॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'B++' grade

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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत प्रस्तुत विद्यापीठाच्या भूशास्त्र सकुंलातील विज्ञान व तंत्रज्ञान विद्याशाखेतील **B. Sc. Environmental Science (B.Sc.+M.Sc. Intergrated)** प्रथम वर्ष अभ्यासक्रम शैक्षणिक वर्ष २०२३–२४ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक १६ जून २०२३ रोजी संपन्न झालेल्या मा. विद्यापरिषदेच्या बैठकीत ऐनवेळचा विषय क्र. १२/५६–२०२३ अन्वये मान्यता दिल्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत प्रस्तुत विद्यापीठाच्या भूशास्त्र संकुलातील B.Sc. Environmental Science (B.Sc.+M.Sc. Intergrated) पदवी प्रथम वर्षाचा अभ्याक्रम शैक्षणिक वर्ष २०२३–२४ पासून लागू करण्यात येत आहे.

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शैक्षणिक–१/परिपत्रक/पदवी एनइपी/संकुल/ 136
२०२३–२४/

दिनांक : ११.०७.२०२३.

आपली विश्वासू

सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. कुलसचिव, यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
३) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
४) मा. संचालक, भूशास्त्र संकुल विद्याशाखा, प्रस्तुत विद्यापीठ.
५) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
६) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
७) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. यानां देवून कळविण्यात येते की, सदरील परिपत्रक विद्यापीठाच्या संकेतस्थळावर प्रसिध्द करण्यात यावे.

STRUCTURE AND SYLLABUS OF FIVE YEAR INTEGRATED MULTIDISCIPLINARY PROGRAM (B Sc+M Sc) WITH MULTIPLE ENTRY AND EXIT OPTION

(R-2023)

UNDER

NATIONAL EDUCATION POLICY (NEP 2020)

In

FIVE YEAR INTEGRATED ENVIRONMENTAL SCIENCE

FACULTY OF SCIENCE AND TECHNOLOGY

B. Sc. First Year

SCHOOL OF EARTH SCIENCES

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

With Effect from June 2023

Introduction:

The National Education Policy 2020 (NEP 2020) is formulated to revamp education system and lay down road map for new India. This policy is framed based on the fundamental pillars of access, equity, quality, affordability, and accountability and seeks to transform India into a thriving knowledge society and a global knowledge superpower.

Some of the important features of National Education Policy are Increasing GER in higher education, Holistic and multidisciplinary education with multiple entry/exit options, Establishment of academic bank of credit, Setting up of multidisciplinary education and research Universities and National Research Foundation, Expansion of open and distance learning to increase gross enrolment ratio, Internationalization of education, Motivated, energized and capable faculty, Online and digital education and Effective governance and leadership.

As per the National Education Policy, the Government of Maharashtra has proposed a model curriculum framework and an implementation plan for the State of Maharashtra. It is to suggest and facilitate the implementation of schemes and programs, which improve not only the level of academic excellence but also improve the academic and research environment in the state. The proposed curriculum framework endeavours to empower the students and help them in their pursuit for achieving overall excellence.

In view of NEP priority and in-keeping with its vision and mission, process of updating the curriculum is initiated and implemented in SRTM University at UG and PG level from the academic year 2023-2024.

Keeping in mind, BOS in Environmental and Earth Science has prepared the curriculum to ensure up-to-date level of understanding of Environmental Science. Studying Environmental Science prepares the students for their career working either in educational institutions or industries in which they can be directly involved in the teaching, research and development. Also, to ensure uniform curriculum and its quality at UG/PG level, curriculum of different Indian Universities, syllabus of NET, SET, MPSC, UPSC, and the UGC model curriculum are referred to serve as a base in updating the same.

The comments or suggestions from all teachers, students and other stakeholders are welcome for upbringing this curriculum.

Salient Features:

The syllabus of M Sc Integrated Environmental Science has been framed to meet the requirement of Choice Based Credit System under NEP 2020. The courses offered here in will train and orient the students in the specific fields of Environmental Science.

This would help students to lay a strong foundation in the field of Environmental Science.

Overall, after completion of this course, students will also acquire fundamental knowledge and applications in Environmental Science and also understand that Environmental Science is an integral part of the human life and developments.

Program Educational Objectives:

The Objectives of this program are:

PEO1: To expose themselves to the diversity amongst life forms and their interactions.

PEO2: To make aware of natural resources and environment and the importance of conserving the same.

PEO3: To update curriculum by introducing recent advances in the subject and enable the students to face NET, SET, UPSC and other competitive examinations successfully.

PEO4: To train and orient the students so as to develop human resource for the educational institutes, industries and other organizations.

PEO5: To develop specific skills amongst students for employability for the development of their own enterprises.

PEO6: To develop ability for the application of the acquired knowledge in the fields of life so as to make our country self-reliant and self-sufficient.

Program Outcomes:

The Outcomes of this program are:

PO1: This program will expose the students to the diversity amongst different life forms.

PO2: This program shall also make aware the students about natural resources and environment and the importance of conserving the same.

PO3: This will provide updated curriculum with recent advances in the subject and enable the students to face NET, SET, UPSC and other competitive examinations successfully.

PO4: This program shall train and orient the students so as to develop human resource for the educational institutes, industries and other organizations.

PO5: This will also develop specific skills amongst students for employability and for the development of their own enterprises.

PO6: This shall develop ability in the students for the application of the acquired knowledge in the fields of life so as to make our country self-reliant and self-sufficient.

Prerequisite:

The students seeking admission to B.Sc. Integrated Environmental Science should have passed plus two examinations. The optional courses are offered to the students registered for graduate and

post-graduate programs. Such students should have the basic knowledge of Environmental Science and willing to gain additional knowledge in the field of Environmental Science.
Admissions to this program are given as per the University rules.

Dr Arjun Bhosle
Chairman, BOS Environmental & Earth Science,
Swami Ramanand Teerth Marathwada University, Nanded.
E Mail : bhoslearjunenvisci@gmail.com

Details of the Board of Studies Members in the subject Environmental Science under the Faculty of Science & Technology, S.R.T.M. University, Nanded.

Dr. Arjun Bapurao Bhosle **Chairman** School of Earth Sciences, Swami Ramanand Teerth Marathwada University, Nanded 431606.	Dr. Vasant Madhav Wagh **Member** School of Earth Sciences, Swami Ramanand Teerth Marathwada University, Nanded 431606.
Dr. Sudhir Vishwambhar Shivanikar **Member** Netaji Subhashchandra Bose College, Nanded	Dr. Raju Kashinath Narkhede **Member** Maharashtra Udaygiri Mahavidyalaya, Udgir, Tq. Udgir Dist. Latur
Dr. Kedar Ramkrishna Solunke **Member** Indira Gandhi Senior College, CIDCO, Nanded	Dr. Vinod K Mukke **Member** Shivneri Mahavidyalaya, Shirur Anantpal, Tq. Shirur Anantpal Dist. Latur
Dr. Jayprakash Manoharrao Patwari **Member** Maharashtra Udaygiri Mahavidyalaya, Udgir, Tq. Udgir Dist. Latur	Dr. Rajkumar Govindrao Pawale **Member** Indira Gandhi Senior College, CIDCO, Nanded
Dr. Satish Sudhakarrao Patil **Member** Dr. B A Marathwada University, Aurangabad (Chh. Sambhajinagar)	Dr. Ravindra S Gavali **Member** Centre for Natural Resource Management, (CNRMCC & DM) National Institute of Rural Development & Panchayati Raj, Rajendra Nagar, Hyderabad
Dr. Pravin U Meshram **Member** Sevadal Mahila Mahavidyalaya & Research Academy, Sakkardara Square, Umrer Road, Nagpur- 440009	
As Per MPUA u/s 40(2)(d)(E Invitee Member	
Sonkamble Soloni Ramkishan (UG Student) C/o Maharashtra Udaygiri Mahavidyalaya, Udgir, Tq. Udgir Dist. Latur	Madiha Jabeen Gulam (PG Student) Netaji Subhashchandra Bose College, Nanded

B. Sc. First Year Semester I (Level 4.5)
Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SENVC101	Fundamentals of Environmental Science	02	--	02	02	--
	SENVC102	Water & Water Resources	02	--	02	02	--
	SENVC103	Lab Course based on Fundamental of Environmental Science and Water & Water Resources	-	02	02		04
Minor	--	--	--	--	--	--	--
Generic Elective	SENVG101	Environmental Education (Group A of Basket 2)	02	--	02	02	--
	SENVG102	Introduction to Solid Waste (Group B of Basket 2)	02	--	02	02	--
Vocational & Skill Enhancement Course	SENVV101	Water Management	--	02	02	--	04
	SENVS101	Rain Water Harvesting	--	02	02	--	04
Ability Enhancement Course	AECEN101	L1 – Compulsory English	02	--	02	02	--
Value Education Course (VEC)	VECCI101	Constitution of India	02	-	02	02	--
Indian Knowledge System (IKS)	IKSCM101	Select from Basket 4	02	--	02	02	--
Community Engagement Services (CES)	CCXXX101	Any one of NCC/ NSS /Sports (SPT)/ Culture Studies (CLS) /Health Wellness (HWS) /Yoga Education (YGE) / Fitness (FIT) (Basket 5)	-	02	02	--	04
Total Credits			**14**	**08**	**22**	**14**	**16**

B.Sc. First Year Semester I *(Level 4.5)*

Examination Scheme

[20% Continuous Assessment (CA)and80% End Semester Assessment (ESA)]

Subject	Course Code	Course Name	Theory				Practical		Total
			Continuous Assessment (CA) Avg of			ESA			
			Test I	Test II(5)	(T1+T2)/2	Total	CA	ESA	
Major	SENVC101	Fundamentals of Environmental Science	10	10	10	40	--	--	50
	SENVC102	Water & Water Resources	10	10	10	40	--	--	50
	SENVC103	Lab Course based on Fundamental of Environmental Sci and Water & Water Resources	--	--	--	--	20	30	50
Minor	--	--	--	--	--	--	--	**Minor**	--
Generic Elective	SENVG101	Environmental Education (Group A of Basket 2)	10	10	10	40	--	--	50
	SENVG102	Introduction to Solid Waste (Group B of Basket 2)	10	10	10	40	--	--	50
Vocational & Skill Enhancement Course	SENVV101	Water Management	--	--	--	--	20	30	50
	SENVS101	Rain Water Harvesting	--	--	--	--	20	30	50
Ability Enhancement Course	AECEN101	L1 – Compulsory English	10	10	10	40	--	--	50
Value Education Course	VECCI101	Constitution of India	10	10	10	40	--	--	50
Indian Knowledge System	IKSCM101	Select from Basket 4	10	10	10	40	--	--	50
Community Engagement Services (CC)	CCXX101	Any one of NCC/ NSS /Sports (SPT)/ Culture Studies (CLS) /Health Wellness (HWS) /Yoga Education (YGE)/ Fitness (FIT) (Basket 5)	--	--	--	--	20	30	50

B. Sc. First Year Semester II (Level 4.5)

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SENVC151	Environmental Chemistry	02	--	02	02	--
	SENVC152	Introduction to Air Pollution	02	--	02	02	--
	SENVC153	Practicals Based on Environmental Chemistry & Introduction to Air Pollution	-	02	02		04
Minor	SENVC151	Renewable Energy Resources (Basket 1)	02	--	02	02	--
Generic Elective	SENVG151	Soil Pollution (Group A of Basket 2)	02	--	02	02	--
	SENVG152	Noise and Radioactive Pollution Group B of Basket 2)	02	--	02	02	--
Vocational & Skill Enhancement Course	SENVV151	Soil Quality and Soil Health	--	02	02	--	04
	SENVS151	Energy Resources	--	02	02	--	04
Ability Enhancement Course	AECXX151	L-2 (HN, MR, KN, UR,PL etc) (Basket 3)	02	--	02	02	--
Value Education Course (VEC)	VECES151	Environmental Studies	02	-	02	02	--
Community Engagement Services (CES)	CCXXX151	Any one of NCC/ NSS /Sports (SPT)/ Culture Studies (CLS) /Health Wellness (HWS) /Yoga Education (YGE) / Fitness (FIT) (Basket 5)	-	02	02	--	04
Total Credits			**14**	**08**	**22**	**14**	**16**

B.Sc. First Year Semester II *(Level4.5)*

Examination Scheme

[20% Continuous Assessment (CA)and80% End Semester Assessment (ESA)]

Subject	Course Code	Course Name	Theory				Practical		Total
			Continuous Assessment(CA) Avg of			ESA			
			Test I	Test II(5)	(T1+T2)/2	Total	CA	ESA	
Major	SENVC151	Environmental Chemistry	10	10	10	40	--	--	50
	SENVC152	Introduction to Air Pollution	10	10	10	40	--	--	50
	SENVC153	Practicals Based on Environmental Chemistry & Introduction to Air Pollution	--	--	--	--	20	30	50
Minor	SENVC151	Renewable Energy Resources (Basket 1)	10	10	10	40	--	--	50
Generic Elective	SENVG151	Soil Pollution (Group A of Basket 2)	10	10	10	40	--	--	50
	SENVG152	Energy Resources (Group B of Basket 2)	10	10	10	40	--	--	50
Vocational & Skill Enhancement Course	SENVV151	Energy Resources	--	--	--	--	20	30	50
	SENVS151	Soil Quality and Soil Health	--	--	--	--	20	30	50
Ability Enhancement Course	AECXX151	L-2 (HN, MR, KN, UR,PL etc) (Basket 3)	10	10	10	40	--	--	50
Value Education Course (VEC)	VECES151	Environmental Studies	10	10	10	40	--	--	50
Community Engagement Services (CES)	CCXXX151	Any one of NCC/ NSS /Sports (SPT)/ Culture Studies (CLS) /Health Wellness (HWS) /Yoga Education (YGE) / Fitness (FIT) (Basket 5)	--	--	--	--	20	30	50

Course Structure: *Major 1 - Teaching Scheme*

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SENVC101	Fundamentals of Environmental Science	02	--	02	--	02

Major 1 - Assessment Scheme

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		Test I (4)	Test II (5)	Avg (T1+T2)/2 (6)		CA (8)	ESA (9)	
SENVC101	Fundamentals of Environmental Science	10	10	10	40	--	--	50

SENVC101: Fundamentals of Environmental Science
(Major 1) Curriculum Details

Course pre-requisite:

1. Basic knowledge of components of Environment
2. Must have knowledge of different environmental processes

Course objectives: This course aims to :

1. stimulate interest in the environment;
2. develop an understanding of the interdisciplinary and holistic nature of the environment;
3. develop knowledge and understanding of environmental issues and principles and the ability to apply these to environmental management;
4. develop the ability to identify critical research questions and formulate hypothesis or guiding statements.
5. develop the ability to collect, collate, analyze and interpret environmental data;

Course outcomes: After completion of this course student can:

1. develop the ability to communicate environmental information and ideas logically and
2. concisely in a variety of forms;
3. provide an understanding of interactions between people and the environment;
4. *increase an awareness of the importance of living in harmony with the environment;*
5. recognize and evaluate the socio-economic, political and ethical issues in Environmental Science;
6. foster positive attitudes, values and commitment to identifying, solving and preventing environmental problems;
7. develop an understanding of how natural resources and the environment affect quality of life and the quest for sustainable development.

Curriculum Details:

Module No.	UnitNo.	Topic	Hrs. Required to cover the contents
1. 0		Basics of Environmental Science.	**10**
	1.1	Definition, Principles and Scope of Environmental Science.	
	1.2	Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere.	
	1.3	Laws of thermodynamics, heat transfer processes, mass and energy transfer across various interfaces, material balance.	
2.0		Meteorological parameters	**10**
	2.1	pressure, temperature, precipitation, humidity,	
	2.2	mixing ratio, saturation mixing ratio, radiation and wind velocity,	
	2.3	adiabatic lapse rate, environmental lapse rate. Wind roses.	
3.0		Interaction between Earth, Man and Environment.	**05**
	3.1	Interaction between Earth, Man and Environment.	
	3.2	Biogeographic provinces of the world and agro-climatic zones of India.	
	3.3	Concept of sustainable development.	
4.0		Applications in Environmental studies	**05**
	4.1	Natural resources and their assessment	
	4.2	Environmental models	
	4.3	Application of Environmental models in Environmental studies	
	4.4	Environmental education and awareness. Environmental ethics.	
		Total	**30**

Text Books:

1. **Environmental Science:** Enger Smith, Smith, W. M. C. Brown (Company Publishing)
2. **Principles of Soil Science:** Watt K. E. F. (1973), (McGraw Hill Book Comp, New Delhi)
3. **Introduction to Environmental Studies:** Turk & Turk
4. **Fundamentals of Environmental Science:** G. S. Dahliwal, G. S. Sangha, P. K. Ralhan, Kalyani Publishers, New Delhi

Reference Books:

1. Environmental Chemistry by A. K. Day
2. Atmosphere by E J Tarbuck
3. Ecology and Environment by P. D Sharma

Course Structure: *Major 2 - Teaching Scheme*

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SENVC102	Water & Water Resources	02	--	02	--	02

Major 2 - Assessment Scheme

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		Test I (4)	Test II (5)	Avg (T1+T2)/2 (6)		CA (8)	ESA (9)	
SENVC102	Water & Water Resources	10	10	10	40	--	--	50

SENVC102: *Title (Major 2) Curriculum Details*

Course pre-requisite:

- Student must know what is a water resourse
- Student must aware about use of water resourses

Course objectives: The paper introduces students to the

- hydrological cycle, properties of water,
- physicochemical and biological water quality assessment and indices,
- types of water resources, their use and management.
- It will also highlight the problems associated with water shortages in India and familiarizes students with case studies on international and national conflicts on water.

Course outcomes: After completion of this course, student can

- Understand hydrological cycle and different properties of water,
- Understand physicochemical and biological water quality assessment and indices,
- Identify types of water resources, their use and management.
- resolve or give solution to the problems associated with water shortages in India

Curriculum Details:

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**Properties of water**	**10**
	1.1	Physical: temperature, colour, odour, total dissolved solids and total suspended solids; hydrological cycle; precipitation, runoff, infiltration, evaporation, evapo-transpiration;	
	1.2	Chemical: major inorganic and organic constituents, dissolved gases, DO, COD, BOD, acidity and alkalinity, electrical conductivity, sodium adsorption ratio;	

	1.3	Biological: phytoplankton, phytobenthos, zooplankton, macro-invertebrates and microbes.	
2.0		**Surface and subsurface water**	**10**
	2.1	Introduction to surface and ground water; surface and ground water pollution; water table; vertical distribution of water; formation and properties of aquifers; techniques for ground water recharge;	
	2.2	river structure and patterns; watershed and drainage basins; importance of watershed and watershed management; rain water harvesting in urban settings.	
	2.3	Marine resources; commercial use of marine resources; threats to marine ecosystems and resources; marine ecosystem and resource management (planning approach, construction techniques and monitoring of coastal zones).	
3.0		**Wetlands and their management**	**04**
	3.1	Definition of a wetland; types of wetlands (fresh water and marine);	
	3.2	ecological significance of wetlands; threats to wetlands; wetland conservation and management;	
	3.3	Ramsar Convention, 1971; major wetlands of India, National River linking plan: ecological and economic impacts.	
4.0		**Water resources, conflicts, laws and treaties**	**06**
	4.1	Water resources (oceans, rivers, lakes and wetlands) and types of water; Overexploitation of surface and ground water resources;	
	4.2	water quality standards in India; role of state in water resources management	
	4.3	Water resources and conflicts on its sharing, case studies on Kaveri and Krishna river water disputes; Multipurpose river valley projects in India and their environmental and social impacts;	
	4.4	case studies of dams - Narmada and Tehri dam issues; International agreements to resolve these conflicts. Water Act 1974; Ganges water treaty; Teesta water treaty.	
		Total	**30**

Text Books:

1. Mays, L.W. 2006. *Water Resources Sustainability*. The McGraw-Hill Publications.
2. Bansil, P.C. 2004. *Water Management in India*. Concept Publishing Company, India.
3. Brebbia, C.A. 2013. *Water Resources Management VII*. WIT Press.

Reference Books:

- CEA. 2011. *Water Resources and Power Maps of India*. Central Board of Irrigation & Power.
- Grumbine, R.E. & Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science* **339**: 36- 37.
- Loucks, D.P., Stedinger, J.R. & Haith, D. A. 1981. *Water Resource Systems Planning and Analysis*. Englewood Cliffs, NJ, Prentice Hall.
- Schward& Zhang, 2003. *Fundamentals of Groundwater*. John Willey and Sons.
- Souvorov, A.V. 1999. *Marine Ecologonomics: The Ecology and Economics of Marine Natural Resource Management*. Elsevier Publications.
- Vickers, A. 2001. *Handbook of Water Use and Conservation*. WaterPlow Press.9

SENVC103	Lab Course based on Fundamental of Environmental Sci and Water & Water Resources

1) **Fundamentals of Environmental Science**

1. Collection and preservation of water and soil samples
2. Determine the pH of soil samples
3. Determine the Electric Conductivity of various samples
4. Identification of phytoplankton any 5 to 10 specimens
5. Identification of Zooplankton any 5 to 10 specimens
6. Study of laboratory safety guidelines
7. Measurement of Noise using Sound Level

2) Water and water resources

1. Determine the pH of various water samples
2. Determine the total hardness of water samples
3. Determine the water quality index
4. Study the water sampling techniques
5. To observe the colour content of the different water samples
6. Determine the water carbonates by titration method
7. Determination of calcium content of the water samples.

SENVG101: *Title (Generic Elective-1) Curriculum Details Environmental Education (2 Credits)*

Course pre-requisite:

- Basic Knowledge about the environment

Course objectives:

- To create awareness about environment
- To inculcate the skills required to protect the surrounding environment.
-

Course outcomes:

- Students must understand the fundamentals of ecosystems.
- They must realize the significance of Environment and services of Environment to the humans.
- Understand the concept, scope and objectives of Environmental Education.
- Better understanding of environmental issues, related policies and legislations.
- They must understand the current environmental issues and their remedial measures.

Curriculum Details: (*There shall be FOUR Modules in each course)*

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**Environmental Education: Nature and Scope**	**08**
	1.1	Multidisciplinary nature of environmental education; scope and importance.	
	1.2	Man as an integral product and part of the Nature.	
	1.3	Fundamentals about biodiversity	
	1.4	Significance of Environmental Education to the society	
	1.5	Environmental Education in School, colleges and Universities	
2.0		**Environmental Degradation**	**08**
	2.1	Population explosion and its consequences on natural resources, over-exploitation of natural resources	
	2.2	Global warming, acid rain	
	2.3	Concept of Healthy Environment	
	2.4	Threats to biodiversity	
3.0		**Environmental Conservation**	**07**
	3.1	Concept of sustainability and sustainable development	
	3.2	Conservation of biodiversity	
	3.3	judicious use of natural resources	
	3.4	Eco Clubs and their significance	
4.0		Environment Laws and International agreements:	**07**
	4.1	Environment Protection Act;	
	4.2	Wildlife Protection Act;	
	4.3	Forest Conservation Act.	
	4.4	Montreal and Kyoto protocols; Environmental movements	
		Total	**30**

Text Books:

Ali Khan,S. &Sterling, (1998). Sustainable development education: Teacher education specification, London, Education for sustainable development Panel.

Allaby,M. (1996).Basics of Environmental Science. New York: Routledge.

Aptekar. Lewis (1914). Environmental Disasters in Global perspective. New York :G.K.Hall; Toronto: Maxwell macmillan.

Burton , Ian , Robert W.Kares and Gilbert F.white (.1993). The environmental as Hazard Education .Chandigarh: Punjab University Publication Bureau.

Huckle,J. & Sterling, S.(eds)(1996). Education for sustainability, London: Earthscan.

Reference Books:

Kaur,T.N.(1999), Environmental Concerns & Strategies, New Delhi: Ashish Publication House.

Laeeq Futehally (1994) Our Environment. India: National Book Trust

Lambert, P.R.(2000). Education for sustainable development : a new role for subject association, education in science ,208.pp.8-9

Pankaj Shrivastava & D.P. Singh (2002). Environment Education, Anmol publication Pvt.Ltd.

Pelling, Mark (ed.)(2003).Natural Disasters & development in a globalizing world . London: New York; Routledge.

Trivedi, P.R. (2000). Encyclopedia of environmental Pollution Planning & Conservation; New Delhi: A.P.H.Co.

Verma V.A. (1972). Textbook of Plant Ecology, Delhi: Euolcary Publication.

Warburton D.(ed.)(1998). Community & Sustainable Development, London, Earthscan.

Yogendra N.Srivastava (2012). Environmental Pollution. New Delhi: PPH Publishing Corporation.

Course Structure: *Generic Elective 2 - Teaching Scheme*

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SENVG102	**Introduction to Solid Waste**	02	--	02	--	02

Generic Elective 2 - Assessment Scheme

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		Test I (4)	Test II (5)	Avg (T1+T2)/2 (6)		CA (8)	ESA (9)	
SENVC102	**Introduction to Solid Waste**	10	10	10	40	--	--	50

SENVG102: Introduction to Solid Waste *(Generic Elective 2)*

Curriculum Details

Course pre-requisite:

1. This course may opt by M.Sc Environmental students to understand the soil and solid waste pollution problems and their pathway in environment.
2. Students will learn how to mitigate the solid waste problems by 4 R principle and product development from waste to wealth. Also, soil and solid waste pollution control measures/technologies will help to control pollution problems.

Course objectives:

- To understand the methods available for solid waste disposal.
- To evaluate the health risks posed by abandoned waste sites and waste

disposal operations.

- To understand the Life cycle inventory of Solid Waste Management.
- To evaluate the legislation designed to control the production, cleanup and disposal of solid and hazardous waste disposal operations.
- To understand the remedial measures/techniques for solid waste pollution.

Course outcomes:

- Analyze and interpret the solid waste pollution problems and associated risk to environment.
- It may help to identify best waste management practices, modern tools and techniques.
- It is important to predict the environmental impacts of developmental projects and engineered solutions in global and socio-economic context.
- Students are able to think critically and contribute to research in solving contemporary environmental problems with professional and ethical accountability.
- To understand the main aspects of waste policy and regulations and would be able to come up with significant policy interventions needed

Curriculum Details:

Module No.	UnitNo.	Topic	Hrs. Required to cover the contents
1. 0		**Introduction**	**10**
	1.1	Introduction of solid waste, Sources and characteristics; Composition.	
	1.2	Solid wastes Types: Residential wastes, Commercial wastes, Industrial wastes. Hazardous waste Types, etc	
	1.3	Biomedical waste, e-waste: classification, methods of handling and disposal.	
	1.4	Plastic waste: sources, consequences and management.	
2.0		**Solid waste collection and transportation**	**05**
	2.1	Solid waste collection and transportation, container systems - hauled and stationary etc,	
	2.2	Layout of collection routes, transfer stations.	
	2.3	Central sorting	
3.0		**Solid waste management and Control techniques**	**10**
	3.1	Solid waste processing and recovery– Recycling, recovery of materials for recycling and direct manufacture of solid waste products.	

	3.2	Composting and Vermicomposting, biomethanation of solid waste etc. Disposal of solid wastes – sanitary land filling and its management, incineration of solid waste. Hog feeding, open dumping, Pyrolysis, incineration	
	3.3	Electrical energy generation from solid waste (Fuel pellets, Refuse derived fuels),Integrated solid waste management, '4R' principles of solid waste, Life cycle inventory of solid waste,	
4.0		**Solid Waste legislation**	
	4.1	Solid waste pollution scenario in India	**5**
	4.2	The Solid Waste Management Rules, 2016, Hazardous waste management Act 1989	
	4.3	The Bio-Medical Waste Management Rules, 2016. Solid waste management case studies and current issues.	
		Total	**30**

Text Books:

- B. K. Sharma, H. Kaur, "Soil and Noise Pollution", Goel Publishing House, Meerut 1994
- Dr. Aradhana Salpekar, "Solid waste pollution" Jnanada Prakashan, New Delhi, 2008.
- M. M. Rai, "Principals of soil science".
- P. C. Mishra, "Soil pollution & Soil organisms".
- B. K. Sharma, "Environmental Chemistry".
- S. C. Santra, "Environmental Science "New Central Book Agency, Kolkata, 2005

Reference Books:

- Handbook of advanced industrial and hazardous wastes treatment / edited by Lawrence K. Wang, Yung-Tse Hung, Nazih K. Shammas
- Solid wastes management / edited by Stephen Burnley. Chichester : Wiley; 2014
- John Pichtel, "Waste management practices: municipal, hazardous, and industrial" CRC Press, 2014.

SENVV101: Water Management

1. To explore and demonstrate the effectiveness of water management techniques in reducing water consumption in irrigation practices.
2. Determine the total solids from the water samples
3. Determination of TDS, TSS from water samples
4. Determination of Chloride content from water.
5. Visit the water resource for the study Dam/Reservoir/River/Ponds/Lakes
6. To study and Field visit for Watershed Management practices
7. Jar Test for efficiency of Coagulants

SENVS101: Rainwater harvesting

1. Calculate the rainwater precipitation by using rain gauge
2. To investigate the effectiveness of rainwater harvesting for water management
3. To study the Rainwater harvesting for water conservation future use
4. Visit to study rainwater harvesting equipment's and techniques
5. To design the rainwater harvesting model for rooftop.
6. To determine the rainwater quality by using water testing kit

B. Sc. First Year Semester II

SENVC151: *Title (Major 1) Curriculum Details*
Environmental Chemistry *(2 Credits)*

Course pre-requisite:

Basic Knowledge about the environment

Course objectives:

- To enhance the knowledge about fundamental chemical processes and their impact on the surroundings.
- To develop new methodologies to tackle environmental pollutions.
- To encourage students to develop and promote awareness among the society regarding pollution and its prevention.
- To undertake the role of individual/volunteer in pollution prevention.
- To understand chemical laboratory safety guidelines

Course outcomes:

At the completion of the course the students will be able to

- Understand about basics of Environmental Chemistry and chemicals associated risk to the surround environment.
- It will help students to understand burning current environmental issues like Air pollution, Green house effect, global warming, ozone depletion etc.
- It may recognize potential environmental impacts of substances.
- They will understand chemical laboratory safety guidelines.
- It will add to their knowledge about quantitative concepts, like normality, molarity, concentration, exposure levels and limits, as it is necessary for the evaluation of the impact of a substance.
- Students are able to think critically and contribute to research in solving contemporary environmental problems with professional and ethical accountability.

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Curriculum Details: *(There shall be FOUR Modules in each course)*

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		Environmental Chemistry:	**06**
	1.1	Introduction, Concept and scope, Importance,	
	1.2	Basic water chemistry, Alkalinity or Acidity of water, Concentration, Normality, Molarity,	
	1.3	Concept of dilution, Single step dilution, Serial dilution, Multiple step dilution, Accuracy and Precision,	
	1.4	Laboratory safety procedures.	
2.0		water quality	**06**
	2.1	Water resources and water pollution	
	2.2	Use of chemicals in potable water treatment, Potable water quality standards,	
	2.3	Buffer solutions and their role, Soaps, Detergent wastes and its effects, Paints.	
	2.4	Pesticides in water, Hydrocarbons, saturated and unsaturated hydrocarbons,	
3.0		Industrial activity and environment,	**06**
	3.1	Industrial activity and environment:	
	3.2	Particulate matter, Photochemical Smog formation,	
	3.3	Chemistry of Air pollutants from industries,	
	3.4	Chemistry of acid rain, Formation of acid rain, Effects of acid rain, Efforts to control acid rain,	
4.0		**Global Concerns**	**12**
	4.1	Global warming: Effects and Control measures	
	4.2	Climate change, Carbon sequestration, Ozone depletion,	
	4.3	Bhopal gas tragedy and other case studies	
	4.4	Trace metal characteristics in relation to toxicity, Biochemical effects of trace elements.	
		Total	**30**

Text Books:

1. Environmental Chemistry: B.K. Sharma, and H. Kaur, Goel Publishing House.
2. Environmental Chemistry by A. K De, New Age International Publishers
3. Elements of Environmental Chemistry : H.V. Jadhav.
4. Environmental Chemistry : Samir K. Banerjee, Prentice Hall of India Pvt. Ltd. New Delhi.
5. Environmental Chemistry : J. W. Moore and E. A. Moore
6. Environmental Pollution, N. Manivasakam
7. A Test Book of Environmental Chemistry & Pollution Control by S. S. Dara, S. Chand and Co.
8. Fundamentals of Environmental Chemistry by Manahan, Stanley E.

Reference Books:

1. Chemistry of the Environment by Sonja Krause, Herbert M. Clark, James P. Ferris, Robert L. Strong, Elsevier Science & Technology Books
2. Applications of Environmental Chemistry by Eugene R. Weiner, CRC Press, LLC
3. Environmental Pollution Analysis: Khopkar
4. Environmental and Man : The Chemical Environmental : J. Lenihan and W.W. Fletcher

SENVC152 Introduction to Air Pollution (Major 2)

Course Structure: (Major 2) - *Teaching Scheme*

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SENVC152	Introduction to air pollution	02	--	02	--	02

Major 2 - *Assessment Scheme*

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		Test I (4)	Test II (5)	Avg (T1+T2)/2 (6)		CA (8)	ESA (9)	
SENVC152	Introduction to air pollution	10	10	10	40	--	--	50

SENVC152: Introduction to Air Pollution
*(*Major 2*) Curriculum Details*

Course pre-requisite:

- This course may helps to understand the air pollution sources and impacts.
- Also, air pollution control measures/technologies will help to control air pollution problems.

Course objectives:

- The aim of this paper is to provide skills and an improved understanding of air pollution problems and there control measures.
- To know the Air pollution legislation and their operations at national level.
- To study and analyze the impacts of air contaminants (energy, resources/waste) within the built, urban, agricultural and natural environments.

Course outcomes:

- Analyze and interpret the air pollution problems.
- Students can be able to understand the sources and impacts of air pollutants on living and nonliving things.
- Students are able to think critically and contribute to research in solving contemporary air pollution problems with professional and ethical accountability.
- It is useful for effective management of air pollution problems.

Curriculum Details:

Module No.	UnitNo.	Topic	Hrs. Required to cover the contents
1. 0		**Introduction to Air pollution**	**10**
	1.1	Introduction of Air pollutants, Sources, classification, primary and secondary pollutants etc	
	1.2	Natural contaminants: Aerosols, Dust, Smoke, Mist, Fog, Fumes, Particulate matter (PM), Suspended particulate matter (SPM), Respirable suspended particulate matter (RSPM), Fly ash,	
	1.3	Gaseous air pollutants: Sulphur dioxide, Carbon monoxide,	

		Radioactive gases etc.	
	1.4	Photochemical smog, types, causes, impacts	
2.0		**Effects of air pollution**	**10**
	2.1	Effects of air pollution on human health, Vegetation, Animals, Material and structure, Long term effects on the planet etc.	
	2.2	Greenhouse gases, Types of greenhouse gases, Effects, Sources and remedies, Technological options etc	
	2.3	Kyoto protocol, Ozone depletion, causes, impacts	
3.0		**Air sampling and measurements**	**5**
	3.1	Air sampling, methods, Particulate matter sampling and analysis	
	3.2	Dust fall measurement, High volume air sampler	
	3.3	Gaseous pollutants sampling and analysis: Carbon monoxide, Ozone, Hydrogen sulphide, etc.	
4.0		**Air quality and emission standards**	**5**
	4.1	Air quality and emission standards. General methods of control of air pollutants,	
	4.2	Problems associated with automobile pollution and control methods. Air pollution legislations etc	
	4.3	Air pollution case studies	
		Total	**30**

Text Books:

1. Sumit Malhotra, "Air Pollution and Its Control" Pointer publishers, Jaipur
2. M. N. Rao, "Air Pollution" Tata McGraw – Hill publishing company, New Delhi.
3. B. K. Sharma, H. Kaur, "Air Pollution" Krishna Prakashan media, Meerut.
5. B. Henderson, "Pollution of Our Atmosphere" Sellers Adam Hilger Limited, Bristol
6. S. K. Agarawal, "Air Pollution**"** A. P. H. Publishing corporation, New Delhi.
7. C. S Rao, "Environmental Pollution Control Engineering" Wiley Eastern Ltd., New Delhi, 1996.

Reference Books:

1. Richard W. Bowbel, Donald L. Fox, D. Bruce Tunner, & A. C. Stern, "Fundamentals of Air Pollution", Academic Press, California
2. Noel De Nevers, "Air Pollution Control Engineering" Mc-Graw–Hill Intl, New York.
3. Arcadio P. Sincero and Gregoria A. Sincero, "Environmental Engineering" Prentice Hall of India, 1999.
4. H. Brauer and Y. B. G. Verma , "Air Pollution Control Equipment". Berlin Heidelberg, New York, latest edition

SENVC153 : Practicals Based on Environmental Chemistry & Introduction to Air Pollution

Environmental Chemistry

1. Determine the pH of various industrial effluents
2. Estimate the EC from the collected samples
3. Determine the Dissolved oxygen by Winkler's method
4. Determine the Alkalinity of collected samples
5. Evaluate the Chloride from water sample by titrimetric method
6. Determination of residual chloride from different samples
7. Determination of optimum dose of Alum (Coagulant) required for water
8. Determination of Biochemical oxygen demand and Dissolved Co
9. Determine the Chemical oxygen demand by reflux method

Introduction to air pollution

1. To study the air pollution equipment's HVAS
2. Estimate the dust fall by High Volume Air Sampler method
3. Estimation of SO_X content of given samples
4. Estimation of NO_X content of given samples
5. To study the air fungi by PDA preparation
6. To study the bacteria by NA preparation method
7. Visit to nearest weather station for air pollution study
8. Estimation of SPM from atmosphere by HVAS/RDS
9. To Determine the effects of H_2S gas on Plants/Leaves/Flowers
10. To Determine the effects of air pollution on coloured cloths/wall paints/marbles
11. Study of Particulate Matter in the air

SENVC151: *Title (Minor) Curriculum Details*
Renewable Energy Resource (2 Credits)

Course pre-requisite:

- Basic understanding and interest about conventional and non-conventional energy resources.

Course objectives:

- This course will be useful to enhance the knowledge about energy resources in present generation including fundamentals of technology, management, energy conservation and energy security and to make them capable in addressing the nearby energy related issues.
- To determine the role of renewable and non-renewable energy resources and learn different utilities of energy
- To develop new methodologies to tackle problems associated with energy sector.
- To encourage students to develop and promote awareness among the society regarding energy resources and their sustainable utilization.

Course outcomes:

After successful completion of this course, a student should know

- The fundamental knowledge about different types of energy
- Depict the challenges associated with the use of different energy sources and their potential solutions
- To recognize and describe the present state of energy security and its significance.
- They will be acquainted with ideas for reducing energy impacts on the surrounding environment.
- Identify the current developments in sustainable and renewable energy

Curriculum Details: *(There shall be FOUR Modules in each course)*

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1. 0		**Introduction to Energy Resources**	**05**
	1.1	Different forms of energy	
	1.2	Sources and requirements of Energy	
	1.3	Nonrenewable energy, Renewable energy,	
	1.4	energy and the environment	
2.0		**Renewable Energy Resources**	**10**
	2.1	Introduction, Need and significance of renewable energy	
	2.2	Solar energy: Solar electricity generation, Solar heaters, Solar dryers, Solar cookers;	
	2.3	Wind energy: Wind Power plants, Wind power potential in India;	
	2.4	Geothermal energy: Sources of geothermal energy, power generation from geothermal energy, Advantages of geothermal energy;	
3.0			**05**
	3.1	Hydroelectric energy: micro hydropower, Hydropower and the environment;	
	3.2	Tidal and wave energy:	
	3.3	Ocean Thermal Energy Conservation.	
	3.4	Future prospects of Renewable energy	
4.0		**Biological Energy Resources**	**10**
	4.1	Bio Fuel: Classes of bio fuel, Sources of bio fuel, Production of bio fuel, Ethanol.	
	4.2	Biodiesel: Introduction, Plant oils used for bio diesel; Production of bio diesel: Vegetable oils as diesel fuels, Manufacturing process for bio diesel, Industrial scale production of bio diesel,	
	4.3	Biomass energy: Wood and wood waste, Biomass and the Environment.	
	4.4	Municipal solid waste, Landfill gas	
		Total	**30**

Text Books:

Fuels and Bio-fuels : Vijayalaxmi, Meena Devi, Nagendra Prasad, Agrobios (India), Jodhpur, 2007.
02. Environmental resource Conservation : S. K. Shukla, P. R. Shrivastava, Commonwealth Publishers, New Delhi, 1992.
03. Environmental Science : S. C. Santra, New Central Book Agency, Kolkata, 2005
04. Environmental Problems & Solutions : D. K. Asthana & Meera Asthana, S. Chand & Co. New Delhi, 1998
05. Environmental Science : Eldon D. Enger, J. Richard Kormelink, B. F. smith, R. J. Smith, WMC Brown Co. Dubuguelowa, 1984
06. Environmental Science : Bernard J. Neble, Richard T. Wright, Prentice Hall, New Jersey, USA, 1981
07. Non Conventional Energy Sources : S. N. Kaul, A. R. Bhalerao, R. K. Trivedy, Current Publications, Agra, 2007.
08. Fundamentals of Environmental Science : G. S. Dahliwal, G. S. Sangha, P. K. ralhan, Kalyani Publishers, New DelhI.

Reference Books:

Environmental Science : Enger Smith, Smith, W. M. C. Brown (Company Publishing)
10. Energy Management Handbook, By W.C. Turner, John Wiley and Sons
11. S. P. Sukhatme and J K Nayak, **Solar Energy - Principles of thermal collection and storage**, 3rd Ed Tata McGraw-Hill, New Delhi.
12. D. Y. Goswami, F. Kreith and J. F. Kreider, **Principles of Solar Engineering**, Taylor and Francis, Philadelphia, 2000.
14. Sunggyu Lee, **Alternative Fuels**, Applied Energy Technology Series, CRC Press
15. Sunggyu Lee, James G. Speight, Sudarshan K. Loyalka, **Handbook of Alternative Fuel Technologies**, CRC Press
16. G.N. Tiwari, M.K. Ghosal, **Fundamentals of Renewable Energy Sources**, Alpha Science Intnl. Ltd., 2007
17. H S Mukunda, **Understanding Clean Energy and Fuels from Biomass**, Wiley India
18. Sobh Nath Singh, **Non-Conventional Energy Resources**, Pearson Education
19. Nijaguna, B.T., **Biogas Technology**, New Age International publishers (P) Ltd.
20. J W Twidell & A D Weir, *Renewable Energy Resources*, ELBS, 2006
21. Tiwari GN. Ghoshal MK. *Fundamental of Renewable Energy Sources*, Narosa, 2007.

SENVG151 : Generic Elective 1: Soil Pollution

Course Structure: **Generic Elective 1** - *Teaching Scheme*

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SENVG151	**Soil pollution**	**02**	**--**	**02**	**--**	**02**

Generic Elective 1 - *Assessment Scheme*

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		Test I (4)	Test II (5)	Avg (T1+T2)/2 (6)		CA (8)	ESA (9)	
SENVG151	**Soil pollution**	10	10	10	40	--	--	50

SENVG151 : Soil pollution *(*Generic Elective 1*)*

Curriculum Details

Course pre-requisite:

This course may helps to understand the Soil pollution sources and impacts.
Also, Soil pollution control measures/technologies will help to control soil pollution problems.

Course objectives:

- The aim of this paper is to provide skills and an improved understanding of soil pollution problems and there control measures.
- To articulate interdisciplinary, historical, ethical, global and cross cultural links of environmental issues between human and natural systems.

Course outcomes:

- Students can be able to understand the sources and impacts of soil pollutants on living and nonliving things.
- Students are able to think critically and contribute to research in solving contemporary soil pollution problems with professional and ethical accountability.
- It is useful for effective management of soil pollution problems.

Curriculum Details:

Module No.	UnitNo.	Topic	Hrs. Required to cover the contents
1. 0		**Introduction to Soil pollution**	**10**
	1.1	Soil introduction, soil formation, factors affecting for soil formation, Types of soil, etc	
	1.2	Physico-chemical and biological properties of soil (texture, structure, inorganic and organic components).	
	1.3	Sources of soil pollution- Natural and Anthropogenic	
2.0		**Effects of soil pollution**	**5**
	2.1	Detrimental effects of soil pollutants on flora, fauna, contaminants in soil etc.	
	2.2	Soil pollution problems, Soil salinity, Saline soil indicators,	
	2.3	Reclamation of saline soil etc	
3.0		**Soil sampling and measurements**	**5**

	3.1	Soil sampling, measurements	
	3.2	Soil pollution and associated problems.	
	3.3	Soil pollution problems, Soil salinity, Saline soil indicators, Reclamation of saline soil, pollution minimization technologies.	
4.0		**Soil quality problems**	**10**
	4.1	Soil quality, soil nutrients	
	4.2	Soil Pollution control measures. Soil micro-organisms and their functions, Soil fertilizers,	
	4.3	Bioremediation technologies- Insitu and ex-situ bioremediation, case studies of soil pollution	
		Total	**30**

Text Books:

- B. K. Sharma, H. Kaur, "Soil and Noise Pollution", Goel Publishing House, Meerut 1994
- Dr. Aradhana Salpekar, "Solid waste pollution" Jnanada Prakashan, New Delhi, 2008.
- M. M. Rai, "Principals of soil science".
- P. C. Mishra, "Soil pollution & Soil organisms".
- B. K. Sharma, "Environmental Chemistry".
- S. C. Santra, "**Environmental Science "** New Central Book Agency, Kolkata, 2005

Reference Books:

- Baird, C., and Cann, M., Environmental Chemistry, W.H. Freeman and Company, 2008.
- Botkin, Daniel B. and Keller, Edward A. Environmental Science: Earth as a Living
- Planet. 6th ed. John Wiley & Sons, USA. 2007.
- Cunningham, W. P. and Cunningham, M. A. Principles of Environment Science.
- Enquiry and Applications. 2nd ed. Tata McGraw Hill, New Delhi. 2004.
- De, A.K., Environmental Chemistry, New Age International (P) Ltd. Publishers,
- New Delhi, 2000.
- Manahan, S. Environmental chemistry. CRC press, 2017.
- Manahan, Stanley E. Fundamentals of environmental chemistry. CRC press, 2011.

SENVG152 : Generic Elective 2: Noise and Radioactive Pollution

Course Structure: *Generic Elective 2- Teaching Scheme*

Course Code	Course Name (Paper Title)	Teaching Scheme (Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SENVG152	Noise and Radioactive Pollution	**02**	**--**	**02**	**--**	**02**

Generic Elective 2 - Assessment Scheme

Course Code (2)	Course Name (3)	Theory				Practical		Total [Col (6+7) / Col (8+9)] (10)
		CA			ESA (7)			
		Test I (4)	Test II (5)	Avg (T1+T2)/2 (6)		CA (8)	ESA (9)	
SENVG152	Noise and Radioactive Pollution	10	10	10	40	--	--	50

SENVG152 : Noise and Radioactive Pollution

(Generic Elective 2) Curriculum Details

Course pre-requisite:

This course may opt by any students from science discipline to understand the noise pollution and its control measures.

Course objectives:

- The aim of this paper is to provide skills and an improved understanding of Noise and Radioactive Pollution problems and there control measures.
- To study the impacts of noise pollution and Radioactive Pollution and their control measures

Course outcomes:

At the completion of the course the students will be able to
1. Analyze and interpret the noise pollution problems.
2. It is important to predict the noise pollution impacts due to developmental projects and engineered solutions in global and socio-economic context.
3. Students are able to think critically and contribute to research in solving contemporary noise pollution problems with professional accountability .

Curriculum Details:

Module No.	UnitNo.	Topic	Hrs. Required to cover the contents
1. 0		**Basics of Noise pollution**	**10**
	1.1	Concept of Noise pollution, sources: point and line sources, multiple sources;	
	1.2	Outdoor and indoor noise propagation , weighting networks,	
	1.3	Noise control and abatement measures:	
	1.4	Active and Passive methods of Noise Control	
2.0		**Impact of Noise pollution**	**5**
	2.1	Impact of noise and vibrations on human health.	
	2.2	Noise Menace– Prevention and Control of Noise Pollution,	
	2.3	control of transmission, protection of exposed person, Absorbent	

	2.4	Annoyance rating schemes; special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom.	
3.0		**Noise measurement**	**5**
	3.1	noise standards and limit values	
	3.2	measurement of noise indices (Leq, L10, L90, L50, LDN, TNI).	
	3.3	Noise measuring instruments and monitoring procedure,	
	3.4	case studies of Noise Pollution	
4.0		**Radioactive Pollution**	**10**
	4.1	Introduction, Sources : Natural and Anthropogenic	
	4.2	Impacts of Radioactive material	
	4.3	Radioactive pollution – sources, biological effects of ionizing radiations, radiation exposure	
	4.4	radiation standards, radiation protection, Case Studies.	
		Total	**30**

Text Books:

1. Environmental Engineering – Arcadio P. Sincero and Gregoria A. Sincero, Prentice Hall of India, 1999.
2. Environmental Pollution Control Engineering- CS Rao, Wiley Eastern Ltd., New Delhi, 1996.
3. Environmental Noise Pollution – PE Cunniff, McGraw Hill, New York, 1987.
4. Handbook of Noise Measurement – APG Peterson & EE Gross PH, Englewood cliffs New Jersey, latest edition.
5. C. S. Rao, ―Environmental Pollution Control Engineering‖, Wiley Eastern Limited, 2000

Vocational & Skill Enhancement Course

SENVV151: **Soil quality and soil health**

1. To collect the soil samples for laboratorial study
2. To determine the organic matter content from the soil samples
3. To determine the water holding capacity of soil samples
4. To determine the pH of different soil samples
5. To determine the soil salinity
6. Determination of Soil Bulk Density

Vocational & Skill Enhancement Course

SENVS151 **Energy Resources**

1. To compare the efficiency of different solar energy conversion devices
2. To estimate the tidal energy power for wind force
3. Determination of Surface Tension of a Liquid - Capillary tube method
4. Solar mapping study
5. Performance testing of solar cooker
6. Estimation of wind speed using anemometer

7. Determination of characteristics of a wind generator
8. Performance evaluation of vertical and horizontal axes wind turbine rotors.
9. Study the effect of density of water on the output power of hydroelectric generator.
10. Determination of efficiency of DC-AC inverter and DC-DC converters
11. Measurement of efficiency of solar flat plate collector
12. Estimation of power requirements of a house/institute.
13. Study on solar photovoltaic panel in series combination.
14. Study on solar photovoltaic panel in parallel combination