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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.

Expected Course Specific Learning Outcomes

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.

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.

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Terrestrial Ecology** • 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	08
2	**Terrestrial Biomes** • Introduction, concept • Types of Biomes--Tundra, Northern coniferous forests, Temperate deciduous and rain forests, Temperate grassland, Desert, Tropical Rainforest, Tropical deciduous forest, Tropical scrub forest, Tropical grassland, Savannas	06
3	**Terrestrial ecosystem services** • 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	06
5	**Exploitation and Sustainable Utilisation** • 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	10

References:

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	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

Expected Course Specific Learning Outcomes

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

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Introduction to Wildlife** • Definition of Wildlife • 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	04
2	**Threats to wildlife** • Habitat Destruction • Developmental projects---Urbanization,Agriculture expansion, Poaching, industrial expansion, Human Wildlife conflict, Deforestation • Exploitation of animals and plants	04
3	**Wildlife Census Technique** • Planning census – Total counts - Sample counts – Basic 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	06
4	**Human Wildlife Conflicts** • Basic concepts, reasons for conflicts • 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	04

	applications	
5	**Conservation of Wildlife** • In-situ and Ex-situ conservation: Wildlife Sanctuaries, 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	08
6	**Modern Concepts of Wildlife Management** • Wildlife Crimes: Wildlife forensics and its applications in 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).	10

References:

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

2023-24 (CBCS – Autonomy 21 Pattern)

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 agro-ecosystem.
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

Expected Course Specific Learning Outcomes

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.

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Introduction** • 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	04
2	**Water Pollution** • Definition, Types , Point andNon- 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	08
3	**Prevention and Control of Water Pollution and its Management** • 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 andSanitation • Application of GIS and Remote sensing for management of WaterResources	10

4	**Soil and Reactions in Soil** • 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	06
5	**Soil Pollution and Management** • 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	08

References:

1. 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

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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

Expected Course Specific Learning Outcomes

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

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Evolution and development of Earth's atmosphere** • 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.	07
2	**Atmospheric circulation and Movement of air masses** • 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	07
3	**Meteorology and atmospheric stability** • Meteorological parameters (temperature, relative humidity, wind speed and direction, precipitation) • Atmospheric stability and mixing heights • Temperature inversion • Plume behavior • Gaussian plume model	07
4	**Global warming and climate change** • 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	07

	• Weather patterns, sea level rise, agricultural productivity and biological responses - range shift of species, CO_2 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

References:

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

Expected Course Specific Learning Outcomes

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

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Introduction to Law and Policy:** • Concept of law and policy • Importance andelements of Environmental Governance	02
2	**Introduction to Environmental Legislation:** • Legal definitions: Environmental pollution, natural resource, Biodiversity,forest, Sustainable Development. Article 48A and 51A (g) • 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	08
3	**Government Institutions** • Role of Ministry of Environment, Forests & Climate Change, Role of Central Pollution Control Board (CPCB), Role of State Pollution Control Boards • Role of National Green Tribunal (NGT)	06
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 • Copenhagen (CoP's, their major outcomes and recent updates and World summits, Brutland report	12
5	**Environmental Acts** **a) Anti-pollution Acts** The Air (Prevention and Control of Pollution) Act 1981,	

	Motor Vehicle Act 1988, Noise Pollution (Regulation and 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,	08

References:

1. Abraham, C.M. 1999. Environmental Jurisprudence in India. Kluwer Law International.
2. 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, Materialsand 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.

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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

Expected Course Specific Learning Outcomes

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

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Introduction** • History and Necessity of EnvironmentalBiotechnology • Objectives, Importance and Applications	06
2	**Composting Techniques** • Classification and Methods of Composting • Manufacturing, Equipment, Development • Types—Bangalore and Indore methods • Preparation of Compost • Commercial application	06
3	**Genetically ModifiedOrganisms** • Introduction, Examples • Principles and Advantages • Risk to Environment • Cartagena Protocol on Biosafety	08
4	**Agricultural biotechnology and Biofertilisers** • Introduction • Detection and diagnosis • Micro-propagation of plants • Biofertilisers-Types, Role, preparation method and Commercial aspects • Agricultural Waste and its Uses	08
5	**Microbes** • 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	08

	• Nutritional types • Types of microbes • Xenobiotic components	

References:

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

Expected Course Specific Learning Outcomes

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.

Syllabus

Unit No.	Title with Contents	Number of lectures
1	**Introduction to Environmental Health and Safety.** • Key elements of safety and health management system. • Scope and Importance. • Training of Employee • Safety & Health Management system records. • Workplace precautions and Control measures	07
2.	**Environmental issues and SOP's** • 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	08
3.	**Industrial Safety.** • 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.	07

4	**Laboratory Safety.** • 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.	07
5	**Role of Management & EHS officer.** • 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.	07

References:

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.

Expected Course Specific Learning Outcomes

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

Syllabus

Unit No.	Title with Contents	Number of lectures
1	**Introduction** • 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)	06
2.	**Conservation measures** • **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.	10
3.	**Methods of Pest Management** • 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,	10
4	**Fertilizers and Environment** • Types of Fertilizers, Classification of Fertilizers Effects due to use of excess fertilizer & theirmanagement. • Calculation of Recommended dose of fertilizer • Schemes for water conservation	10

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

References:

1. 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.
3. 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.

Expected Course Specific Learning Outcomes

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 forAnimal/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.

References:

1) Manual for Field Ecology; Mishra R.

2) Handbook of Methods in Environmental Studies Vol-I &II; Mailti S.K.; ABD Publishers; Jaipur

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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.

Expected Course Specific Learning Outcomes

Sr. No.	Learning outcomes
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 polluted sites	01
2	Collection and Sampling of Soil s a m p l e s from different polluted sites	01
3	Analysis of pH, Temperature and Electrical Conductivity of different waste water	01
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 Plant	01
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 pollutes water	01

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

References:

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

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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

Expected Course Specific Learning Outcomes

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, nutrients, moisture, temperature and air, microbial populations	01
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_2S) 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.

References:

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

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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.

Expected Course Specific Learning Outcomes

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.

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Limnology** • 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	06
2	**Freshwater ecology** • The freshwater environment: types • 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	08

3	**Marine and Estuarine ecology** • 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	08
4	**Aquatic ecosystem management and Monitoring** • Application of Remote sensing and Geographical information system in aquatic ecosystem management • Need for conservation of aquatic resources • Eco-development program • Traditional methods • Methods of aquatic sampling and data analysis: sampling approaches • Species association • Case studies	08
5	**Exploitation and Need for wetland conservation** • 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'saquatic resources	06

References:

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

Expected Course Specific Learning Outcomes

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

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Introduction to Nature Conservation** • Introduction, • Concept of nature conservation • Objectives • Challenges	04
2	**In-situ Conservation** • 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	06
3	**Ex-situ conservation** • Concept and principle • Types : Cryopreservation, Seed banks, • Botanical Gardens, Zoos, Balcony Gardens, Home Gardens • Field genebanking, Cultivation Collections • Challenges, merits and Demerits	06
4	**International and National Efforts forconservation** • 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	12

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

References:

1. Principles of Environmental science - Cunningham and Cunningham

2. Ecology, Environment and Resource Conservation (2006): Singh JS, Singh SP and Gupta SR; Anamaya Publ, NewDelhi.

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

Expected Course Specific Learning Outcomes

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

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Atmosphere and its nature** • 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	06
2	**Air pollution** • 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)	06
3	**Analytical Methods for Monitoring Air Pollutants** • 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	04
4	**Air Pollution control** • Air Pollution control- at source-equipment for control of air pollution-For particulate matter-Settling chambers-Fabric filters-Scrubbers-Cyclones Electrostatic precipitators,	08

	• For Gaseous pollutants-control by absorption & adsorption scrubbers	
5	**Noise pollution** • 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	06
6	**Effects of noise** • 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	06

References:

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

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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

Expected Course Specific Learning Outcomes

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.

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Environmental and Social issues:** • 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)	10
2	**Ecological conflicts and the environmental movements in India:** • Narmada Bachao Andolan, Appiko Movement, Chipko movement, Silent Valley Movement, Tehri Dam conflicts, Almatti dam, Bhopal gas tragedy • Environmental Hazards	04
3	**Reclamation / Conservation** • 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	06

4	**Current issues and their impacts** • 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	08
5	**Green technology** • 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	08

References:

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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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

Expected Course Specific Learning Outcomes

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

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Environmental Governance** • Introduction, Importance, Objective and attributes of Governance • Elements of governance :Institutional and structural, rules and regulation • Environmental governance in India-Issues and challenges	07
2	**ISO 14000 standards** • Overview of ISO 14000-Management system benefits and scopes Implementation and certification ISO/207 TC function, 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	15
3	**EIA and Audits** • Introduction ,Needs and Goals, Advantages and Disadvantages • 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	08
4	**Case Studies** • With respect to mining, construction, industries,	06

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

References:

1. 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

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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

Expected Course Specific Learning Outcomes

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

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Bioremediation** • 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.	08
2	**Biotechnology applications for the control of pollutants** • 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.	10

3	**Bioleaching and Bio mining** • 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	04
4	**Biomethanation** • 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	04
5	**Aerobic biological treatments** • 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.	10

References:

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. ASM Publications, 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. Fermentation Laboratory, TNAU, Coimbatore.

9. Crawford, RL and DL Crawford. 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

Expected Course Specific Learning Outcomes

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.

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Introduction** • Sources and generation of solid waste, • Classification and chemical composition; • Characterization of municipal solid waste; • Hazardous waste and biomedical waste. • Waste management techniques	05
2	**Impact of solid waste** • On environment, human, animals and plant health; • 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	07
3	**Different techniques** • 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.	07
4	• **Types of industrial waste:** • Hazardous and non-hazardous;, • Industrial waste management and its importance; • Stack emission controland emission monitoring; • Effluent treatment plant and sewage treatment plant.	07
5	• **4R- reduce, reuse, recycle and recover** • Biological processing - composting, anaerobic	10

	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.	

References:

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. BlackieAcademic & 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

Expected Course Specific Learning Outcomes

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 requirementsof 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.

Syllabus

Unit No.	Title with Contents	No. of Lectures
1	**Introduction:** • Objects of town planning, principles of town planning • 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	06
2	**Surveys & Planning**: • Various types of surveys to be conducted for town 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.	06
3	**Housing**: • Classification of residential building as per HUDCO 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	06
4	**Public buildings & Industries**: • Classification – location, Design Principles of public 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	06

	and their space standards, knowledge of Landscape sketches for Green Buildings.(IGBC)	
5	**Urban Roads**: • Objects, requirements, classification, types of street systems, through and bypass roads, outer and inner ring roads, expressways, freeways	06
6	**Traffic Management**: • 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	06

References:

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

Expected Course Specific Learning Outcomes

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 zooplankton from water sample	01
2	Quantitative analysis of phytoplankton by Lackey's Drop count method	01
3	Visit to Wetland ecosystem	01
4	Study of Macrophytes and Microorganisms as Bioindicator for water / soil pollution	01
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 germination	01

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

References:

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.

Expected Course Specific Learning Outcomes

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.

Syllabus

Sr. No.	Title of practical	Number 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, industrial, residential and commercial zones	01
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.

References:

1. 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

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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

Expected Course Specific Learning Outcomes

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

Syllabus

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

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.