

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 educate the students about instrumentation handling.

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.
- 4) The students will be able to apply for the jobs with a minimum requirement of B.Sc. Program.

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 fundamental concepts and management of the various resources of mother Earth.
- PSOB-2. To bring sensitization towards the environment and also increase student competency & employability
- PSOB-3. To inculcate a sense of responsibility among students about various principles and laws of nature.
- 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 and environment related problem
- **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.
- **PSOC-6:** Knowledge about wild life management, Atmospheric sciences, global climate change, Environment Health and Safety, Soil health management, urban town planning, Solid waste management, pollution control technology

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T.Y.B.Sc. course design To be implemented form 2023-2024

Course Code	Name of the Course	Course Code	Name of the Course	Credit
	Semester V		Semester VI	
21SBEV351	Terrestrial Ecosystem Management	21SBEV361	Aquatic Ecosystem Management	2+2
21SBEV352	Wildlife biology and its Management	21SBEV362	Nature Conservation	2+2
21SBEV353	Water and Soil quality	21SBEV363	Air and Noise Pollution Control Technology	2+2
21SBEV354	Atmospheric Sciences and Global Climate change	21SBEV364	Environmental Issues	2+2
21SBEV355	Environmental Legislation and Policies	21SBEV365	Environmental Governance: EMS, EIA & ISO14000	2+2
21SBEV356	Environmental Biotechnology-I	21SBEV366	Environmental Biotechnology-II	2+2
21SBEV357	Practical-I	21SBEV367	Practical-I	2+2
21SBEV358	Practical-II	21SBEV368	Practical-II	2+2
21SBEV359	Practical-III	21SBEV369	Project	2+2
21SBEV3511	Environmental Health and Safety	21SBEV3613	Solid Waste Management	2+2
21SBEV3512	Soil Health Management	21SBEV3614	Urban Town Planning	2+2



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Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course / Paper Title	Terrestrial Ecosystem Management
Course Code	21SBEV351
Semester	V
No. of Credits	2 (36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To know about importance of hotspots of biodiversity and the
	biogeographic zones of the country.
2.	To discuss about various terrestrial Biomes and the significance of them.
3.	To enumerate the services, benefits and values of Terrestrial ecosystems to mankind.
4.	To understand the concept of various communities based terrestrial ecosystem management methods.
5.	To integrate the role of people in sustainable utilisation of terrestrial ecosystems with case studies.

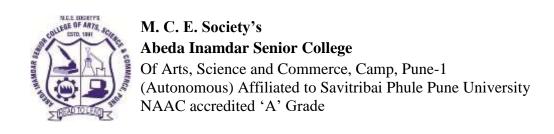
Sr. No.	Learning Outcomes		
1.	Students will learn the role of hotspots in maintaining the balance of		
	nature and their wellbeing.		
2.	Students will recognize the direct and indirect values of ecosystems and		
	sustainable management methods.		
3.	Students will learn to apply the terrestrial ecosystem sustainable		
	utilisation approach from case studies.		

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4.	Students will get exposure of Remote sensing and GIS methods for		
	better management aspect.		
5.	Students will compare the effects of conservation and management on		
	the main ecosystem processes and components; analyze ecological		
	theories, using understanding of plant and animal biology, and		
	environmental interactions.		

Unit	Title with Contents	No. of
No.		Lectures
1	Terrestrial Ecology	08
	Introduction to Terrestrial Environment	
	Parameters of terrestrial environment	
	The terrestrial biota	
	Biogeographic regions of India	
	The Soil subsystem	
	Hotspots in India: Western Ghats and Eastern Himalaya	
	General structure of terrestrial communities	
	Concept of Keystone species with examples	
2	Terrestrial Biomes	06
	Introduction, concept	
	Types of BiomesTundra, Northern coniferous forests,	
	Temperate deciduous and rain forests, Temperate grassland,	
	Desert, Tropical Rainforest, Tropical deciduous forest,	
	Tropical scrub forest, Tropical grassland, Savannas	
3	Terrestrial ecosystem services	06
	Aesthetic values	
	Cultural values	
	Tourism and recreation, industry, drugs and medicines	
	Concept of Carbon sequestration with respect to soil and	
	trees	
	Direct and Indirect values	

		06
4	Methods of terrestrial ecosystem management	
	Remote sensing	
	Geographical information system	
	Community based forest management, traditional methods	
	Forest fire: reasons, effects, control measures, management	
	and case studies	
5	Exploitation and Sustainable Utilisation	10
	Concept of exploitation and sustainable utilisation	
	Reasons, Threats of exploitation	
	Sustainable management methods	
	Role of People, NGO's ,Community and Local Government	
	Community Based terrestrial ecosystem management	
	methods	
	Case studies related	

- 1. Groom. B. & Jenkins. M. 2000. Global Biodiversity: Earth's Living Resources in the 21st Century. World Conservation Press, Cambridge, UK, Gurevitch, J., Scheiner, S. M., & Fox, G. A. 2002.
- 2. The Ecology of Plants. Sinauer Associates Incorporated. Loreau, M. & Inchausti, P. 2002.
- 3. Biodiversity and Ecosystem Functioning: Synthesis and Perspectives. Oxford University Press, Oxford, UK, Odum, E. P. 1971.
- 4. Fundamentals of Ecology. W. B. Sounders, Pandit, M. K., White, S. M. & Pocock, M. J. O., 2014. The Contrasting Effects of Genome Size, Chromosome Number and Ploidy Level on Plant Invasiveness: A Global Analysis.
- 5. New Phytologist 203: 697-703. Pimentel, D. (Ed.). 2011.
- 6. Biological Invasions: Economic and Environmental Costs of Alien Plant, Animal and Microbe Species. CRC Press. Singh, J. S., Singh, S. P. & Gupta, S. R. 2006.
- 7. Ecology, Environment and Resource Conservation. Anamaya Publications.
- 8. Wilson, E. O. 1985. The Biological Diversity Crisis. Bioscience 35: 700-706.



Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course /Paper Title	Wildlife Biology and its Management
Course Code	21SBEV352
Semester	V
No. of Credits	2 (36 Lectures of 50 minutes)

Aim & Objectives of the Course

Sr. No.	Objectives
1	To understand about Wildlife and its importance
2	To understand the various threats associated with Wildlife
3	To understand various Wildlife conservation techniques and Management

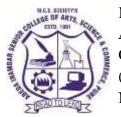
Sr. No.	Learning outcomes
1	Students will learn effective Wildlife Management Techniques
2	Students will understand the importance of Wildlife of India and its conservation
3	Students will understand laws, various Government bodies working for Wildlife Protection
4	Encouragement of students for research, create career in Wildlife and its Management

Unit	Title with Contents	No. of
No.		Lectures
1	Introduction to Wildlife	
	Definition of Wildlife	04
	Causes of wildlife loss	
	Economic importance of wildlife	
	Need for wildlife conservation; rare, endangered,	
	threatened and endemic species of fishes, amphibians,	
	reptiles, birds and mammals in India.	
	India as a mega bio diversity country	
2	Threats to wildlife	
	Habitat Destruction	04
	Developmental projectsUrbanization, Agriculture	
	expansion, Poaching, industrial expansion, Human	
	Wildlife conflict, Deforestation	
	Exploitation of animals and plants	
3	Wildlife Census Technique	
	Planning census – Total counts - Sample counts – Basic	06
	concepts and applications	
	• Direct count (block count, transect methods, Point	
	counts, visual encounter survey, waterhole survey)	
	Indirect count (Call count, track and signs, pellet count,	
	pugmark, camera trap)	
	Identifying animals based on indirect signs; Capture-	
	recapture techniques	
4	Human Wildlife Conflicts	
	Basic concepts, reasons for conflicts	04
	Identification of damages caused by wildanimals and	
	control measures	
	• Case studies – Elephant, Gaur, Wild boar, Monkey, Tiger	
	and Leopard	
	• Translocation of Wild animals – Principles, Methods and	

	applications	
5	Conservation of Wildlife	
	• In-situ and Ex-situ conservation: Wildlife Sanctuaries,	08
	National Parks, Tiger Reserves and Biosphere reserves:	
	Definition, formation, management and administration	
	Wildlife Projects: Tiger, Elephant, Lion, Vulture and	
	Hangul; Zoos and Zoological Parks, Definition- Aims	
	behind establishment of Zoos, Ex situ conservation	
	methods	
	Central Zoo Authority of India; Captive breeding: Aims,	
	Principles, methods	
	Role of Government and Non-Governmental	
	organizations in conservation, Case studies related to wild	
	life projects	
6	Modern Concepts of Wildlife Management	
	Wildlife Crimes: Wildlife forensics and its applications in	10
	detecting wildlife crimes;	
	Wildlife Toxicology: Types of contaminants, methods of	
	toxicity evaluation, bio concentration- bioaccumulation	
	and biomagnifications; impacts of pesticides and heavy	
	metals on birds and mammals;	
	Environmental Impact Assessment (EIA) methods and	
	their role in wildlife conservation,	
	Administrative set up - Advisory bodies- Rules of	
	Biodiversity board –Wildlife (Protection) Act, 1972 and	
	its Amendments; Wildlife trade and regulations;	
	Biodiversity Act 2000; Eco-Development, Eco-	
	Restoration and Ecotourism programmes; Anti-poaching	
	operations –Village Forest Council (VFC).	

- 1. Principles of Environmental science Cunningham and Cunningham
- 2. Ecology, Environment and Resource Conservation (2006): Singh JS, Singh SP and Gupta SR; Anamaya Publ, New Delhi.

- 3. Fundamental of Ecology (1971): EP Odum; WB Saunders Company.
- 4. Plant Diversity Hotspots in India (1997): PK Hajra and V. Mudgal; Botanical Survey of India
- 5.Environmental Management (2005): Bala Krishnamoorthy; Prentice-Hall of India Pvt. Ltd., New Delhi



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Course/ Paper Title	Water and Soil Quality
Course Code	21SBEV353
Semester	V
No. of Credits	2 (36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To understand the concepts like water stress and water inventory
2.	To know the current status of water pollution in context to Indian rivers And the impact on health of water bodies.
3.	To discuss the role of healthy soil and the soil reactions in agroecosystem.
4.	To apply the new technologies in management of soil and water resources
5.	To learn about various remediation process and conservation methods of soil

Sr. No.	Learning outcomes
1.	Students will understand the current status of country' water and soil resources.
2.	Students will learn application of new technologies for resource management.
3.	Students will know the various remediation process and conservation methods of soil

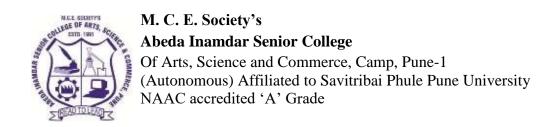
4. Students will understand various Nutrient management concepts and Nutrient use efficiencies of major and micronutrients and enhancement techniques.

Unit	Title with Contents	No. of
No.		Lectures
1	Introduction	04
	Water resources sources, uses, distribution of water resources	
	on Earth, Water cycle	
	Characteristics of Water –Physical, Chemical and Biological	
	Sewage and its characteristics and effects on environment	
	Water Stress Index and Water Inventory	
2	Water Pollution	08
	Definition, Types , Point and Non- point sources	
	Types of Water Pollution- Lake water pollution, River water	
	pollution, Groundwater pollution, Sea water pollution with	
	Case studies, Ballast water	
	Eutrophication process with Case study	
	Water Pollution with respect to Indian Rivers	
	Water Borne diseases- causes, modes of transmission, effects	
	and examples	
3	Prevention and Control of Water Pollution and its Management	10
	Water Quality Standards for drinking water given by different	
	agencies	
	Water treatment Process- Primary, Secondary, Tertiary	
	and Advanced treatment	
	Water (Prevention and Control of Pollution) Act, 1972	
	Ganga Action Plan & National River Action Programme	
	Role of National and International agencies in Water	
	health and Sanitation	
	Application of GIS and Remote sensing for	
	management of WaterResources	

	Soil and Reactions in Soil	06
4	 Introduction to soil and its importance in ecosystem and 	
	Agriculture	
	Composition of soil	
	Soil types and their formation	
	Soil Horizons, Texture, Soil structure, Soil fertility	
	Factors influencing soil –Soil aeration, Soil temperature	
	Soil Reactions –Acid base reactions, Ion exchange, Micro and	
	Macro nutrients, Nitrogen pathways, NPK in soil	
5	Soil Pollution and Management	08
	 Concept, causes and effects of Soil sickness 	
	Soil toxicology—reasons and effects	
	Remediation processes for contaminated sites	
	Application of GIS and Remote sensing in soil	
	resource management	
	Soil conservation principles and techniques	

- RS Ramalho ,1983 Introduction to Waste water Treatment Process, Academic press, New York
- 2. Principles of Waste Water Treatment Vol I, Biological process, National Science Development Board ,Manila, Phillipines
- 3. Water pollution by Dr. Anuradha Salpekar
- 4. Environmental pollution Analysis by S.M. Khopkar
- 5. Textbook of Practical Chemistry by Vogel, A.I Tatchell and Furnis
- 6. Dean, J. R., Jones, A. M., Holmes, D., Reed, R., Weyers, J., &Jones, A., (2011), Practical skills in Chemistry, 2nd Ed., Prentice Hall, Harlow
- 7. Hydrology Principles, analysis and Design H. M Ragunath, New age International Publications.(1996)
- 8. Standard Methods for the examination of water and waste water APHA (American Public Health Association), AWWA (American Water Works Association), WEF (Water Environmental Federation)
- 9. Low cost waste water treatment technologies R. K. Trivedy and SiddharthKaul
- 10. Pollution and Bioremediation- P. C. Trivedi

- 11. An Introduction to Environmental pollution- B. K. Sharma and H. Kaur
- 12. Environmental Chemistry A. K. De
- 13. Soils and soil fertility, Troch, F.R. And Thompson, L.M. Oxford Press.
- 14. Principles of Soil Chemistry (2Wed.) Marcel Dekker Inc., New York. 5. Handbook of Agricultural Sciences



Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Atmospheric Sciences and Global Climate Change
Course Code	21SBEV354
Semester	V
No. of Credits	2 (36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To know about importance of atmospheric sciences and the current
	knowledge related to it
2.	To discuss about various issues related to climate change and
	significance of its studies
3.	To study the services, benefits of Atmosphere
4.	To understand the concept of Global Warming, Ozone Depletion and
	Climate Change

Sr. No.	Learning outcomes
1.	Students will learn the role of climate in maintaining the balance of atmosphere
2.	Students will recognize the direct and indirect impact of Global Climate Change
3.	Students will learn to apply the sustainable approach from case studies to maintain atmospheric balance
4.	Students will get exposure of various methods handle global climate change issue

Unit	Title with Contents	No. of
No.		Lectures
1	Evolution and development of Earth's atmosphere	07
	Atmospheric structure and composition	
	Significance of atmosphere in making the Earth	
	Earth's energy balance and energy transfers in atmosphere	
	Earth's radiation budget	
	Greenhouse gases (GHGs) and greenhouse effect	
	Global conveyor belt.	
2	Atmospheric circulation and Movement of air masses	07
	Atmosphere and climate; air and sea interaction	
	southern oscillation; western disturbances; El Nino and La	
	Nina	
	Tropical cyclone; Indian monsoon and its development	
	Changing monsoon in Holocene in the Indian subcontinent,	
	its impact on agriculture and Indus valley civilization;	
	Effect of urbanization on micro climate	
	Asian brown clouds	
3	Meteorology and atmospheric stability	07
	Meteorological parameters (temperature, relative	
	humidity, wind speed and direction, precipitation)	
	Atmospheric stability and mixing heights	
	Temperature inversion	
	Plume behavior	
	Gaussian plume model	
	Global warming and climate change	07
4	Evolution of Earth's climate through geological time scale	
	Trends of global warming and climate change	
	Drivers of global warming and the potential of different	
	greenhouse gases (GHGs) causing the climate change;	
	atmospheric windows	
	Impact of climate change on environment	

	 Weather patterns, sea level rise, agricultural productivity and biological responses - range shift of species, CO₂ fertilization and agriculture Impact on economy and spread of human diseases. 	
5	 Climate change Policies and Treaties Environmental policy debate International agreements Montreal protocol 1987 Kyoto protocol1997 Convention on Climate Change Introduction to Carbon credit and carbon trading Paris Agreement etc. 	08

- 1. Barry, R. G. 2003. Atmosphere, Weather and Climate. Routledge Press, UK.
- 2. Gillespie, A. 2006. Climate Change, Ozone Depletion and Air Pollution: Legal Commentaries with Policy and Science Considerations. Martinus Nijhoff Publishers.
- 3. Hardy, J.T. 2003. Climate Change: Causes, Effects and Solutions. John Wiley & Sons.
- 4. Harvey, D. 2000. Climate and Global Climate Change. Prentice Hall.
- 5. Manahan, S.E. 2010. Environmental Chemistry. CRC Press, Taylor and Francis Group.
- 6. Maslin, M. 2014. Climate Change: A Very Short Introduction. Oxford Publications.
- 7. Mathez, E.A. 2009. Climate Change: The Science of Global Warming and our Energy Future. Columbia University Press.
- 8. Mitra, A.P., Sharma, S., Bhattacharya, S., Garg, A., Devotta, S. &Sen, K. 2004. Climate Change and India. Universities Press, India.
 - 9. Philander, S.G. 2012. Encyclopedia of Global Warming and Climate Change (2nd edition). Sage Publications.



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Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course /Paper Title	Environmental Legislation and policies
Course Code	21SBEV355
Semester	V
No. of Credits	2 (36 Lectures of 50 minutes)

Aim & Objectives of the Course

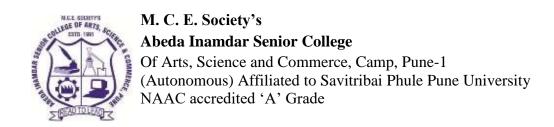
Sr. No.	Objectives
1	To understand various laws related to Environment
2	To understand duties of citizen towards Environmental protection and Management through laws
3	To understand the concept of Environmental Ethics
4	To understand various International laws, polices, conferences for Environmental protection

Sr. No	Learning outcomes
1	To understand the applications of the laws related to Environment in our daily
	lives
2	To understand various International and National laws related to
	Environmental protection
3	To understand the role of Judiciary in Environmental protection
4	To understand the rights and duties of Citizen towards Environmental
	protection and Conservation

Unit	Title with Contents	No. of
No.		Lectures
1	Introduction to Law and Policy:	
	Concept of law and policy	02
	Importance and elements of Environmental	
	Governance	
2	Introduction to Environmental Legislation:	
	Legal definitions: Environmental pollution, natural	
	resource, Biodiversity, forest, Sustainable	
	Development. Article 48A and 51A (g)	08
	Importance and needs of Environmental legislation	
	The protection and improvement of environment and	
	safeguarding of forests and wildlife.	
	Fundamental rights and duties as per the Constitution	
	of India	
	Environmental Ethics: Introduction, Concept,	
	Development of Environmental ethics	
3	Government Institutions	
	Role of Ministry of Environment, Forests & Climate	
	Change, Role of Central Pollution Control Board	06
	(CPCB), Role of State Pollution Control Boards	
	Role of National Green Tribunal (NGT)	
4	International Laws and Policy	
	Stockholm Conference 1972	
	United Nations Conference on Environment and	
	Development 1992	
	Rio de Janeiro (Rio Declaration, Agenda 21)	
	Kyoto Protocol 1997	12
	Copenhagen (CoP's, their major outcomes and recent	
	updates and World summits, Brutland report	
5	Environmental Acts	
	a) Anti-pollution Acts	
	The Air (Prevention and Control of Pollution) Act 1981,	

Motor Vehicle Act 1988, Noise Pollution (Regulation and	08
Control) Rules 2000, Plastic law and its Amendments,	
Hazardous Waste Management Rules, 2016.	
b) Environment Conservation Acts	
The Forests (Conservation) Act 1980	
The Public Liability Insurance Act 1991	
• The Biological Diversity Act 2002,	

- 1. Abraham, C.M. 1999. Environmental Jurisprudence in India. Kluwer Law International.
- Agarwal, V.K. 2005. Environmental Laws in India: Challenges for Enforcement. Bulletin of theNational Institute of Ecology 15: 227-238
- 3. Divan, S. &Rosencranz, A. 2001. Environmental Law and Policy in India. Oxford UniversityPress.
- 4. Divan, S. &Rosencranz, A. 2002. Environmental Law and Policy in India: Cases, Materials and Statues (2nd edition). Oxford University Press
- 5. Gupta, K.R. 2006. Environmental Legislation in India. Atlantic Publishers and Distributors.
- 6. Leelakrishnan, P. 2008. Environmental Law in India (3rd edition). LexisNexis India.
- 7. Naseem, M. 2011. Environmental Law in India Mohammad. Kluwer Law International.
- 8. P. Leelakrishnan. 2016. Environmental Law in India. 4th edition. Publisher: Lexis Nexi
- 9. T S Doabia. 2017. Environmental and Pollution Laws In India. (3rdEdition). Publisher: Lexis
- 10. Venkat, A. 2011. Environmental Law and Policy. PHI Learning Private Ltd.



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

Course/ Paper Title	Environmental Biotechnology-I
Course Code	21SBEV356
Semester	V
No. of Credits	2 (36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1	To know about importance of Environmental Biotechnology and the
	current knowledge related to it
2	To discuss about various issues related to Environmental
	Biotechnology, GMOs and significance of its studies
3	To study the services, applications, benefits of Environmental
	Biotechnology
4	To understand the concept of Environmental Biotechnology,
	Composting and role of microorganisms

Sr. No.	Learning outcomes
1	Students will learn the role of Environmental Biotechnology to control pollution
2	Students will recognize the direct and indirect impact of Genetically Modified Organisms
3	Students will learn to apply the sustainable approach from case studies to maintain Environment with the help of Biotechnological methods
4	Students will get exposure of various methods handle current Environmental Issues

Unit	Title with Contents	No. of
No.		Lectures
1	Introduction	06
	History and Necessity of EnvironmentalBiotechnology	
	Objectives, Importance and Applications	
2	Composting Techniques	06
	Classification and Methods of Composting	
	Manufacturing, Equipment, Development	
	Types—Bangalore and Indore methods	
	Preparation of Compost	
	Commercial application	
3	Genetically ModifiedOrganisms	08
	Introduction, Examples	
	Principles and Advantages	
	Risk to Environment	
	Cartagena Protocol on Biosafety	
4	Agricultural biotechnology and Biofertilisers	08
	• Introduction	
	Detection and diagnosis	
	Micro-propagation of plants	
	Biofertilisers-Types, Role, preparation method and	
	Commercial aspects	
	Agricultural Waste and its Uses	
5	Microbes	08
	Nutrient media,	
	Preparation of nutrients	
	Collection and Enumeration of microbes	
	Nutritional requirements and applications	
	Concept of soil micro flora and its examples	
	Ecological Relation of microbes	
	Growth conditions	

Nutritional types	
• Types of microbes	
Xenobiotic components	

- 1. Introduction to Environmental Biotechnology; by AK Chatterji (2002); Prantice-Hall of India.
- 2 Erickson, LE and DY Fung. 1988. Handbook on Anaerobic fermentations. Marcel and Dekker Inc. New York.
- 3. Holland, KT, JS Knapp and JG Shoesmith. 1990. Anaerobic bacteria. Blackie Publications. New York.
- 4. Ramasamy, K., G. Kalaichelvan and B. Nagamani. 1992. Working with anaerobes: Methanogens. FermentationLaboratory, TNAU, Coimbatore.
- 5. Gerhardt, P., RGE Murray, WA Wood and NR Krieg. 1994. Methods for General and Molecular Bacteriology. ASMPublications, Washington.
- 6. Jogdand, SN 1995. Environmental Biotechnology. Himalaya Publishing House, Mumbai.
- 7. Erickson, LE and DY Fung. 1988. Handbook on Anaerobic fermentations. Marcel and Dekker Inc. New York.
- 8. Ramasamy, K, G Kalaichelvan and B Nagamani. 1992. Working with anaerobes: Methanogens. FermentationLaboratory, TNAU, Coimbatore.
- 9. Crawford, RL and DLCrawford. 1996. Bioremediation Principles and Applications. Cambridge University Press, London



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2023-24 (CBCS – Autonomy 21 Pattern)

Course /Paper Title	Environmental Health & Safety
Course Code	21SBEV3511
Semester	V
No. of Credits	2 (36 Lectures of 50 minutes)

Aim & Objectives of the Course

Sr. No.	Objectives
1	To understand various Safety measures in Environment.
2	To train and motivate students in maintaining and improving the quality of the environment.
3	Educate students how to reduce work place hazardous and to encourage the standard of safety health and environment problem.
4	To understand various laws of EIA,LCA & ISO standards

Sr. No.	Learning outcomes
1	To understand importance of health & safety while working in industry.
2	To understand various laws related to employee in Industry.
3	To ensure 0% accidents and 100% safety in different industries in which
	Safety management plays an important role.

Unit No.	Title with Contents	Number of
		lectures
1	Introduction to Environmental Health and Safety.	07
	Key elements of safety and health management system.	
	Scope and Importance.	
	Training of Employee	
	Safety & Health Management system records.	
	Workplace precautions and Control measures	
2	Environmental issues and SOP's	08
	Need for public awareness with respect to environment	
	Major environmental issues.	
	Climate actions and changes scenario	
	Urbanization and Development.	
	Renewable and Non-renewable natural resources.	
	Sustainable development.	
	Introduction to ISO, EIA & LCA.	
	SOP at work place	
3	Industrial Safety.	07
•	Importance of Safety.	
	Classification of Accidents—Transpiration system, accidents and	
	control measures, Radiation hazards	
	Management's responsibility.	
	Employee state insurance act 1948	
	Industrial noise and noise control.	
	Safety with respect to plant and Machinery,	
	Personal protective equipment.	
	Pollution released from industry.	
	ISO related to Industrial safety.	

4	Laboratory Safety.	07
	Safety instructions.	
	Use of safety kits & Protective kits.	
	• Training of staff.	
	Hazardous chemicals and their management.	
	Naming & classification of concentrated & diluted solutions.	
	Instructions regarding usage of Instruments.	
5	Role of Management & EHS officer.	07
	Conducting risk analysis.	
	• Ensuring proper solution to avoid the risk and hazard.	
	• Inspection of machines, tools and equipment's.	
	• Environment Audit reports—Green audit, Energy audit, Carbon	
	audit, Water audit.	
	• Enforcement of rules & regulations.	
	Monitoring of employee.	
	Introduction and enforcement of safety gears.	
	Providing technical advice and training.	

- 1. Risk assessment- A Practical Guide, 1993, Institution of Occupational Safety and Health, United Kingdom.
- 2. Rao CS (2006)- Environmental Pollution Control—New Age International Pvt. Ltd Publishers.
- 3. Manjunath D.L. (2007) Environmental Studies Pearson Education Publishers.
- 4. Benny Joseph (2005) Environmental Studies Tata Mc Graw Hill Publishers.
- 5. Yaji R.K (2006) Text Book of Environmental Studies United Publishers.



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Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course /Paper Title	Soil Health Management
Course Code	21SBEV3512
Semester	V
No. of Credits	2 (36 Lectures of 50 minutes)

Aim & Objectives of the Course

Sr. No.	Objectives
1	To understand the concept of soil fertility and integrated plant nutrient
	management
2	To educate about the various soil conservation methods
3	To aware about ill effects of fertiliser use and Soil Health card.

Sr. No.	Learning outcomes
1	Students will understand importance of Soil health quality
2	Students will learn various pest management methods
3	Students will get knowledge about bio pesticides and energy crops

Unit No.	Title with Contents	Number of
		lectures
1	Introduction	06
	Composition of soil,	
	Soil Fertility – Concept and Evaluation	
	Nutrition & Essential Plant Nutrient Elements and their deficiency.	
	Concept of Plant Diseases & Pest, Classification of Plant Diseases &	
	DiseaseTriangle	
	Concept of Integrated Plant Nutrient Management(IPNM)	
2	Conservation measures	10
•	Biological measures – contour cultivation – strip	
	cropping – cropping systems –vegetative barriers -	
	windbreaks and shelterbelts - shifting cultivation	
	Mechanical measures – contour bund – graded bund – broad	
	beds and furrows – basin listing – random tie ridging,	
	contour trench – bench terrace – contour stone wall – Rain water	
	harvesting – insitu soil moisture conservation – runoff water	
	harvesting	
	• Farm ponds and percolation ponds - storage and its use for	
	domestic and groundwater recharge, Irrigation Scheduling and	
	Agriculture Drainage System.	
3	Methods of Pest Management	10
	Biological, Cultural, Legislative, Physical & Chemical,	
	(Chlorinated Hydrocarbons, Organophosphates & Carbonates),	
	Pesticide use & Environment, Organic Crop Production,	
	Agroforestry, IntegratedPest Management (IPM) & Biopesticides.	
	• Concept of Ecological Pest & Disease Management-Energy Crops,	
4	Fertilizers and Environment	10
	Types of Fertilizers, Classification of Fertilizers Effects due to	
	use of excess fertilizer & theirmanagement.	
	Calculation of Recommended dose of fertilizer	
	Schemes for water conservation	

- Scheme for fertilizer, seed, and other material purchase
- Soil Health card

- Brady, N., and R. Weil. The Nature and Properties of Soils. 14th ed. Upper Saddle River, NJ: Prentice Hall, 2008. 2.Clark, A., ed. Managing Cover Crops Profitably. 3rd ed. Handbook Series No. 9. Beltsville, MD: Sustainable Agriculture Network, 2007.
- 2. Coleman, D. C., D. A. Crossley Jr., and P. F. Hendrix. Fundamentals of Soil Ecology. 2nd ed. Burlington, MA: Elsevier Academic Press, 2004.
- Gugino, B. K., O. J. Idowu, R. R. Schindelbeck, H. M. van Es, B. N. Moebius-Clune,
 D. W. Wolfe, J. E. Thies, and G. S. Abawi. Cornell Soil Health Assessment Training
 Manual. Edition 2.0. Ithaca: Cornell University, 2009.
- 4. Hall, M., and G. Roth, eds. The Penn State Agronomy Guide .
- 5. Hooper, D., et al. "Interactions between aboveground and belowground biodiversity in terrestrial ecosystems: Patterns, mechanisms, and feedbacks." BioScience 50 (20): 1049–61.
- 6. Magdoff, F., and H. van Es. Building Soils for Better Crops: Sustainable Soil Management. 3rd ed. Handbook Series No.
- 7. Beltsville, MD: Sustainable Agriculture Network, 2009.
- 8. Tisdall, J. M., and J. M. Oades. "Organic matter and water-stable aggregates in soils." Journal of Soil Science 33 (1982): 141–63.
- 9. Tugel, A., A. Lewandowski, D. HappevonArb, eds. Soil Biology Primer. Rev. ed. Ankeny, Iowa: Soil and Water Conservation Society, 2000.
- 10. Zehnder, G. Farmscaping: Making Use of Nature's Pest Management Services



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Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Practical-I
Course Code	21SBEV357
Semester	V
No. of Credits	2

Aim and objectives of the course:

Sr. No.	Objectives
1	To understand the Urban environment and the interspecies
	relationships.
2	To know the importance of Shannon- Simpsons diversity index in
	understanding the phytosociology
3	To learn the Interpretation techniques for aerial photographs and
	satellite imageries
4	To study the wild life population assessment techniques.

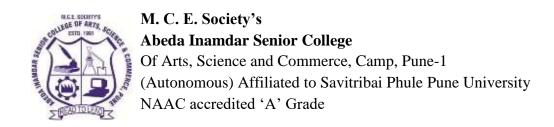
Sr. No.	Learning outcomes
1	Students will learn how to interpret the satellite images and aerial photographs and will understand the status of land use patterns
2	Students will come to know the impacts of pollution on the productivity and chlorophyll content
3	Students will recognize the importance of responsible tourism and related aspects.

Syllabus
Practicals based on ENV- 351 and 352

Sr. No.	Title	No. of practical
1	Study of Flora of Urban terrestrial ecosystem	01 (Field based)
2	Study of Fauna of Urban terrestrial ecosystem	01 (Field based)
3	Estimation of Productivity of Grassland by harvest method	01 (Field & Lab)
4	Study of various types of Interspecies relationships in ecosystem	01
5	Estimation of Chlorophyll content form the leaves of plants growing in clean and polluted environment	01
6	Study of threat assessment model for an ecosystem	01
7	To find out the diversity within an ecosystem using Shannon and Simpson's diversity indices	01
8	Study of any one population assessment technique for Animal/plant/bird	01
9	Identification of different groups of wild species (Flora and Fauna)	01
10	Study of different Ecotourism activities	01
11	Vegetation mapping by using aerial photographs	01
12	Interpretation techniques for aerial photographs and satellite imageries	01
13	Vegetation mapping by using satellite imageries	01

Note: Visits along with submission of visit report is compulsory.

- 1) Manual for Field Ecology; Mishra R.
- 2) Handbook of Methods in Environmental Studies Vol-I ⅈ Mailti S.K.; ABD Publishers; Jaipur



Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Practical - II
Course Code	21SBEV358
Semester	V
No. of Credits	2

Aim and objectives of the course:

Sr. No.	Objectives
1	To understand the sampling techniques for water and soil
2	To know the impacts of sewage water on environmental components and the physical, chemical and biological methods for treatment.
3	To learn the analysis methods for soil and waste water samples.

Sr.	Learning outcomes
No.	
1	Students will understand the sewage water / Effluent treatment processes.
2	Students will assess the extent of pollution of aquatic resources.
3	Students will recognize the various parameters by using standard sophisticated instrumentation techniques and well known methods

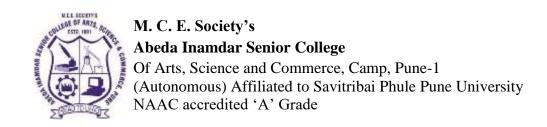
Syllabus
Practicals based on ENV- 353 and 354

Sr. No	Name of Practical	No. of Practical
1	Collection and Sampling of Waste water from different	01
	polluted sites	
2	Collection and Sampling of Soil samples from	01
	different polluted sites	
3	Analysis of pH, Temperature and Electrical Conductivity	01
	of different waste water	
4	Estimation of Dissolved Oxygen of waste water sample	01
	Estimation of free Carbon di-oxide of waste water sample	
5	Determination of Soil Organic Carbon and Organic matter	01
6	Determination of Water acidity	01
7	Visit to Sewage Treatment Plant / Effluent Treatment	01
	Plant	
8	Determination of Nitrates from Water sample	01
9	Determination of Phosphates from Water sample	01
10	Testing the potability of drinking water using MPN test	01
11	Determination of Soil Bulk density	01
12	Determination of MLSS and Sludge Volume Index	01
13	Estimation of Na and K using Flame Photometer	01
14	Demonstration of Water Purifiers (Working Principle) of	01
	pollutes water	

Note: Visits along with submission of visit report is compulsory.

- 1. Handbook of Methods in Environmental Studies: Vol.1 By Maiti, Subodh. (2003).
- 2. Handbook of Methods in Environmental Studies: Vol 2 (Air, noise, soil and overburden analysis). By Maiti, Subodh. (2003).
- 3. Waste Water Engineering, Metcalf and Eddy, INC, Tata McGraw Hills
- 4. Indian Standard for Drinking Water, BSI, New Delhi. Environmental Pollution Control, C. S. Rao, Wiley Eastern Ltd.,1993

- 5. Air Pollution Control and Engineering, De Nevers, McGraw Hills, 1993, 10.
- 6. Fundamentals of Air Pollution, Samuel, J. W., 1971, Addison Wesley Publishing
- 7. Fundamentals of Environmental Pollution, Krishnan Khannan, S. Chand and Company Ltd., 1994.
- 8. Noise Pollution, Vandana Pandey, Meerut Publishers, 1995. Environmental Pollution Control, C.
- S. Rao, Wiley Eastern Ltd., 1993.
- 9. Air Pollution Control and Engineering, De Nevers, McGraw Hills, 1993.
- 10. Fundamentals of Environmental Pollution, Krishnan Khannan, S. Chand and Company Ltd., 1994.
- 11. Environmental Chemistry, A. K. De., New Age Intl. Pub Co, New Delhi, 1990
- 12. Environmental Pollution Analysis S. M. Khopka



Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Practical- III
Course Code	21SBEV359
Semester	V
No. of Credits	2

Aims & Objectives of the Course

Sr. No.	Objectives	
1	To create biologically and technologically skilled minds for the	
	understanding theoretical and practical knowledge essential for	
	implementation from LAB to LAND	
2	to inculcate scientific temper and social attitude to solve various	
	problems in the field of Environment	
3	To Apply problem-solving and teamwork skills	
4	To Retrieve and critically evaluate original scientific literature and Use	
	critical analysis, synthesis and writing skills to produce a scientific report	
	at a professional level	

Sr. No.	Learning outcomes	
1	Students understand the important parameters to study microorganisms and various methods to Isolate them from different samples	
2	Students will work with others to coordinate activities and practical to achieve group/team objectives	
3	Students will be able to outline how to study microorganisms in the	

samples and how pollution can be treated using Biotechnological methods

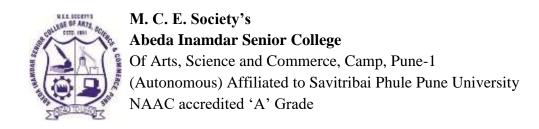
Syllabus

Practicals based on ENV- 355 and 356

Unit No	Course Content	Number of
		Lectures
1	Determining the factors influencing the composting process,	01
	nutrients, moisture, temperature and air, microbial populations	
2	Study of microorganisms by Standard Plate Count (SPC) method	01
3	Microbial analysis of flocs in activated sludge system	01
4	Biological de-colorization using microbial columns	01
5	Isolation of bacteria from soil and decaying matter	01
6	Survey of plants in and around air polluted sites	01
7	Determination of hydrogen sulfide (H ₂ S) from sewagesample	01
8	Analysis of residual pesticides in agricultural land and crops	01
9	Study of Eutrophication parameters & its effects on waterbodies	01
10	Study of instrumentation and safety standards in microbial laboratory	01
11	Isolation and characterization of soil micro-organism from polluted sites	01
12	Isolation of Phosphate solubilizing microbes form Sewage	01
13	Study visit to Biotechnology laboratory	01

Note: Visits along with submission of visit report is compulsory.

- 1. Microbiology by Michael J.Pelzer et.al. (5th ed), Tata McGraw Hill, New Delhi (1993).
- 2. Microbiology for Environmental Scientists and Engineers by Gaudy, AF and Gaudy, ET MGH, New York (1980).
- 3. Standard Methods for the Examination of Water and Wastewater (21st ed.)-AWWA



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

Course/ Paper Title	Aquatic Ecosystem Management
Course Code	21SBEV361
Semester	VI
No. of Credits	2 (36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1	To outline the key aspects of aquatic environments and the importance
	of Ramsar convention sites in context to climate change impacts
2	To address and evaluate ecological issues related to processes and
	structures of fresh environments.
3	To know about the food production potential and ecological
	significance of coastal vegetation
4	To enlighten the students about the methods of aquatic ecosystem
	management
5	To evaluate the significance of eco-tourism along with conservation
	techniques.

Sr. No.	Learning outcomes	
1	Students will understand the various values of wetlands and the significance of convention.	
2	Students will learn to use integrated techniques for controlling and	

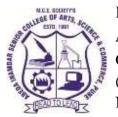
	monitoring aquatic ecosystems.
3	Students will be able to formulate goals and objectives in aquatic ecosystems management and choose appropriate approaches to achieve them.
4	To give students an understanding of human impact on aquatic ecosystems, of how ecosystem management balances protection, societal benefits, economics and sustainable use, and how current legislation governs ecosystem management.

Unit	Title with Contents	No. of
No.		Lectures
1	Limnology	06
	Introduction, The Aquatic environment,	
	Aquatic Biota, Parameters	
	Energy flow in aquatic ecosystem	
	Major environmental factors and ecosystem processes	
	Ramsar sites in India	
	Structure and Stratification of Aquatic ecosystems	
	Impacts of Climate change on aquatic ecosystems	
2	Freshwater ecology	08
	The freshwater environment: types Limiting feeters	
	Limiting factors	
	Ecological classification of freshwater organisms,	
	The freshwater biota (flora and fauna), lentic (lakes)	
	and ponds) andlotic (rivers, streams, springs, etc.),	
	communities, planktons	
	Biodiversity, negative and positive feedbacks and	
	resilience	

 The marine environment The marine biota(flora and fauna), Zonation in the sea, study of planktons, Communities in the marine environment. Food Production potential Mangrove Vegetation Coral reefs and Ecological significance Importance of Estuaries- Gene Pool, Ecotone Ecosystem, Edge effect Aquatic ecosystem management and Monitoring Application of Remote sensing and Geographical information system in aquatic ecosystem management Need for conservation of aquatic resources 	
 Zonation in the sea, study of planktons, Communities in the marine environment. Food Production potential Mangrove Vegetation Coral reefs and Ecological significance Importance of Estuaries- Gene Pool, Ecotone Ecosystem, Edge effect Aquatic ecosystem management and Monitoring Application of Remote sensing and Geographical information system in aquatic ecosystem management Need for conservation of aquatic resources 	
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 Application of Remote sensing and Geographical information system in aquatic ecosystem management Need for conservation of aquatic resources 	
 information system in aquatic ecosystem management Need for conservation of aquatic resources 	08
Need for conservation of aquatic resources	
_	
Eco-development program	
Traditional methods	
Methods of aquatic sampling and data analysis: sampling	
approaches	
Species association	
Case studies	
5 Exploitation and Need for wetland conservation	06
Exploitation and consequences of wetland degradation and	
Sustainable management of wetlands	
Role of Local Government and people inconservation	
Impact of Tourism, Significance of Eco-tourism	
Conservation and Sustainable use of India's aquatic	1
resources	

1. Groom. B. & Jenkins. M. 2000. Global Biodiversity: Earth's Living Resources in the 21st Century. World Conservation Press, Cambridge, UK, Gurevitch, J., Scheiner, S. M., & Fox, G. A. 2002.

- 2. The Ecology of Plants. Sinauer Associates Incorporated. Loreau, M. & Inchausti, P. 2002.
- 3. Biodiversity and Ecosystem Functioning: Synthesis and Perspectives. Oxford University Press, Oxford, UK, Odum, E. P. 1971.
- 4. Fundamentals of Ecology. W. B. Sounders, Pandit, M. K., White, S. M. & Pocock, M. J. O., 2014. The Contrasting Effects of Genome Size, Chromosome Number and Ploidy Level on Plant Invasiveness: A Global Analysis.
- 5. New Phytologist 203: 697-703. Pimentel, D. (Ed.). 2011.
- 6. Biological Invasions: Economic and Environmental Costs of Alien Plant, Animal and Microbe Species. CRC Press. Singh, J. S., Singh, S. P. & Gupta, S. R. 2006.
- 7. Ecology, Environment And Resource Conservation. Anamaya Publications. 8. Wilson, E. O. 1985. The Biological Diversity Crisis. Bioscience 35: 700-706



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Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Nature Conservation
Course Code	21SBEV362
Semester	VI
No. of Credits	2 (36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives	
1	To know about importance of Natural Resources, Conservation in	
	maintaining the Balance of Environment	
2	To discuss about various issues related to Conservation of Resources	
	and significance of its studies	
3	To study the services, benefits of Natural Resources and its	
	conservation	
4	To understand the concept of Natural Resources and their management	

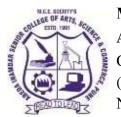
Sr. No.	Learning outcomes		
1	Students will have a greater knowledge of how natural resources relate to		
	the economy and environment, both currently and in the future.		
2	Students will be able to critically evaluate current events and public		
	information related to natural resources as being scientifically-based or		
	opinion-based and contributes to the knowledge base of information.		

3	Students will learn to apply the sustainable approach from case studies		
	to maintain natural resources		
4	Students will get exposure of various methods handle Natural Resources		

Unit	Title with Contents	No. of
No.		Lectures
1	Introduction to Nature Conservation	04
	Introduction,	
	Concept of nature conservation	
	• Objectives	
	• Challenges	
2	In-situ Conservation	06
	Concept and principle of In-situ Conservation.	
	• Types : Biosphere reserve, National Parks, Wildlife	
	sanctuaries,	
	Biodiversity Hotspots, Gene Sanctuary,	
	Community reserves, Sacred groves	
	Challenges, merits and Demerits	
3	Ex-situ conservation	06
	Concept and principle	
	• Types : Cryopreservation, Seed banks,	
	Botanical Gardens, Zoos, Balcony Gardens, Home Gardens	
	Field genebanking, Cultivation Collections	
	Challenges, merits and Demerits	
	International and National Efforts forconservation	12
4	Role of IUCN, WWF for Nature conservation.	
	Introduction to Protocol and Conventions for Nature	
	conservation.	
	National Efforts: BNHS, Tiger, Crocodile, Reindeer, Whaling	
	mission.	
	Administrative Setup: MoEFCC, SPCB, CPCB, etc	
	Role of NGO	
	Species conservation efforts	

5	Awareness aboutconservation	08
	Need and Importance of awareness.	
	State Symbols (Animal and Plants)	
	Role of NGO in Awareness	
	Role of Education and Research in awareness	
	Community participation	

- 1. Principles of Environmental science Cunningham and Cunningham
- 2. Ecology, Environment and Resource Conservation (2006): Singh JS, Singh SP and Gupta SR; Anamaya Publ, New Delhi.
- 3. Fundamental of Ecology (1971): EP Odum; WB Saunders Company.
- 4. Plant Diversity Hotspots in India (1997): PK Hajra and V. Mudgal; Botanical Survey of India
- 5. Environmental Management (2005): Bala Krishnamoorthy; Prentice-Hall of India Pvt. Ltd., New Delhi.
- 6. .Agrawal K. C., 2009. Biodiversity: Concept. Conservation and Management, Concept Publishing Company Pvt. Ltd, New Delhi.
- 7. Anderson A., David .,2010. Environmental economics and Natural resource Management. The USA and Canada byRoutledge 270 Madison Avenue, New York.
- 8. Balvanera P., Daily G. C., Ehrlich P. R., Ricketts T. H., Bailey S. A., Kark S., Kremen C., Pereira H., 2001. Conserving Biodiversity and Ecosystem Services. Science, 291, 5511: 2047
- 9. Botkin D. B., Keller E. A., 2010. Envionmental Science.
- 10. Central Zoo Authority (CZA) report., 2011. Important zoo in India. www.cza.nic.in
- 11. Chaturvedi, Mahendra, .2010. Biodiversity and Conservation. D.P.S. Publishing House ,New Delhi, 8.Convention on International Trade in Endangered Species of Wild Fauna and For a (CITES) www.cites.org 9ENVIS. Environmental Information system. www.envis.nic.in
- 12. Gadgll M., Berkes F., Folke C., 1993. Indigenous knowledge for biodiversity conservation. Biodiversity: Ecology, Economics, Policy, 22 (2/3), 151-156
- 13. Ahluwalia V. K., Malhotra S. 2008. Environmental Science, doi, 13: 978-1-42007-069-9.



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Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Air and Noise Pollution Control Technology
Course Code	21SBEV563
Semester	VI
No. of Credits	2 (36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1	To understand the basics of Air pollution and Noise pollution
2	To understand the techniques, instruments, equipment's and analytical methods used to control Air and Noise pollution
3	To understand standards prescribed by the Government for controlling Air and Noise pollution
4	To understand the science behind various Environmental phenomena such as Global warming, climate change, ozone layer depletion etc

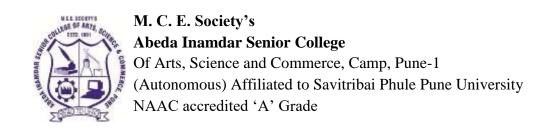
Sr. No.	Learning outcomes
1	To understand the application of Air pollution control equipment's in
	Industries and vehicles in order to reduce pollution
2	To understand and apply various Noise pollution control techniques in
	Industries in order to reduce noise pollution
3	To understand the basics and mechanism of Global warming, Climate
	change, Ozone layer depletion, Acid rain and its control measures

4	To understand the various instrumentation and analysis techniques used
	to control Air and Noise pollution in daily life

Unit	Title with Contents	No. of
No.		Lectures
1	Atmosphere and its nature	06
	Composition of Atmosphere	
	Chemical and photochemical reactions in the atmosphere	
	Plume behaviour, Transport of Pollution in Atmosphere	
	Global Warming, Ozone Hole, Acid rain	
	El Nino, La Nina Phenomenon	
2	Air pollution	06
	• Air pollution: Meaning and definition, Sources and Types of	
	air pollutants,major air pollutants	
	• Types of air pollution – indoor air pollution, vehicular	
	pollution, industrial pollution	
	Status of Air pollution in India	
	• Effects of air pollution on plants; animals; human; and	
	materials, Smog and Acid rains	
	• Control of air pollution. Emission Standards Air quality Index	
	(AQI)	
3	Analytical Methods for Monitoring Air Pollutants	04
	Analytical Methods for Monitoring Air Pollutants	
	Sampling, : Stack sampling, instrumentation and methods of	
	analysis of SO ₂ , CO etc,	
	Monitoring, and, Hydrogen Sulphide, Hydrocarbons,	
	Methane ,Particulate Matter, Monitoring of Ozone	
	Air Pollution control	08
4	Air Pollution control- at source-equipment for control of	
	air pollution-For particulate matter-Settling chambers-	
	Fabric filters-Scrubbers-Cyclones Electrostatic	
	precipitators,	

	For Gaseous pollutants-control by absorption & adsorption	
	scrubbers	
5	Noise pollution	06
	• Basics of acoustics and specification of sound; sound	
	power, sound intensity and sound pressure levels	
	Sources of Noise pollution, causes of noise, outdoor and	
	indoor noise propagation	
	Psycho-acoustics and noise criteria	
	Control measures of Noise pollution in industries and work	
	place	
6	Effects of noise	06
	 On health, annoyance rating schemes 	
	• Special noise environments: Infra-sound, ultrasound, impulsive	
	sound and sonic boom	
	 Noise standards and limit values; noise instrumentation and 	
	monitoring procedure	
	Noise indices	

- 1. Rao and Rao: Air Pollution Control Engineering.
- 2. Environmental Pollution Control Engineering-CS Rao, Wiley Eastern Ltd., New Delhi, 1996
- 3. C.S. Rao, Air pollution and control
- 4. Environmental Noise Pollution-PE Cunniff, McGraw Hill, New York, 1987



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

Course/ Paper Title	Environmental Issues
Course Code	21SBEV364
Semester	VI
No. of Credits	2 (36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1	To examine and interpret environmental impacts for major
	environmental issues and impacts on environment
2	To study the Ecological conflicts and the environmental movements in
	India
3	To identify the impacts of accelerated changes introduced by anthropogenic activities.
4	To learn the concept of Green technology for protection of environmental quality

Sr. No.	Learning Outcome	
1	Students will develop critical-thinking skills, analyze real-world problems, and understand the power of narrative to create sustainable solutions for local and global communities.	
2	Students will reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.	
3	It provides students with the ability to investigate environmental issues from a rigorous interdisciplinary perspective by integrating insights and information from the natural sciences, social sciences, and humanities.	

4 Students will analyze the social, economic, and political and policy dynamics involved in both the emergence and the resolution of environmental problems.

Unit	Title with Contents	No. of
No.		Lectures
1	Environmental and Social issues:	10
	Global Environmental issues – Ozone depletion, global	
	warming and climaticchange, Energy crisis and	
	conservation, Threats and reasons for loss of Biodiversity	
	Bio-resources and their impact on local economy.	
	• The green revolution, positive and negative impacts,	
	food crisis and population explosion	
	Degraded lands and its rehabilitation	
	The Gender and Environment debate	
	Epidemiological issues (e.g. Corona pandemic Goitre,	
	Fluorosis, Arsenic)	
2	Ecological conflicts and the environmental movements in India:	04
	Narmada Bachao Andolan, Appiko Movement, Chipko	
	movement, Silent Valley Movement, Tehri Dam conflicts,	
	Almatti dam, Bhopal gas tragedy	
	Environmental Hazards	
3	Reclamation / Conservation	06
	Waste lands and their reclamation	
	Desertification and its control	
	Vehicular pollution and urban air quality	
	Depletion of Natural resources—cause, effects and	
	conservation	
	Fly ash utilization	
	Rain water harvesting and conservation	

	Current issues and their impacts	08
4	 Food safety and Food quality 	
	Waste as Resource	
	Carbon sinks and rainforest loss	
	Ocean acidification and coral bleaching / coral die -offs	
	Overfishing and its impacts on biodiversity of ocean	
	Unplanned urban sprawl and construction waste	
	disposal and impacts	
	Consumerist and techno centric lifestyle	
5	Green technology	08
	Introduction, Concept and Need	
	Electric vehicles, Hydrogen- fuelled cars	
	Vertical farms and gardens	
	Green architecture	
	Waste management and recycling	
	Desalinization	
	Grey water recycling technology	
	Biodegradable plastic	
	Carbon auditing	
	 Plant based packaging, Milk textiles, Solar flower, 	
	Plastic roads	

- 1. Environmental Governance: The Global Challege; By Lamont C. Hempel; Island Press (1996) 72.
- 2.Environmental Issues in India A Reader; By Mahesh Rangrajan; Pearson-Longman Publ. (2007)
- 3.Introduction to Environmental Biotechnology; by AK Chatterji (2002); Prantice-Hall of India.
- 4.Handbook of Environmental Law, Acts, Guidelines, Compliances, and Standards: Vol. I and II; by R.K. Trivedy; BS publ (2004).
- 5. International Environmental Law, Fairness, Effectiveness and World Order; by Elli Louka, Cambridge, (2006)

- 6. Global Environmental Governance: A Reform Agenda; by Adil Najam, Mihaela Papa, and Nadaa Taiyab (2006), International Institute for Sustainable Development (IISD), Canada
- 7. Environmental Governance and Regulation in India: by Atiyah Curmally; (Environment and Rehabilitation) India Infrastructure Report 2002
- 8. Green Technology: An A-to-Z Guide, SAGE publications, Dustin Mulvaney



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Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course /Paper Title	Environmental Governance: EMS, EIA and ISO 14000
Course Code	21SBEV365
Semester	VI
No. of Credits	2 (36Lectures of 50 minutes)

Aim & Objectives of the Course

Sr. No.	Objectives
1	To understand the concept of Environmental Governance
2	To understand the concept of ISO 14000 series and its importance
3	To understand EIA, EMS, EMP and Environmental Audits
4	To understand with case studies EIA and Environmental Audit benefits

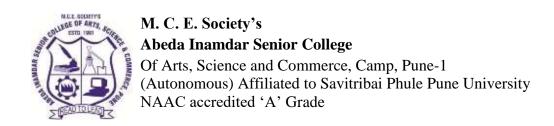
Sr. No.	Learning outcomes
1	To understand the concept of Environmental Governance and its
	application in day to day life
2	To understand the importance of ISO 14000 series and its application
3	To understand the importance of EIA in developmental projects and
	Environmental conservation
4	To understand the importance applications and advantages of EMP and
	EMS in an organization

Unit	Title with Contents	No. of
No.		Lectures
1	Environmental Governance	
	Introduction, Importance, Objective and	07
	attributes of Governance	
	Elements of governance :Institutional and	
	structural, rules and regulation	
	Environmental governance in India-Issues and	
	challenges	
2	ISO 14000 standards	
	Overview of ISO 14000-Management system	
	benefits and scopes Implementation and	
	certification ISO/207 TC function,	15
	Environmental management and sustainability	
	aspects	
	Basic of EMS and EMP	
	 Elements of EMS and EMP, Planning and 	
	selection of appropriate resources management	
	Benefits of EMS and EMP system	
3	EIA and Audits	
	Introduction ,Needs and Goals, Advantages and	
	Disadvantages	08
	Life cycle assessment , Societal response and	
	Responsibilities (Public participation),EIA	
	Notification, 2006	
	Methods of data collection :Network, Checklist,	
	Matrix, Overlay & GIS, Cost -benefit analysis	
	Concept of Audit: Definition and Types,	
	Benefits and objectives of environmental audit,	
	onsite, offsite audit, report preparation	
4	Case Studies	
	With respect to mining, construction, industries,	06

developmental projects

Sustainability reporting for industries, Case studies related to EIA, Environmental Audits

- EIA notification published by Ministry of Environment, Forests and Climate Change, Government of India
- 2. Environmental Impact Assessment, Canter R.L., McGraw Hill International Editio
- 3. Environmental Impact Assessment: Practical Guide for Professional Practices by Rathi AKA, Publisher: Gujarat Akar Unlimited, 2016
- 4. Preventive Environmental Management: An Indian Perspective by Dr. Shyam R. Asolekar& Dr. R. Gopichandran



Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Environmental Biotechnology-II
Course Code	21SBEV366
Semester	VI
No. of Credits	2 (36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1	To know about importance of Environmental Biotechnology and the
	current knowledge related to it
2	To discuss about various issues related to Environmental
	Biotechnology, GMOs and significance of its studies
3	To study the services, applications, benefits of Environmental
	Biotechnology
4	Apply core scientific concepts and practical techniques to
	Environmental Biotechnology

Sr. No.	Learning outcomes
1	Students will learn the role of Environmental Biotechnology to control pollution
2	Students will recognize the direct and indirect impact of Genetically Modified Organisms
3	Students will learn to apply the sustainable approach from case studies to maintain Environment with the help of Biotechnological methods

4	Students will get exposure of various methods handle current
	Environmental Issues

Unit No.	Title with Contents	No. of
		Lectures
1	Bioremediation	08
	History, Principles of bioremediation; Types of	
	Bioremediation; Concept of bioaugmentation and	
	biostimulation.	
	(A) Microbial Remediation: - Factors affecting bioremediation	
	process: microbial metabolism, environmental conditions and nature	
	of pollutant.	
	(B) Phytoremediation: - Concept and types of phytoremediation,	
	factors affecting on phytoremediation, plants useful for	
	phytoremediation, removal of metals and organic pollutants;	
	phytoextraction, Phytostabilisation, Rizofiltration,	
	Phytotransformation, phytovolatilization.	
2	Biotechnology applications for the control of pollutants	10
	Air and water pollution & its control through	
	biotechnology; methods of biofiltration	
	Xenotiotics in environment; toxic and anoxic degradation of	
	xenobiotics	
	Biotechnological approach to address environmental	
	problems	
	Wastewater treatment using aquatic plants; Biotechnology	
	of solid waste disposal	
	Use of immobilized enzymes and microbes for pollution	
	abatement; improvement of microbial strains by	
	conventional and molecular biological techniques.	

3	Bioleaching and Bio mining	04
	History, advantages and disadvantages of Bioleaching	
	Microbes used for bioleaching; Biochemical extraction from mixture	
	Types of bioleaching, methods of bioleaching and metal	
	precipitation; Biosorption of metals	
4	Biomethanation	04
	Anaerobic treatment for gas generation, microbiology and	
	biochemistry, factors affecting on Biomethanation	
	Design of Anaerobic digester biomethanation in industries	
	Potential of biomethanation from MSW, Biomass	
	gasification, Problems in Biomethanation	
5	Aerobic biological treatments	10
	Activated sludge, biofilm reactors and biological filters	
	Anaerobic biological treatments UASB, Removal of specific	
	pollutants- nitrate, phosphates, heavy metals, etc.;	
	Biosorption techniques for removal of pollutants	
	Biopolymers: - concept and types of biopolymers/bio plastics	
	and its applications	
	Biosensors: - concept and applications of biosensors in	
	environmental monitoring.	

- 1. Introduction to Environmental Biotechnology; by AK Chatterji (2002); Prantice-Hall of India.
- 2 Erickson, LE and DY Fung. 1988. Handbook on Anaerobic fermentations. Marcel and Dekker Inc. New York.
- 3. Holland, KT, JS Knapp and JG Shoesmith. 1990. Anaerobic bacteria. Blackie Publications. New York.
- 4. Ramasamy, K., G. Kalaichelvan and B. Nagamani. 1992. Working with anaerobes: Methanogens. FermentationLaboratory, TNAU, Coimbatore.

- 5. Gerhardt, P., RGE Murray, WA Wood and NR Krieg. 1994. Methods for General and Molecular Bacteriology. ASMPublications, Washington.
- 6. Jogdand, SN 1995. Environmental Biotechnology. Himalaya Publishing House, Mumbai.
- 7. Erickson, LE and DY Fung. 1988. Handbook on Anaerobic fermentations. Marcel and Dekker Inc. New York.
- 8. Ramasamy, K, G Kalaichelvan and B Nagamani. 1992. Working with anaerobes: Methanogens. FermentationLaboratory, TNAU, Coimbatore.
- 9. Crawford, RL and DLCrawford. 1996. Bioremediation Principles and Applications. Cambridge University Press, London



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

Course /Paper Title	Solid Waste Technology
Course Code	21SBEV3613
Semester	VI
No. of Credits	2 (36 Lectures of 50 minutes)

Aim & Objectives of the Course

Sr. No.	Objectives
1	To understand the concept of waste management and its harmful
	impacts on environment
2	To study various waste management techniques for conservation of
	environment quality.
3	To learn about integrated waste management processes

Sr. No.	Learning outcomes
1	Students will realise the real time problems by keeping inview of social,
	environmental and health issues related to solid waste by various new techniques.
2	Students will understand the various monitoring methods for waste disposal
3	Students will be aware about the 4 R's principle to be followed in day today life.

Unit No.	Title with Contents	No. of Lectures
1	Introduction	05
	Sources and generation of solid waste,	
	Classification and chemical composition;	
	Characterization of municipal solid waste;	
	Hazardous waste and biomedical waste.	
	Waste management techniques	
2	Impact of solid wasteOn environment, human, animals and plant health;	07
	Effect of solid waste and industrial effluent discharge on	
	water quality and aquatic life;	
	Mining waste and land degradation;	
	Effect of landfills leachate on soil characteristics and	
	ground water pollution.	
	Effects of industrial waste on air quality	
3	Different techniques	07
	Collection, storage, transportation and disposal of	
	solid waste (municipal, hazardous and biomedical	
	waste); landfill (traditional and sanitarylandfill	
	design);	
	Thermal treatment (pyrolysis and incineration) of	
	waste material;	
	Drawbacks in waste management techniques.	
4	Types of industrial waste:	07
	Hazardous and non-hazardous;,	
	 Industrial waste management and its importance; 	
	Stack emission controland emission monitoring;	
	Effluent treatment plant and sewage treatment plant.	
5	4R- reduce, reuse, recycle and recover	10
	Biological processing - composting, anaerobic	

- digestion, aerobic treatment, biological treatment; green techniques for waste treatment
- Concept of energy recovery from waste; refuse derived fuel (RDF); different WTEprocesses: combustion, pyrolysis, landfill gas (LFG) recovery; anaerobic digestion; gasification
- Concept of Integrated waste management; waste management hierarchy; methods and importance of Integrated waste management.

- 1. Asnani, P. U. 2006. Solid waste management. India Infrastructure Report 570.
- 2. Bagchi, A. 2004. Design of Landfills and Integrated Solid Waste Management. John Wiley & Sons.
- 3. Blackman, W.C. 2001. Basic Hazardous Waste Management. CRC Press.
- 4. McDougall, F. R., White, P. R., Franke, M., & Hindle, P. 2008. Integrated Solid Waste Management: A Life CycleInventory. John Wiley & Sons.
- 5. US EPA. 1999. Guide for Industrial Waste Management. Washington D.C.
- 6. White, P.R., Franke, M. & Hindle P. 1995. Integrated Solid waste Management: A Lifecycle Inventory. Blackie Academic & Professionals.
- 7. Zhu, D., Asnani, P.U., Zurbrugg, C., Anapolsky, S. & Mani, S. 2008. Improving Municipal Solid waste Managementin India. The World Bank, Washington D.C.



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

Course /Paper Title	Urban Town Planning
Course Code	21SBEV3614
Semester	VI
No. of Credits	2 (36Lectures of 50 minutes)

Aim & Objectives of the Course

Sr. No.	Objectives
1	To understand the concept of Town planning and ensuring that new
	and existing facilities are complimentary to each other
2	To develop Sustainable Building and its Management
3	To create awareness about location of Industries , Recreational areas
4	To create awareness about the traffic management within the town

Sr. No.	Learning outcomes
1	To solve the real time problems by keeping inview of social, environmental
	and health issues in a sustainable way
2	To focus on the various recreational requirements of the town and
	preparation of master plan
3	Predict the difficulties and obstacles in re- planning of towns
4	Plan safe and rapid road transit system by proper design of roadways and
	effective traffic management.

Unit No.	Title with Contents	No. of Lectures
1	Introduction:	0.6
	Objects of town planning, principles of town planning	06
	• Origin and growth of towns – development of towns,	
	Modern town planning in India	
	Socio – Economic aspects of town planning. Selection of	
	site for an ideal town	
2	Surveys & Planning:	
	Various types of surveys to be conducted for town	06
	planning project	
	Data's to be collected in different types of town planning	
	survey. Types of planning, -a brief note on urban, rural	
	and regional planning	
	• Zoning: Definition – objects and principles of zoning.	
	Advantages of zoning, Special Economic Zone (SEZ),	
	Maps for zoning.	
3	Housing:	
	Classification of residential building as per HUDCO	06
	norms, Housing in villages, Low Cost Housing, Housing	
	policy	
	 Different types of housing agencies involved in housing, 	
	investment in Housing, Housing Problems in India	
	Slums:	
	Causes, growth, characteristics, effects	
	• Rehabilitation, prevention of slum formation, financial	
	assistance for slum clearance	
4	Public buildings & Industries:	0.6
	Classification – location, Design Principles of public	06
	building, grouping of public buildings.	
	Effects of Industries on towns and cities, classification of	
	industries, regulation of their location	
	Recreation measures:	
	Parks- park ways, Playgrounds, Theme parks, boulevards	

	and their space standards, knowledge of Landscape	
	sketches for Green Buildings.(IGBC)	
5	Urban Roads:	
	Objects, requirements, classification, types of street	06
	systems, through and bypass roads, outer and inner ring	
	roads, expressways, freeways	
6	Traffic Management:	06
	Objectives, traffic surveys, traffic congestion, traffic	
	control, road junctions and intersections, parking, road	
	accidents	
	Traffic capacity of roads, traffic islands, roundabouts,	
	traffic signals, road signs, road markings, street lighting	
	in a town	
	Case studies from developed countries for Traffic	
	management	

- 1. D'Monte, Darryl. 1985. Industry versus Environment Temples or Tombs. Three Controversies, Delhi, CSE.
- 2. Ernstson, H. 2011. Re-translating nature in post-apartheid Cape Town: The material semiotics of people and plants at Bottom Road. In: Heeks, R., (Ed.) Conference on "Understanding Development through Actor-Network Theory", London School of Economics, 30 June, London.
- 3. Gaston, K.J. 2010. Urban Ecology. Cambridge University Press, New York
- 4. Grimm, N. B., Faeth, S. H., et al. 2008. Global Change and the Ecology of Cities. Science 319: 756-760.
- 5. Hinchliffe, S. & Whatmore, S. 2006. Living cities: Towards a politics of conviviality. Science as Culture 15: 123–138
- 6. McIntyre, N.E. 2000. Urban ecology as an interdisciplinary field: differences in the use of 'urban' between the social and natural sciences. Urban Ecosystems 4: 5-24.
- 7. Montgomery, M.R. 2009. Urban Transformation of the developing world. Science 319: 761-764
- 8. Town Planning By Rangwala, Charotar Publication, 1980
- 9. Richter, M. & Weiland, U. (ed.). 2012. Applied Urban Ecology. Wiley-Blackwell, UK



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Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Practical- I
Course Code	21SBEV367
Semester	VI
No. of Credits	2

Aims & Objectives of the Course

Sr. No.	Objectives
1	To learn various aquatic ecosystems and their significance
2	To analyze the various waste water parameters
3	To obtain knowledge on various water pollutants, water analysis and quality control.
4.	To understand the importance of macro and macrophytes as Bioindicator of pollution

Sr. No.	Learning outcomes
1	Students understand the important parameters for measuring water quality. They also develop awareness about the various water quality parameters, their determination and the impact of water quality on public health and environment.
2	Students will obtain quantitative information on the physical, chemical, and biological characteristics of water
3	Students will be able to outline how sewage may be treated before

discharge to the environment including the disinfection methods.

Syllabus

Sr. No.	Title of practical	No. of
		practical
1	Identification and Classification of phytoplankton and	01
	zooplankton from water sample	
2	Quantitative analysis of phytoplankton by Lackey's Drop count	01
	method	
3	Visit to Wetland ecosystem	01
4	Study of Macrophytes and Microorganisms as Bioindicator for	01
	water / soil pollution	
5	Determination of pH, EC and temperature of waste water	01
6	Estimation of Dissolved oxygen and CO ₂ of water sample	01
7	Determination of BOD of waste water sample	01
8	Determination of COD of waste water sample	01
9	Testing the bacteriological quality of drinking water	01
10	Jar test for Coagulation and Flocculation	01
11	Determination of Sludge Volume Index	01
12	Study of various disinfection methods for water	01
13	Design of STP / ETP by using the given data	01
14	Effect of toxic pollutants / waste water / sewage on seed	01
	germination	

Note: Visits along with submission of visit report is compulsory.

- 1. Soil and water chemistry by Anu Gopinath
- 2. Environmental Chemistry by Anil Kumar De
- 3. Environmental Chemistry by Neill, Peter O., Blackie Academic and Professional, London, 1998
- 4. Environmental Chemistry: Global Perspective by Vanloon, Gary W, Oxford University Press, New York, 2000

- 5. Environmental Chemistry by Stanley E. Manahan, 5th Ed., Lewis Publishers, 1995
- 6. Chemistry for Environmental Engineering and Sciences (5th Ed) by CN Sawyer, PL McCarty, Tata McGraw-Hill ed., New Delhi, 2003.
- 7. Microbiology by Michael J.Pelzer et.al. (5th ed), Tata McGraw Hill, New Delhi (1993).
- 8. Microbiology for Environmental Scientists and Engineers by Gaudy, AF and Gaudy, ET MGH, New York (1980).
- 9. Standard Methods for the Examination of Water and Wastewater (21st ed.)-AWWA



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Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Practical- II
Course Code	21SBEV368
Semester	VI
No. of Credits	2

Aims & Objectives of the Course

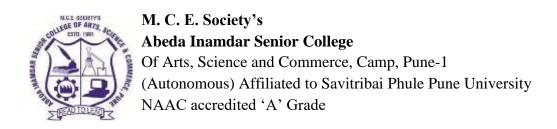
Sr. No.	Objectives
1	To learn the working principle of High Volume Sampler.
2	To understand the phytoremediation techniques in detail.
3	To examine the sewage water microorganisms by various techniques.

Sr. No.	Learning outcomes				
1	Students will understand the practical applications of HVS for determination of PM and other pollutants				
2	Students will recognize the importance and role of bio indicators in nature.				
3	Students will be able to categorize microorganisms based on their characteristics.				

Sr. No.	Title of practical		
		Lectures	
1	Study of Safety instructions	01	
2	Determination of Particulate matter by using HVS	01	
3	Determination of SOx from polluted air	01	
4	Determination of NOx from polluted air	01	
5	Visit to pollution control laboratory	01	
6	Study of phytoremediation techniques to remove pollutants	01	
7	Setting up of Phytoremediation plant for a week	01	
8	Methods of disinfection of waste waters	01	
9	Estimation of Air Pollution Index	01	
10	Determination of Cation Exchange Capacity of soil	01	
11	Identification and classification of bacteria by Gram staining technique.	01	
12	Measurement of Equivalent Noise level by SLM from silent,	01	
	industrial, residential and commercial zones		
13	Evaluation of EIA by using Leopold matrix Technique.	01	
14	Preparation of EMP	01	
15	Study of Energy Audit Process; Format and Survey	01	

Note: Visits along with submission of visit report is compulsory.

- A Handbook of Practical Microbiology, R. Saravanan , D. Dhachinamoorthi, CH. MM.
 Prasad Rao
- 2. Practical Handbook of Microbiology, Emanuel Goldman (Editor), Lorrence H Green
- 3. Practical Microbiology, D.K. Maheshwari
- 4. Practical Atlas for Bacterial Identification, D. Roy Cullimore



Syllabus for T.Y.B. Sc. Environmental Science

2023-24 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Project Work		
Course Code	21SBEV369		
Semester	VI		
No. of Credits	2		

Aims & Objectives of the Course

Sr. No.	Objectives			
1	To Plan, manage and execute a substantial project.			
2	To Explain the significance of the project in the context of the literature,			
	the problem which the project solves, and the implications of what has			
	been learned in conducting the project.			
3	To Demonstrate mastery of the underlying theory of the project subject			
	matter and analysis techniques.			
4	Demonstrate mastery of a non-trivial technical skill in a scientific			
	approach			

Sr. No.	Learning outcomes			
1	Students understand the importance of field experience and implementation of various methods			
2	Students will obtain quantitative information on the physical, chemical, and biological characteristics of various samples			
3	Students will be able to outline how sewage may be treated before discharge to the environment including the disinfection methods through			

the project

Unit	Name of Unit	Content	Lectures
No.			
1	Project	Introduction	36
		 Hypothesis 	
		• Aim	
		 Objectives 	
		 Methodology 	
		 Progress reports 	
		• Results	
		 Conclusion 	
		 Recommendations 	
		• References	
		Final presentation	

Policy procedure to be followed for T. Y. B. Sc. Project Work and Submission

Students have to complete six monthly project reports for successful completion of B. Sc. degree. Students can select topics related with various areas of Environmental science. Initially, students are asked to submit brief synopsis of the proposed work. Allotment of supervisor and final topics are selected based on facilities available in the department and based on possibilities of scientific work. Students are also free to have collaborative work and can choose a supervisor outside college. It is advised that students should have combination of external and internal supervisor after consultation with departmental staff member. Students can also start their project work at the start of year. An innovative topic, problem solving approach and originality in the work is expected. Students can select experienced teachers / experts / scientists of other reputed institutions. 'Acceptance Certificate' is required from external supervisor. Exposure and collaborative work is highly encouraged. Strict internal evaluation is carried out through six months while for final presentation and assessment of submitted reports, external supervisors are invited. The final report is prepared as per standard format which includes 'Completion Certificate' and 'Declaration' regarding originality of the content and work done by the student.