory and practical courses in Environmental science.
- **PSOC-2.** Students will understand about how the subject knowledge helps in solving various social, economic, environment related problem and circular economy.
- **PSOC-3**. Knowledge about various Environmental laws, ISO series, EMS, Standards and Ethics required to peruse higher education in the field.
- **PSOC-4**. Knowledge about Environmental (Resource, Energy) Management, Monitoring, introductory aspects of Environmental Biotechnology and Microbiology
- **PSOC-5.** Skills in laboratory techniques and experience in instrument handling



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#### **FACULTY OF SCIENCE**

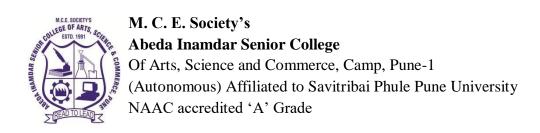
### Name of BOS -- Life science

#### To be implemented from Academic Year 2024-25

#### **B.Sc. Program Structure (Choice Based Credit System, Under NEP Guidelines)**

## S.Y.B.Sc. Environmental Science Program structure and Syllabus

Sr.	Program	Sem.	Offered as	Course Code	Course title	Number of Credits
1.	S.Y.B.Sc.	III	Major- Theory	23SBEV31MM	Ecological Studies	2
2.	S.Y.B.Sc	III	Major- Theory	23SBEV32MM	Natural Resource Management and Sustainability	2
3.	S.Y.B.Sc	III	Major- Theory	23SBEV33MM	Environmental Conservation during Ancient times (IKS)	2
4.	S.Y.B.Sc	III	Major- Practical	23SBEV34MM	Practical Course on Ecological studies and Resource Conservation	2
5.	S.Y.B.Sc	III	Major	23SBEV3FP	Field Projects	2
6.	S.Y.B.Sc	IV	Major- Theory	23SBEV41MM	Biological Diversity and Conservation	2
7.	S.Y.B.Sc	IV	Major- Theory	23SBEV42MM	Environmental Pollution Control Technologies	2
8.	S.Y.B.Sc	IV	Major- Practical	23SBEV43MM	Practical Course in Biodiversity and Pollution Control Technology	2
9.	S.Y.B.Sc	IV	Major- Practical	23SBEV44MM	Practical Course in Soil and Noise Analysis	2
10.	S.Y.B.Sc	III	Major	23SBEV4CEP	Community Engagement Program	2



## **Syllabus for Ecological Studies**

## **S.Y.B.Sc. 2024-25 (CBCS – Autonomy 21 Pattern)**

<b>Course Title</b>	Ecological Studies		
Course Code: 23SBEV31MM			No. of Credits: 02
Course Type: Major (MM)			<b>Total Teaching Hours: 30</b>

	Course Objectives
1.	To ensure 'well variedness' with the basic concepts of Ecology and to
	integrate ecological informatics with social science
2.	To integrate People-Planet-Profit and merging Ecological and Social sciences
3.	To bring sensitization towards the environment and also increase
	student competency and employability.
4.	To inculcate sense of environmental responsibility among students and trans-disciplinary approach
5.	To understand the concept of Carrying capacity of nature and the
	interrelationship of all forms of life with environment.

Course Outcome				
1.	Students will understand the multidisciplinary nature of the subject			
	and thus the Scope of study			
2.	Students will understand the importance of ecological studies			
3.	Students will understand the various types of ecosystems with structural			
	and functional characteristics			

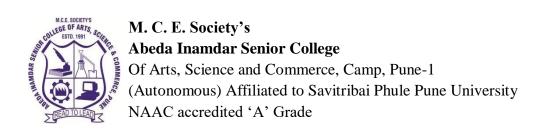
4.	Students will understand the levels of ecological organizations,
	Community and Population ecology, cycling of nutrients and the
	concept of flow of Energy

Unit No.	Title with contents	No. of lectures
I	1. Introduction to basics of Ecology	04
	Basic concepts, Principals, Scope	
	Definitions: Ecology, Landscape, Habitat, Ecozones,	
	Biosphere, Ecosystems, Ecosystem stability, Autecology,	
	Synecology, Population, Community, Biome and	
	Ecosystem Ecology	
	2. Levels of Organisation –	
	i. Biological / Ecological Spectrum.	
	ii. Ecological Hierarchy by Barett et al.	
	3. Ecological Classification based on –	
	i. Taxonomic Affinity (From Kingdom to Species	
	Level Ecology).	
	ii. Habitat Types (Terrestrial and Aquatic Ecology).	
	4. Ecology of Individuals	
	Ecological niche; types of niche Eltonian niche,	
	Hutchinsonian niche, Fundamental niche, Realized niche,	
	Multidimensional niche, Trophic niche	
II		06
	1. Concept of the Ecosystem	
	2. Macro ecosystems—Forest, Grassland, Desert, Ocean, Pond	
	3. Micro-ecosystems—River, Streams, Estuary	
	4. Ecosystem Structural attributes – Abiotic and Biotic	
	Components.	
	5. Ecosystem Function: Functional attributes-	
	i. Food Chain – Grazing and Detritus.	
	ii. Food Web and Ecosystem Stability	
	a. Ecological Energetics –	
	i. Energy Input.	

	ii. Energy Flow – Single Channel and Y shaped	
	models.	
	b. Productivity of Ecosystem –	
	i. Primary Production – GPP and NPP.	
	ii. Secondary Production.	
	iii. Standing Crop (Biomass).	
	c. Ecological Pyramids – of Number,	
	Biomass and Energy with examples	
III	1. Ecosystem Nutrient Cycling and Ecological	06
	Succession	
	i. Concept of –	
	a) Macro and Micro-nutrients, deficiency syndromes,	
	Functions	
	b) Nutrient Cycling—Biogeochemical Cycles –	
	Gaseous Cycles – Hydrological, Carbon and Nitrogen	
	Cycles.	
	Sedimentary Cycles – Phosphorus and Sulphur Cycles.	
	2. Human Impact on Biogeochemical Cycles.	
	3. Ecological succession	
	i. Causes of Succession.	
	ii. Basic Types – Primary, Secondary, Autogenic, Allogenic	
	etc.	
	iii. Mechanism of Succession –	
	a) Nudation.	
	b) Invasion.	
	c) Competition, Co-action and Reaction.	
	d) Stabilisation (Climax).	

IV		
	1. Population Ecology	
	i. Introduction and Basic Concepts.	
	ii. Population Characteristics –	
	a) Size and Density.	
	b) Dispersion – Random, Aggregate and Uniform.	
	c) Natality (Potential and Realised).	
	d) Fecundity	
	e) Mortality (Potential and Realised).	
	f) Survivorship Curves.	
	g) Age and Sex Structure.	
	h) Life Table and Viability analysis	
	2. The Concept of Carrying Capacity.	
	3. Population Growth –	
	a) Growth Curves – Exponential and Logistic.	
	b) Population Fluctuation.	
	c) Biotic Potential and Environmental Resistance.	
V	1. Community Ecology and Relationships	08
	i. Characteristics of Community - Species Diversity,	
	Growth form and Structure, Dominance, Succession,	
	Trophic Structure, Eco tone and Edge Effect.	
	2. Characters used in Community Structure-	
	i. Analytical Characters – Quantitative and Qualitative.	
	ii. Synthetic Characters.	
	3. Inter-specific Relationships Commensalism, Parasitism,	
	Mutualism, Symbiosis, Predation, Amensalism, Neutralism	
	4. Intra-specific Relationships Association, Aggregation,	
	Social Life, Territoriality	

Suggeste	ed Readings
1.	Understanding Environment; Chokkar K. B., Pandya M. and Raghunathan M.;
	Centre for Environment Education; Sage Publication, New Delhi.
2.	Ecology - Principles and Applications; Chapman J. L. and Reiss M. J.; Cambridge
	University Press.
3.	Fundamentals of Ecology; Odum P.E.; Natraj Publishers; Dehradun; 3 Edt
4.	Ecology, Environment and Resource Conservation; Singh J.S., Singh S.P. and Gupta
	S.R.; Annamaya Publishers; New Delhi.
5.	Ecology and Environment; Sharma P.D.; Rastogi Publication; Meerut; 11 Rev. Edt
6.	Environment Science; Tyler M.G.; Wadsworth Publishing Co.; 1997.
7.	Perspective in Environmental Studies; Kaushik and Kaushik; New Age International
	Pvt. Ltd. Publishers.
8.	Environmental Science; Santra S.C.; New Central Book Agency (P) Ltd.; 2 Edt
9.	Manual for Field Ecology; Mishra R.
10.	Gurevitch, J., Scheiner, S. M., and Fox, G. A. 2002. The Ecology of Plants. Sinauer
	associates incorporated
11.	Odum, E.P. 1971. Fundamentals of Ecology. W.B. Sounders.



## Syllabus for 2023-24 (CBCS – Autonomy 21 Pattern)

Course Title	Natural Resource Managemen		and Sustainability	
Course Code: 23SBEV32MM			No. of Credits: 02	
Course Type: Major (MM)			<b>Total Teaching Hours: 30</b>	

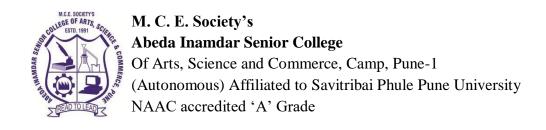
	Course Objectives
1.	To understand the Concept of Natural Resources and its Importance in
	Day to day Life
2.	To understand Generation, Extraction and impacts of Natural
	Resources by Human activities on the Earth's Environment
3.	To encourage Sustainable Management of Natural Resources and
	Minimize depletion of Natural Resources
4.	To understand Management Techniques of Natural Resources using
	Case studies

	Course Outcome			
1.	To Understand effective and efficient Natural Resource Management strategies			
2.	To inculcate values for Conservation Natural Resources among students			
3.	To understand Sustainable Management of Resources in everyday life			
4.	To understand Renewable energy resources and their Future scope and application			

Unit No.	Title with Contents	No. of
		Lectures
I	Introduction to Natural Resources	
	Definition and Classification of Natural Resources	04
	2. Importance and Scope of Natural Resources	
	3. Man's interaction with Natural Resources	
	i. As important resource	
	ii. Waste sink	
	iii. Cultural significance	
	4. Problems and Degradation of Natural Resources	
	5. Management Techniques of Natural Resources	
II	Forest Resources and Wildlife Resources	
	Forest Resources	08
	1. Functions and importance of Forest resources	
	2. Human Interaction with Forest – Over exploitation,	
	Deforestation (Causes and Effects)	
	3. Forest Management in India and Case studies	
	Wild Life Resources	
	1. Definition of Wild life and Importance of Wildlife	
	2. Causes and Threat to Wildlife	
	3. Protection and Conservation of Wild life	
III	Food Resources and Water Resources	
	Food Resources	08
	1. World Food Problems	
	2. Changes caused by Agriculture and over-grazing, effects	
	of Modern agriculture, Fertilizer-Pesticide problems,	
	Water logging, Salinity, Case-studies- Green Revolution	
	in India -Concept, Impact in India, Concept of GMO	
	and HYV -Advantages and Disadvantages	
	3. Concept of Sustainable Agriculture	
	Water Resources	
	1. Surface Water and Ground Water, Use and over-	

	utilization and Pollution, Water Crisis	
	2. Conflicts over water in World and India	
	3. Conservation and Management of Water Resources-	
	Rain-water Harvesting, Watershed Management,	
	Traditional Water Harvesting Technique etc	
IV	Land and Mineral Resources	
	Land Resources	04
	1. Soil Erosion –Causes and Consequences of Soil Erosion	
	2. Soil Degradation and Soil Pollution Causes and effects	
	3. Soil Conservation Methods	
	Mineral Resources	
	1. Types of Minerals, Importance, and application of	
	Mineral Resources	
	2. Mining types and its impact on Ecosystem	
	3. Conservation of Mineral Resources	
V	Energy Resources  1. Classification of Energy Resources	
	2. Conventional Energy Resources -Coal, Oil, Natural Gas,	06
	Nuclear Energy and their impacts on Environment	00
	3. Non-Conventional Energy Resources – Solar energy,	
	Wind Energy, Hydroelectricity, Tidal energy, Ocean	
	Thermal energy, Wave energy, Bioenergy- Biomass and	
	Biomass Programme, Biogas, Bio -Ethanol, Biodiesel	
	4. Renewable energy resources and India	
	5. Current information on Central and State Government	
	Policies related to Renewable energy	
	I	

Suggested Rea	adings
1.	Owen , O .S Chiras ,D.D and Reganold, J.P ,1988 .Natural Resource Conservation –
	Management for Sustainable Future (7 <sup>th</sup> Edition ).Prentice Hall
2.	Craig ,J.R ,Vaughan .D.J and Skinner .B.J. 1996 .Resources of the Earth :Origin,
	Use, and Environmental impacts (2nd Edition), Prentice Hall, New Jersey
3.	Freeman, A.M .2001.Measures of value and Resources : Resources for Future
	.Washington DC.
4.	Freeman, A.M 2003. Millennium Ecosystem Assessment : Conceptual Framework
	.Island Press
5.	Ginley, D.S and Cahen, D.2011. Fundamentals of Materials for Energy and
	Environmental Sustainability ,Cambridge University Press
6.	Miller, T.G ,2012, Environmental Science, Wadsworth Publishing Co.
7.	Tiwari ,G.N and Ghosal .M.K , 2005, Renewable Energy Resources: Basic
	Principles and Applications ,Narosa Publishing House



# Syllabus for Green Technologies for Sustainable Future S.Y.B.Sc. 2024-25 (CBCS – Autonomy 21 Pattern)

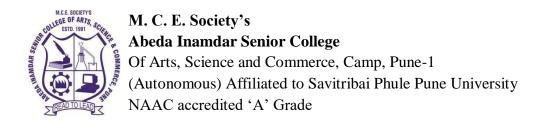
Course Title	Environmental Conservation during ancient times		
Course Co	Course Code: 23SBEV33MM No. of Credits: 02		No. of Credits: 02
Course Ty	pe: Major (MM)		<b>Total Teaching Hours: 30</b>

Course Objectives		
1.	To know about importance of Environmental Conservation.	
2.	To discuss about various ancient methods to Conserve the Environment.	
3.	To understand importance of Environment in various Religions.	

	Course Outcome		
1.	Students will understand the Importance of Environmental Conservation during ancient times.		
2.	Students can relate to different religious teachings on Environmental Conservation.		
3.	Encouragement of students for Environmental conservation through different ancient teachings.		

Unit No.	Title with Contents	No. of
		Lectures
I	Ancient Tradition of Environmental Conservation.	05
	Sacred Mangroves.	
	Religious Community Rituals.	
	> Totemism.	
II	Environmental Conservation in Buddhism.	06
	<ul> <li>Concept of Eco-Buddhism</li> </ul>	
	<ul><li>Environmental Ethics by Lord Buddha.</li></ul>	
	Buddhist teaching on preservation of Nature.	
III	Environmental Conservation in Hinduism	08
	<ul> <li>Bhagwat Geeta teachings on Environmental</li> </ul>	
	Protection.	
	<ul> <li>Ashoka teachings on Wildlife and Environment.</li> </ul>	
	➤ Teachings of Brahmans – Concept of Ahimsa.	
	<ul><li>Vishnu – Protecting India's Sacred Forests</li></ul>	
	Environmental Conservation in Islam	06
IV	<ul><li>Islam and Environmental Ethics.</li></ul>	
	<ul><li>Protection of Natural Resources.</li></ul>	
	<ul><li>Environmental models provided by Islam.</li></ul>	
	➤ Islam and Climate Change.	
V	Environmental Conservation in Christianity.	05
	Christian teachings on Environmental stewardship.	
	<ul><li>Christian teachings on Global warming.</li></ul>	

Suggested Readings		
1.	Robson, James. Power of Place: The Religious Landscape of the	
	Southern Sacred Peak (Nanyue)	
2.	Swearer, Donald K. "An Assessment of Buddhist Eco-Philosophy." Harvard	
	Theological Review	
	99, no. 2 (2006): 123–137	
3.	WIJESEKERA, O.H. de A.Rgvedic river-goddesses and an Indus Valley	
	sealIn: Dr.C.Kunhan Raja presentation volume: a volume of Indological	
	studies. Edited by G.S. Murti and others (Madras: The Adyar Library,	
	1946	
4.	APFFEL-MARGLIN, F.The sacred groves: menstruation rituals in rural	
	OrissaManushi (Delhi) 1994;no.82:22-32	
5	Khalid, F.M. (2002). Islam and the environment. Social and Economic	
	Dimensions of Global Environmental Change, 5, 332-339	
6.	Manzour, S.P. (1984). Environment and Values: the Islamic	
	Perspective dalam Ziauddin Sardar (ed). The Touch of Midas:	
	Science. Values and Environment in Islam and the West, Manchester.	
	Manchester University Press	
7.	Boff, L. 1989. Faith on the Edge: Religion and Marginalized Existence.	
	San Francisco: Harper and Row	



# Syllabus for Practical Course on Ecological studies and Resource Conservation S.Y.B.Sc. 2024-25 (CBCS – Autonomy 21 Pattern)

Course Title	Practical Course in Ecological studies and Resource Conservation		
Course Code: 23SBEV34MM		No. of Credits: 02	
Course Type: Major (MM)		<b>Total Teaching Hours: 30</b>	

Sr. No.	Objectives
1.	To understand the concept like Rain water harvesting, Watershed
	management, water and energy audit.
2.	To understand the importance of social media for dissemination of
	information about various current environmental issues.
3.	To know the importance of practical's from ecological point of view.

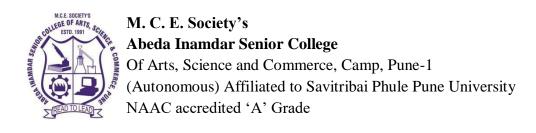
Sr. No.	Learning Outcome		
1.	To know the importance of Shannon- Simpsons diversity index in understanding the phytosociology		
2.	To learn about vegetation sampling methods.		
3.	To create awareness about current environmental issues and their socio- economic aspects/impacts		
4.	Students will get practical hands on training while preparing compost pits and Biogas plants		

Sr.	Title with Contents	Practical
No.		Sessions
1	To measure the Primary Productivity of grassland by	Field +
	Harvest Method.	Laboratory.
2	To estimate the Total Chlorophyll from plants in	Laboratory.
	Clean and Polluted Environment.	
3	To study grassland vegetation by List Count Quadrat Method	Field +
	to determine the Frequency, Density and Abundance.	Laboratory
4	To determine Frequency and Abundance of	Field +
	Species across terrestrial – aquatic transitional zone, by	Laboratory
	Line Transect Method.	
5	To determine Density of species across terrestrial – aquatic	Field +
	transitional zone by Belt Transect Method.	Laboratory
6	Field visit to study Watershed Mgmt. Techniques.	Visit.
7	Visit to Nature Interpretation / Information	Visit.
	Centre.	
8	Visit to National Park / Wildlife Sanctuary to study	Visit.
	Wildlife and various Inter-specific and Intra-specific	
	Relations.	
9	Continuation of the use of Social Media for e-networking	
	and dissemination of ideas on Environmental Issues	
	pertaining to the Course.	
10	To identify the advanced cultivars in the Local market	Visit.
11	Field visit to study Rain water Harvesting technique	Visit.
12	To determine the minimum area and number of quadrates	Field +
	for vegetation	Laboratory
13	To determine Shannon Diversity Index of a vegetation (	Laboratory.
	Data sheet)	
14	To estimate Importance Value Index from collected	Field +
	vegetation data.	Laboratory
15	To determine Simpson Diversity Index of a vegetation	Laboratory.
	(Data sheet)	
16	Visit to Soil Survey Department.	Visit.
17	Study of Soil sampling techniques	Visit.

18	To prepare Biogas unit in laboratory	Field +
		Laboratory
19	To Prepare a composting unit at home	Project based

- Any other relevant practical's related
- Report of visits must be submitted along with journal.

Suggested Readings		
1.	Manual for Field Ecology; Mishra R.	
2.	Handbook of Methods in Environmental Studies, Vol-I and II; Mailti S.K.; ABD	
	Publishers; Jaipur	



## **Syllabus for Biological Diversity and Conservation**

**S.Y.B. Sc., 2024-25 (CBCS – Autonomy 21 Pattern)** 

Course Title	Biological Diversity and Conservation			
Course Code: 23SBEV41MM			No. of Credits: 02	
Course Type: Major (MM)			<b>Total Teaching Hours: 30</b>	

	Course Objectives		
1.	To introduce ethical values for protection, preservation and sustainable management of biological diversity		
2.	To encourage incitation of sustainable use of the components of biodiversity in students		
3.	To bring sensitization towards the biodiversity but also increase Student competency and employability		
4.	To share the benefits arising from the commercial and other utilization of biodiversity in a fair and equitable way		
5.	To impart knowledge about endemic, endangered and rare species for conservation		
6.	To embrace the implications of new technological forces for the future of biodiversity, science and management		

	Course Outcome
1.	Students will explore the complexity of biodiversity.
2.	Students will come to know the importance of the subject in day today's life, thus understanding the basics of threats and importance of biodiversity

3.	Students will learn about certain species' roles in an ecosystem and how life on earth is intrinsically related with conservation of biodiversity.
4.	Students will understand about how the subject knowledge helps in
	solving various social, economic and environment related problems

Unit No.	Title with Contents	
I	Introduction to Biological Diversity	04
	1. The Concept, Definition	
	2. Levels – Ecosystem, Species and Genetic.	
	3. Methods of assessment of Biological diversity	
	<b>Ecosystem Diversity</b>	
	1. Classification of Ecosystem –	
	a) Udvardy's Classification.	
	b) Bailey's Classification.	
	c) Olsen's Classification.	
	d) Holdridge's Classification.	
	2. Major Ecosystem types of India with	
	their physical and biological	
	characteristics.	
	3. Major Ecosystem types of the World	
	with their physical and biological	
	characteristics.	
	Importance of Ecosystem in maintaining	
	Ecological balance	
II	Species diversity	06
	1. Species Diversity at Local, National and International	
	Level	
	2. Special features and Latest estimates for major	
	groups of Plants, Animals and Microbes.	
	3. <b>Measuring Species Diversity</b> – Species Richness,	
	Species Abundance and Species Evenness.	
	4. <b>Factors</b> affecting global distribution of	

Species Richness – Latitudinal Altitudinal	
,	
Hot-spot.	
8. India as a Mega-diversity Country	
Genetic Diversity	06
1. <b>Definition and Introduction</b> to Genetic Variations in	
Species	
2. Nature and Origin of Genetic Variations	
3. <b>Factors</b> affecting Genetic Diversity	
4. Measurement of Genetic Diversity –	
a) Based on DNA and Chromosomes.	
b) Molecular Marker Techniques.	
5. Transgenic Organisms.	
6. Diversity in Domesticated Species –	
a) Variations since the first domestication to the present.	
b) Land Races,	
c) Advanced Cultivars,	
d) Wild Relatives of Cultivated Plants and Feral Plants.	
	06
Significance and Threat to Biodiversity	06
	06
	Genetic Diversity  1. Definition and Introduction to Genetic Variations in Species  2. Nature and Origin of Genetic Variations  3. Factors affecting Genetic Diversity  4. Measurement of Genetic Diversity —  a) Based on DNA and Chromosomes.  b) Molecular Marker Techniques.  5. Transgenic Organisms.  6. Diversity in Domesticated Species —  a) Variations since the first domestication to the present.  b) Land Races,

	2. Non Ecological Significances – Nutritional,	
	Medicinal, Aesthetic, Cultural, Commercial Values	
	etc.	
	3. Optional Values, Use of microorganism in	
	remediation of pollution	
	_	
	(Threats) 4. Threats with suitable Examples –	
	a) Large Scale Dev. Projects – Habitat  Destruction and Fragmentation.	
	b) Changing Agriculture and Forestry Practices.	
	c) Invasion by Introduced Species.	
	<ul><li>d) Over-exploitation.</li><li>e) Environment Pollution.</li></ul>	
	<ul><li>e) Environment Pollution.</li><li>f) Global Climate Change.</li></ul>	
	g) Loss of Traditional Knowledge. b) Nature of Logal and Mamt. System. Human Wildlife.	
	h) Nature of Legal and Mgmt. System – Human Wildlife Conflict.	
V	1. Conservation Methods – In-situ	08
•	and Ex-situ methods with Examples	Vo
	2. National Conservation Efforts –	
	a) The laws – Environment Protection Act 1986,	
	Forest Act 1927, Wildlife Act 1972, The	
	Biodiversity Act 2002	
	b) Involving People's Participation – NBSAP, PBR	
	c) Involving Community Participation – JFM, EDP	
	d) People's Movement – Silent Valley Movement,	
	Beej Bachao Andolan	
	3. International Conservation Efforts –	
	a) IUCN – The World Conservation Union.	
	b) CBD.	
	c) CITES.	
	4. Traditional Methods of Conservation –	
	Sacred Groves / Ponds / Species	
	5. Ethics of Conservation – Values of Biodiversity	
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(Economic and Legal), Biopiracy, Hybridized plants, GM crops (benefits and criticism), , Ethical and Conservation issues related to uses of biodiversity, Global Conservation Issues

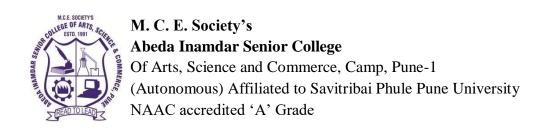
**6.** National Biodiversity Authority <a href="http://nbaindia.org/">http://nbaindia.org/</a>

National Biodiversity Portal

https://indiabiodiversity.org/

MoEFCC https://moef.gov.in/moef/about-the-ministry/organisations-institutions/authorities-tribunal/national-biodiversity-authority/index.html

Suggest	ed Readings
1.	Gaston, K J. and Spicer, J.I. 1998. Biodiversity: An Introduction. Blackwell Science, London, UK.
2.	Krishnamurthy, K.V. 2004. An Advanced Text Book of Biodiversity - Principles and
	Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi.
3.	Pandit, M.K. and Grumbine R.E. 2012. Ongoing and proposed hydropower development
	in the Himalaya and its impact on terrestrial biodiversity. Conservation Biology 26:1061-
	1071.
4.	Primack, R.B. 2002. Essentials of Conservation Biology (3rd edition). Sinauer
	Associates, Sunderland, USA.
5.	Singh, J. S. and Singh, S. P. 1987. Forest vegetation of the Himalaya. The Botanical
	Review 53: 80-192
6.	Singh, J. S., Singh, S.P. and Gupta, S. 2006. Ecology, Environment and Resource
	Conservation. Anamaya Publications, New Delhi.
7.	Sodhi, N.S. and Ehrlich, P.R. (Eds). 2010. Conservation Biology for All. Oxford
	University Press.
8.	Sodhi, N.S., Gibson, L. and Raven, P.H. 2013. Conservation Biology: Voices from the
	Tropics. Wiley-Blackwell, Oxford, UK.
9.	Understanding Environment; Chokkar K. B., Pandya M. and Raghunathan M.;
	Centre for Environment Education; Sage Publication, New Delhi.
10.	An Advanced Textbook on Biodiversity – Principles Practice; Krishnamurthy K.V.;
	Oxford and IBH Publishing Co. Pvt. Ltd.; New Delhi.
11.	Ecology – Principles and Applications; Chapman J. L. and Reiss M. J.; Cambridge
	University Press.
12.	Fundamentals of Ecology; Odum P.E.; Natraj Publishers; Dehradun; 3 Edt
13.	Ecology, Environment and Resource Conservation; Singh J.S., Singh S.P. and Gupta
	S.R.; Annamaya Publishers; New Delhi.
14.	Ecology and Environment; Sharma P.D.; Rastogi Publication; Meerut; 11 Rev. Edt
15.	Environmental Science; Santra S.C.; New Central Book Agency (P) Ltd.; 2 Edt



## Syllabus for S.Y.B. Sc. Environmental Science 2023-24 (CBCS – Autonomy 21 Pattern)

Course Title	<b>Environmental Pollution Control Technologies</b>		
Course Code: 23SBEV42MM			No. of Credits: 02
Course Type: Major (MM)			Total Teaching Hours: 30

	Course Objectives		
1.	To understand various Environmental Pollution Monitoring and Management Techniques with respect to Air, Water, Soil, Solid waste Managementand Noise Pollution		
2.	To impart knowledge and skills in Management with respect to Air, Water, Soil, Solid waste Management and Noise Pollution		
3.	To Study Different Aspects Of Environmental Contamination, which have adverse effects on Human Health		
4.	Understanding mechanisms of pollutants impacting on human health.		
5.	Developing an understanding of different types of pollutants, their sources and mitigation measures		

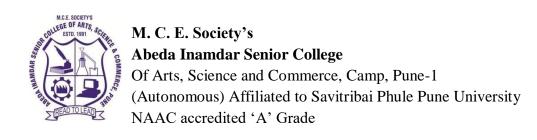
	Course Outcome		
1.	Able to describe and solutions to address environmental issues including pollution		
2.	To develop Environmentalist students and sensitize them towards Environmental issues		
3.	Acquiring values and attitudes towards understanding complex environmental		

	economic-social challenges, and participating actively in solving current environmental problems and preventing the future ones	
4.	Adopting sustainability as a practice in life, society and industry	

Unit No.	Title with Contents	No. of
		Lectures
I	Air Quality Monitoring	
	1. Air Quality standards by WHO and National Standards	04
	2. Air Sampling Techniques, Monitoring Tool/ Instruments	
	used and its working principle	
	3. Plume Behavior	
	4. Introduction to AQI and its significance	
	5. Air Pollution Control Techniques used in Industries	
	6. Control of Emissions from Automobiles	
	7. Indoor Pollution- Causes and Control	
II	Water Quality Monitoring	
	1. Objectives /Purpose of Water Quality Monitoring	06
	2. Water Sample Collection and Preservation ( Types of	
	sample, chain of custody, sampling method, number of	
	samples, sample containers, sample volume etc)	
	3. Waste Water Treatment	
	i. Primary Treatment of Waste Water	
	ii. Secondary Treatment -Aerobic and Anaerobic	
	Treatment of Waste Water	
	iii . Tertiary Treatment –Disinfection ( Chlorination ),	
	Biogas	
	iv. Advanced Treatment of Waste Water	
	4. WHO, BIS and ICMR National Standards for Water quality	
III	Solid Waste Management Techniques	
	Material Separation Techniques and Processing –	08
	Recovery, Reuse, Recycle	

	2 Discussif Management Tanksissas	
	2. Disposal/ Management Techniques-	
	Sanitary Landfill, Composting, Incineration, Pyrolysis,	
	Injection Well, Gasification, Ocean Dumping	
	4 .Hazardous Waste Management – Waste Management	
	Treatment, Storage and Disposal	
	5. Bio-Medical Waste Management	
	Categorization, Segregation, Packaging/Colour coding and	
	Treatment, Transport and Disposal	
IV	Soil Pollution Monitoring	
	1. Objectives of Soil Monitoring	06
	2. Soil Sampling Techniques	
	3. Biological Methods to control Soil Pollution - Use of Bio	
	Fertilizers, Bio-Pesticides, Conservational Tillage, Mixed	
	Cropping, Crop Rotation, Biological Pest Management,	
	Organic Farming, Soil Conservational Methods,	
	Bio/Phytoremediation of Contaminated Sites	
V	Noise Pollution Monitoring	
	1. Noise Measuring Methods and Instruments	06
	2. Noise Control Techniques	
	S. Sound Insulation	
	ii. Sound Absorption	
	S. Vibration Damping	
	S. Active Noise Control/ Cancellation	
	3. Noise Control at Source	
	I. Selection and Maintenance of Machines	
	II. Control over Vibrations	
	III. Installations of Barriers/Enclosures	
	IV. Using Protective Equipment's	
	iv. Noise Proof Walls	
	4. National Standards for Noise quality, Noise pollution	
	(Regulation and control) Rules-2000 in India	
1		1

Suggeste	d Readings
1.	Environmental Chemistry, Dey A. K.; New Age International Publishers; 6 Edt
2.	Air Pollution; Rao M.N. and Rao H.V.N.; Tata McGraw Hill; New Delhi; 1989.
3.	Environmental Pollution Control and Environmental Engineering; Rao C. S.; Tata
	McGraw Hill; New Delhi; 1994.
4.	Waste Water Engineering, Treatment, Disposal and Reuse; Metcalf and Eddy.
5.	Chemical and Biological Methods for Water Pollution Studies; Trivedi R.K. and Goel
	P.K.; Environmental Publications; Karad; 1986.
6.	Textbook of Noise Pollution and Its Control – S.C. Bhatia
7.	Advanced Air and Noise Pollution Control – L.K Wang and N.C Pereira
8.	Environmental Pollution Control and Environmental Engineering; Rao C. S.; Tata
	McGraw Hill; New Delhi; 1994.
9.	Physico-Chemical Examination of Water, Sewage and Industrial Effluents; Manivasakam
	N.; Pragati Prakashan; Meerut; 1984



# Syllabus for Practical Course on Biodiversity and Pollution Control Technology S.Y.B.Sc., 2024-25 (CBCS – Autonomy 21 Pattern)

Course Title	Practical Course in Biodiversity and Pollution Control Technology		
Course Code: 23SBEV43MM		No. of Credits: 02	
Course Type: Major (MM)		Total Teaching Hours: 30	

Course Objectives				
1.	To understand the concept like Nature Interpretation Centre, in-situ and			
	Ex-situ conservation, Soil sampling techniques.			
2.	To understand the importance of control measures of environmental			
	components like air, soil, water etc.			
3.	To know about the various parameters of water and noise pollution			
4.	To know about biodiversity and related aspects by maintain the biodiversity register.			

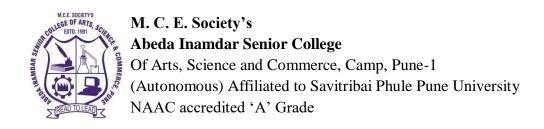
Course Outcomes			
1.	To know the importance of Shannon- Simpsons diversity index in understanding the phytosociology		
2.	To learn about water and soil sampling methods.		
3.	To create awareness about importance of various ecosystem form biodiversity point of view.		
4.	To get hand on training during phytoremediation project		

Unit	Title with Contents	Practical
No.		Sessions
1	Sampling of Air by High Volume Sampler	Field +
		Laboratory
2	Determination of Optimum Dose of Alum (Coagulant) required	Laboratory.
	for water.	
3	Determination of Turbidity of water. (Turbidimeter	Laboratory.
	/ Nephelometer)	
4	Determination of Residual Chlorine from treated water.	Laboratory.
5	Determination of Dissolved Oxygen in water by Winkler's	Laboratory.
	method	
6	Determination of Nitrate from water ( Calorimeter)	Laboratory.
7	Determination of Phosphate from water. (Colorimeter)	Laboratory.
		-
8	Determination of Soluble Salts from Soil.	Laboratory.
9	Determination of Assillable Nitroness for more it	Laboratory.
10	Determination of Available Nitrogen from soil.	Field +
10	Study of Water Sampling and Preservation techniques	Laboratory
11	Measurement of sounds by DB meter / SLM in silent,	Field +
	industrial, residential and commercial zones and Analysis	Laboratory
12	Determination of Lime required for Acidic soil	Laboratory
13	Visit to Solid waste Dumping Site	Field
14	Estimation of NOx content of given samples	Laboratory.
		_
15	Estimation of Sox content of given samples	Laboratory.
16	Study of wetland (source region visit) and its vegetation and	Field + Laboratory
	seasonal bird diversity.	
17	Visit to a sacred grove/Forest / Grassland / Marine ecosystem to	Field + Laboratory
10	assess its biodiversity (Flore and Found) register of the	Ein14
18	To prepare a Biodiversity (Flora and Fauna) register of the	Field
	campus	

19	To set up Phytoremediation project at laboratory level	Field + Laboratory
	*(Polluted Soil / waste water)	

- Any other relevant practical's related
- Report of visits must be submitted along with journal.

Suggest	ed Readings
10.	Air Pollution; Rao M.N. and Rao H.V.N.; Tata McGraw Hill; New Delhi; 1989.
11.	Environmental Pollution Control and Environmental Engineering; Rao, C. S.; Tata
	McGraw Hill; New Delhi; 1994.
12.	Waste Water Engineering, Treatment, Disposal and Reuse; Metcalf and Eddy.
13.	Manual for Field Ecology; Mishra R.
14.	Handbook of Methods in Environmental Studies Vol-I andII; Mailti S.K.; ABD
	Publishers; Jaipur.
15.	Physico-Chemical Examination of Water, Sewage and Industrial Effluents; Manivasakam N.; Pragati Prakashan; Meerut; 1984.
16.	Chemical and Biological Methods for Water Pollution Studies; Trivedi R.K. and Goel P.K.; Environmental Publications; Karad; 1986
17.	Instrumental Methods of Analysis; Willard; cbpspd; 7 Edt
18.	Waste Water Engineering, Treatment, Disposal and Reuse; Metcalf and Eddy



## Syllabus for Lab Course in Soil and Noise Analysis

**S.Y.B.Sc. 2024-25 (CBCS – Autonomy 21 Pattern)** 

Course Title	Practical Course in Soil and Noise Analysis		
Course Code: 23SBEV44MM			No. of Credits: 02
Course Type	: Major (MM)		<b>Total Teaching Hours: 30</b>

Course Objectives			
1.	To study various Soil Sampling Techniques		
2.	To understand various Soil analysis techniques and methods used to detect the pollutants present in soil		
3.	To estimate the Noise Level in Residential and Commercial areas through Survey methods		
4.	To understand the measures of Reducing Soil and Noise pollution levels		

Course Outcomes			
1.	To have hands on training on estimating Soil quality and Noise Levels in Residential, Commercial areas		
2.	To have practical experience of Soil, irrigation techniques and Soil Management methods on Farm		
3.	To understand the various Environmental Laboratory analysis		
	techniques used for Soil and Noise level measurement		

Sr. No.	Title with Contents	Practical
1,00		Sessions
1	To study various Soil sampling Techniques	Field + Laboratory
2	To determine Moisture Content from the given Soil sample	Laboratory
3	To determine the Water Holding Capacity from the given Soil sample	Laboratory
4	Study Visit to Soil Survey Department	Visit
5	Study Visit to Environmental Laboratory	Visit
6	Determination of pH and EC from the given Soil sample	Laboratory
7	To determine the Organic content from the given Soil sample	Laboratory
8	To determine Soil Texture, Temperature and Particle Size	Laboratory
9	To measure the Noise using Sound Level Meter	Laboratory /Field
10	To determine the Soil Bulk Density	Laboratory
11	Noise Level Survey related to effects on Human health in Residential and Commercial areas	Field
12	Study Visit to Farm and surrounding areas to understand Soil types, Irrigation practices and Crop yield	Field
13	Study of Macro, Micro nutrients and Heavy Metals found in Soil and their impacts	Laboratory
14	Study of Rocks and their properties	Laboratory
15	Study of Minerals and their properties	Laboratory
16	Study of Soil types found in India with respect to Climatic conditions	Laboratory

## • Any other relevant practical's related

• Report of visits must be submitted along with journal.

## **Suggested Readings**

1. Handbook of Methods in Environmental Studies Vol-II Air, Noise, Soil and

Overburden analysis; Maiti S.K: ABD Publishers Jaipur