परिपत्रक - UG (1) ST

॥ 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

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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 राष्ट्रीय शैक्षणिक धोरण २०२० नुसार पदवी प्रथम वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, या विद्यापीठा अंतर्गत येणा–या सर्व संलग्नित महाविद्यालयामध्ये शैक्षणिक वर्ष २०२४–२५ पासून पदवीस्तरावर राष्ट्रीय शैक्षणिक धोरण –२०२० लागू करण्याच्या दृष्टीकोनातून विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत येणा–या अभ्यासमंडळांनी तयार केलेल्या पदवी प्रथम वर्षाचे अभ्यासक्रमांना मा. विद्यापरिषदेने दिनांक १५ मे २०२४ रोजी संपन्न झालेल्या बैठकीतील विषय क्रमांक १५/५९–२०२४ च्या ठरावाअन्वये मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील खालील बी. एस्सी प्रथम वर्षाचे अभ्यासक्रम (Syllabus) लागू करण्यात येत आहेत.

1) B. Sc. I year - Botany
2) B. Sc. I year - Seed Technology
3) B. Sc. I year - Horticulture
4) B. Sc. I year - Geology
5) B. Sc. I year - Dairy Science
6) B. Sc. I year -Electronics
7) B. Sc. I year - Environmental Science
8) B. Sc. I year - Fishery Science
9) B. Sc. I year - Mathematics
10) B. Sc. I year - Microbiology
11) B. Sc. I year - Agricultural Microbiology
12) B. Sc. I year - Physics
13) B. Sc. I year - Food Science
14) B. Sc. I year – Computer Science (N M D College Hingoli)

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.

डॉ. सरिता लोसरवार
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी/विवत्रंविपदवी/२०२४–२५/९१२
दिनांक १२.०६.२०२४

प्रत : १) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
३) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) मा. संचालक, सर्व संकुले परिसर व उपपरिसर, प्रस्तुत विद्यापीठ
५) मा. प्राचार्य, न्यू मॉडल डिग्री कॉलेज हिंगोली.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, सदर परिपत्रक संकेतस्थळावर प्रसिध्द करण्यात यावे.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED - 431 606 (MS)

(Credit Framework and Structure of Four Year UG Program with Multiple Entry and Exit Option as per NEP-2020)

UNDERGRADUATE PROGRAMME OF SCIENCE & TECHNOLOGY

Major in **DSC** and Minor in **DSM** (Subject)

(B.Sc. Environmental Science – I Year)

Under the Faculty of Science & Technology

(Revised as per the Govt. Of Maharashtra circular dt. 13th March 2024)

From the Desk of the Dean, Faculty of Science and Technology

Swami Ramanand Teerth Marathwada University, Nanded, enduring to its vision statement "***Enlightened Student: A Source of Immense Power***", is trying hard consistently to enrich the quality of science education in its jurisdiction by implementing several quality initiatives. Revision and updating curriculum to meet the standard of the courses at national and international level, implementing innovative methods of teaching-learning, improvisation in the examination and evaluation processes are some of the important measures that enabled the University to achieve ***the 3Es, the equity, the efficiency*** and ***the excellence*** in higher education of this region. To overcome the difficulty of comparing the performances of the graduating students and also to provide mobility to them to join other institutions the University has adopted the cumulative grade point average (CGPA) system in the year 2014-2015. Further, following the suggestions by the UGC and looking at the better employability, entrepreneurship possibilities and to enhance the latent skills of the stakeholders the University has adopted the Choice Based Credit System (CBCS) in the year 2018-2019 at graduate and post-graduate level. This provided flexibility to the students to choose courses of their own interests. To encourage the students to opt the world-class courses offered on the online platforms like, NPTEL, SWAYM, and other MOOCS platforms the University has implemented the credit transfer policy approved by its Academic Council and also has made a provision of reimbursing registration fees of the successful students completing such courses.

SRTM University has been producing a good number of high calibre graduates; however, it is necessary to ensure that our aspiring students are able to pursue the right education. Like the engineering students, the youngsters pursuing science education need to be equipped and trained as per the requirements of the R&D institutes and industries. This would become possible only when the students undergo studies with an updated and evolving curriculum to match global scenario.

Higher education is a dynamic process and in the present era the stakeholders need to be educated and trained in view of the self-employment and self-sustaining skills like start-ups. Revision of the curriculum alone is not the measure for bringing reforms in the higher education, but invite several other initiatives. Establishing industry-institute linkages and initiating internship, on job training for the graduates in reputed industries are some of the important steps that the University would like to take in the coming time. As a result, revision of the curriculum was the need of the hour and such an opportunity was provided by the New Education Policy 2020. National Education Policy 2020 (NEP 2020) aims at equipping students with knowledge, skills, values, leadership qualities and initiates them for lifelong learning. As a result the students will acquire expertise in specialized areas of interest, kindle their intellectual curiosity and scientific temper, and create imaginative individuals.

The curriculum given in this document has been developed following the guidelines of NEP-2020 and is crucial as well as challenging due to the reason that it is a transition from general science based to the discipline-specific-based curriculum. All the recommendations of the ***Sukanu Samiti*** given in the **NEP Curriculum Framework-2023** have been followed, keeping the disciplinary approach with rigor and depth, appropriate to the comprehension level of learners. All the Board of Studies (BoS) under the Faculty of Science and Technology of this university have put in their tremendous efforts in making this curriculum of international standard. They have taken care of

maintaining logical sequencing of the subject matter with proper placement of concepts with their linkages for better understanding of the students. We take this opportunity to congratulate the Chairman(s) and all the members of various Boards of Studies for their immense contributions in preparing the revised curriculum for the benefits of the stakeholders in line with the guidelines of the **Government of Maharashtra regarding NEP-2020**. We also acknowledge the suggestions and contributions of the academic and industry experts of various disciplines.

We are sure that the adoption of the revised curriculum will be advantageous for the students to enhance their skills and employability. Introduction of the mandatory ***On Job Training, Internship program*** for science background students is praise worthy and certainly help the students to imbibe firsthand work experience, team work management. These initiatives will also help the students to inculcate the workmanship spirit and explore the possibilities of setting up of their own enterprises.

Dr. M. K. Patil
Dean
Faculty of Science and Technology

From Desk of Chairman, Board of Studies of the Subject Environmental Science and Earth Science

PREAMBLE

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 B.Sc. 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. 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. Vasant Madhav Wagh
Associate Professor,
Chairman, BOS Environmental & Earth Science,
Swami Ramanand Teerth Marathwada University, Nanded.
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Details of the Board of Studies Members in the subject Environmental Science and Earth Science under the Faculty of Science & Technology, S.R.T.M. University, Nanded.

Dr. Vasant Madhav Wagh **Chairman** 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 2023 UG and PG Students	
Shaikh Humedsalman Shaikh Aminullah C/o Yeshwant Mahavidyalaya, Nanded	Maniyar Fatema Ismail C/o Maharashtra Udaygiri Mahavidyalaya, Udgir, Tq. Udgir Dist. Latur

Swami Ramanand Teerth Marathwada University, Nanded

Assigning TEN DIGIT Codes to the Courses ALPHANUMERIC Coding AAAAAA XXXX

1) First (A) Letter indicate Faculty: H – Humanities; **S** - Science; **C** – Commerce, & Management, **I** - Interdisciplinary Studies and **D** –Distance / External mode .

2) Next Three Letters(XXX) indicates Subject (e.g. **ECO** – Economics, **PHY** – Physics, **COM** – Commerce, **CSC** – Computer Sci.) etc.

3) Fourth and Fifth Letters indicate nature of the course : (e.g. **CT** – Core Theory, **CP** – Core Practical, **MT** – Minor Theory, **ET** – BOTctive Theory, **EP** – BOTctive Practical, **FP**– Field Project, **FW** – Field Work, **OJ** – On Job training, **GE** - Generic /open BOTctive, **IN** – Internship, **CS** – Case Study, **VC** - Vocational Skill Courses, **SC** - Skill Enhancement Courses, **AEC** - Ability Enhancement courses, **ML** - Modern Indian languages, **CCC** - Co-Curricular Courses/ Community Engagement and Service, **RM** - Research Methodology, **IKC** - Indian Knowledge System,**VEC** - Value Education Courses, etc.)

4) Sixth Character or First Number: indicate the Centre (**1**- for Affiliated colleges, **2** -Main Campus, **3**- Model Degree College, **4**- Sub-Centre Latur, **5**-Sub-Centre Parbhani, **6** –Sub-Centre Kinwat)

5) Seventh Character or second number indicate -Year of Study.e.g.**1** - First year,**2**- second year.etc.

6) Last Two Numbers indicate Course Number

e.g. **SPHYCT1101** – Faculty of **Science & Technology (S) PHYSICS** (PHY) subject **Core Theory** (**CT**) Course offered in the First Semester in affiliated colleges

Sr. No	UG/PG	Semester	Affiliated Colleges	Main Campus	Model Degree College	Sub-center Latur	Sub-center Parbhani	Sub-Centre Kinwat
1	First Year	Semester I	1101 to 1150	2101 to 2150	3101 to 3150	4101 to 4150	5101 to 5150	6101 to 6150
2		Semester II	1151 to 1199	2151 to 2199	3151 to 3199	4151 to 4199	5151 to 5199	6151 to 6199
3	Second Year	Semester III	1201 to 1250	2201 to 2250	3201 to 3250	4201 to 4250	5201 to 5250	6201 to 6250
4		Semester IV	1251 to 1299	251 to 2299	3251 to 3299	4251 to 4299	5251 to 5299	6251 to 6299
5	Third Year	Semester V	1301 to 1350	2301 to 2350	3301 to 3350	4301 to 4350	5301 to 5350	6301 to 6350
6		Semester VI	1351 to 1399	2351 to 2399	3351 to 3399	4351 to 4399	5351 to 5399	6351 to 6399
7	Fourth Year	Semester VII	1401 to 1450	2401 to 2450	3401 to 3450	4401 to 4450	5401 to 5450	6401 to 6450
8		Semester VIII	1451 to 1499	2451 to 2499	3451 to 3499	4451 to 4499	5451 to 5499	6451 to 6499
9	Fifth Year	Semester IX	1501 to 1550	2501 to 2550	3501 to 3550	4501 to 4550	5501 to 5550	6501 to 6550
10		Semester X	1551 to 1599	2551 to 2599	3551 to 3599	4551 to 4599	5551 to 5599	6551 to 6599

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

Teaching Scheme

	Course Code	CourseName	CreditsAssigned			TeachingScheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	SENVCT1101	Fundamentals of Environmental Science	02	--	**04**	02	--
	SENVCP1101	Practical Based on SENVCT 1101	-	02			04
Optional 2	SDSCMT1101	Title of paper 1	02	--	**04**	02	--
	SDSCMP1101	Title of paper 2 (practical)	-	02			04
Optional 3	SDSCMT1101	Title of paper 1	02	--	**04**	02	--
	SDSCMP1101	Title of paper 2 (practical)	-	02			04
Generic Electives *(from other Faculty)*	SENVGE1101	Environmental Awareness (Basket 3 of respective faculty)	02	--	**02**	02	--
Skill Based Course (related to Major)	SENVSC1101	Training course for water Quality Assessment	--	02	**02**	--	04
Ability Enhancement Course	AECENG1101	L1 – Compulsory English	02	--	**02**	02	--
Indian Knowledge System (IKS)	IKSXXX1101	SBOTct from **Basket 5**	02	--	**02**	02	--
Community Engagement Services (CES)	CCCXXX1101	Any one of NCC/ NSS /Sports/ Culture /Health Wellness /Yoga Education / Fitness **(Basket 6)**	-	02	**02**	--	04
Total Credits			**14**	**08**	**22**	**12**	**20**

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

Examination Scheme

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits assigned to individual paper)

Subject (1)	Course Code (2)	CourseName (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Average of T1 & T2 (6)	Total (7)	CA (8)	ESA (9)	
Optional 1	SENVCT1101	Fundamentals of Environmental Science	10	10	10	40	--	--	50
	SENVCP1101	Practical Based on SENVCT 1101	--	--	--	--	20	30	50
Optional 2	SDSCMT1101	Title of paper 1	10	10	10	40	--	--	50
	SDSCMP1101	Title of paper 2 practical	--	--	--	--	20	30	50
Optional 3	SDSCMT1101	Title of paper 1	10	10	10	40	--	--	50
	SDSCMP1101	Title of paper 2 practical	--	--	--	--	20	30	50
Generic elective	SENVGE1101	Environmental Awareness (Basket 3)	10	10	10	40	--	--	50
Skill Based Course	SENVSC1101	Training course for water Quality Assessment	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1101	**L1 – Compulsory English**	10	10	10	40	--	--	50
Indian Knowledge System	IKSXXX1101	Title **(Basket 5)**	10	10	10	40	--	--	50
Community Engagement Services (CC)	CCCXXX1101	Any one of NCC/ NSS/Sports/ Culture /Health Wellness /Yoga Education / Fitness **(Basket 6)**	--	--	--	--	20	30	50

B. Sc. FIRST YEAR Environmental Science

SEMESTER – I

SENVCT1101: Fundamentals of Environmental Science (2 credit)

Course pre-requisite:

- The paper deals with fundamental knowledge of Environment which include soil and water and circulations of various elements in nature, meteorological phenomena, and atmospheric chemistry.

Course Objectives:

- To built-up scientific approach towards Environment.
- To acquire the knowledge necessity of elements and its circulations in nature
- To built-up scientific approach towards Environment

Course Outcomes:

- To built-up scientific approach towards Environment.
- To acquire the knowledge necessity of elements and its circulations in nature
- To built-up scientific approach towards Environment

Curriculum Details:

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Origin & Evolution of Biosphere**	**07**
	1.1	Introduction to Origin & Evolution of Biosphere	
	1.2	Early Lifeforms: fossils	
	1.3	Origin of life Chemical Basis	
	1.4	Evolution of Lifeforms through Ages	
2.0		**Concept & Scope**	**08**
	2.1	Concept, Principle and Scope of environment	
	2.2	Global environmental problems	
	2.3	Need of Environmental Education & awareness	
	2.4	Interaction between Earth, Man and Environment	
3.0		**Structure & Composition**	**07**
	3.1	Biosphere: Introduction, components	
	3.2	Hydrosphere: Structure of water, properties of water	
	3.3	Lithosphere: Origin, Soil Formation, Soil Properties	
	3.4	Atmosphere: Structure, composition	
4.0		**Biogeochemical Cycles**	**08**
	4.1	Introduction & Types of Biogeochemical cycles	
	4.2	Significance of Biogeochemical Cycles	
	4.3	Gaseous cycles: Nitrogen, Carbon, Oxygen, Water	
	4.4	Sedimentary Cycles: Phosphorus and Sulphur	
		Total	**30**

TextBooks:

- Principles of Ecology: P. S. Verma, V. K. Agarwal S. Chand and Co. New Delhi .
- Environmental Biology : P. D. Sharma Rastogi Publications, Meerut .
- Ecology and Environment : P. D. Sharma Rastogi Publications, Meerut .
- Principles of Environmental Biology : P. K. G. Nair Himalaya Publishing House, New Delhi .

- Environmental Biology : M. P. Arora Himalaya Publishing House, New Delhi
- General Ecology : H. D. Kumar , Vikas Publishing house, New Delhi
- BOTments of Ecology : Brijgopal, N. Bharadwaj Vikas Publishing house, New Delhi.
- Concepts of Ecology : N. Arumugam Saras Publication, Kottar, Dist. Kanyakumari .
- Plant Ecology : P. L. Kochhar
- A textbook of Environmental Studies : G. R. Chatwal, Harish Sharma, Himalaya Publishing House, New Delhi

Reference Books:

- *Fundam*entals of Ecology: Eugene P. Odum, Natraj Publishers, Dehradun…
- Ecology and Field Biology : Robert Leo Smith Harper Collins college publication
- Environmental Ecology : Bill Freedman Academic Press, New York
- Environmental Science :New Central Book Agency ,Kolkata

SENVCP 1101: Practical Based on (SENVCT 1101) Fundamentals of Environmental Science (2 credits)

Course pre-requisite:

- Basic knowledge of components of Environment
- Must have knowledge of different environmental processes
- Student must know and aware about water resources

Course objectives:

- To develop an understanding of the interdisciplinary and holistic nature of the environment;
- To develop knowledge and understanding of environmental issues and principles and the ability to apply these to environmental management;
- To develop the ability to collect, collate, analyze and interpret environmental data;
- To assess physicochemical and biological water quality assessment and indices
- 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:

- To develop the ability to analyze water quality parameters;
- To study the sampling techniques of water collection, analysis and interpretation
- To foster positive attitudes, values and commitment to identifying, solving and preventing environmental problems;
- To resolve or give solution to the problems associated with water shortages in India

Curriculum Details: SENVCP 1101: Practical Based on SENVCT 1101

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1	Collection & Preservation of Water Samples	4
2	Measurement of rain fall by rain gauge.	4
3	Determination of wind velocity by anemometer.	4
4	Determination of wind direction by wind vane	4
5	Determination of the Color of given Water Sample	4
6	Determination of the odour of given Water Sample	4
7	Determination of the pH of given Water Sample	4
8	Determination of Residual chlorine from provided water sample	4
9	Determination of Turbidity from provided water sample by Turbidity meter.	4
10	Determination of conductivity by conductivity meter.	4
11	Determination of TDS of water.	4
12	To study the water sampling methods	4
13	Determination of Oil & Grease from Water sample	4
14	Estimation of Dissolved Oxygen from water by Winkler's method	4
15	Visit to Water reservoirs/Lakes/Rivers and water treatment plants and submission of Report	4
	Total	**60**

Text Books and Reference Books:

- Environmental Chemistry: B.K. Sharma, and H. Kaur, Goel Publishing House.
- Environmental Chemistry by A K. De, New Age International Publishers
- BOTments of Environmental Chemistry: H.V. Jadhav.

SENVGE 1101: Environmental Awareness (2 credits)

Course pre-requisite:

- The course is offered for a student registered for undergraduate programme in the Faculty of Science and Technology who had primary training in the field of Environmental Science at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in Environmental Science as Major subject.
- The students should have basic knowledge of Environment science.

Course objectives:

- To aware about Environmental issues.
- To Understand Man and Environment
- To create Environmental Awareness

Course outcomes:

- Students will know how to protect our Environment.
- Students will understand Environmental processes.
- Students will able to communicate among the Society about Environmental awareness.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introduction**	**07**
	1.1	Environment, Ecology, Ecosystems.	
	1.2	Importance of Biogeochemical Cycles.	
	1.3	Concept of Biodiversity, India as a megadiverse nation.	
	1.4	Biotic-Producers, Consumers and Decomposers.	
2.0		**Environmental Pollution**	**08**
	2.1	Definition of Pollution; Causes and effects.	
	2.2	Air Water, Soil and Noise pollution.	
	2.3	Solid waste: causes, effects.	
	2.4	Nuclear hazard causes, effects.	
3.0		**Global Issues**	**07**
	3.1	Photochemical Smog	
	3.2	Ozone layer depletion and Climate Change	
	3.3	Greenhouse effect and Global Warming.	
	3.4	Acid rain, deforestation etc	
4.0		**Role of an Individual in Pollution Mitigation**	**08**
	4.1	Environmental Education & Sensitization, Role of an Individual	
	4.2	Environmental summits and issues	
	4.3	Environmental Laws	
	4.4	Sustainable Development, Environmental policies and planning	
		Total	**30**

Text Books:

1. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
2. Rosencranz, A., Divan, S., & Noble, M.L. 2001. Environmental law and policy in India. Tripathi 1992.
3. Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
4. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent. Warren, C. E. 1971. Biology and Water Pollution Control. WB Saunders.
5. World Commission on Environment and Development. 1987. Our Common Future. Oxford University Press.
6. A textbook of Environmental Chemistry and Pollution Control S.Chand and Company Ltd. 1998.
7. Environmental Chemistry by B.K. Sharma Krishna Prakashan 2014.

Reference Books:

1. Essentials of Ecology and Environmental Science Third Edition S.V.S. Rana Prentice Hall India New Delhi.
2. Environmental Pollution and Health hazards in India R. Kumar Efficient Offset Printers New Delhi.
3. Principles of Environmental Science, William P. Cunningham, Marry Ann Cunningham.Tata Mc Graw Publishing Company Ltd. New Delhi.
4. Environmental Encyclopedia William P Cunningham, Terence H Cooper , Eville Gorham and Malcolm T HepworthJaico Publishing Chennai

SENVSC 1101: Training course for water Quality Assessment (2 credits)

Course pre-requisite:

- The course is offered for a student registered for undergraduate program in the Faculty of Science and Technology who had primary training in the field of Environmental Science at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in Environmental Science as Major subject.
- The students should have basic knowledge of Environment science.

Objectives:

The main objective of course is to improve the awareness and skills of the students in modern techniques of analysis of water for research and extension activities. Use of instruments and their general upkeep / maintenance, interpretation of analytical data and formulation of reports / recommendations...

Learning Outcomes

- Acquire the skill of water quality testing.
- It helps to get knowledge of equipment required for water quality testing.
- This course helps to file written reports on their findings of water analysis.
- This course gives the skill of survey, Laboratory analysis and interpretation of results

Curriculum Details: SENVSC 1101: Training course for water Quality Assessment

Sr. No	Practical Exercises	Hrs. Required
1	Collection of Water Sample	4
2	Preservation of Water Sample	4
3	Determination of the pH of given Water Sample	4
4	Determination of Electrical conductivity from provided water sample	4
5	Determination of Turbidity from provided water sample by Turbidity meter.	4
6	Determination of conductivity from provided by conductivity meter.	4
7	Determination of TDS from provided water sample	4
8	Estimation of CO2 from provided water sample	4
9	Determination of Oil & Grease from Water sample	4
10	Estimation of Dissolved Oxygen from water by Winkler's method	4
11	Estimation of Alkalinity of provided water sample.	4
12	Estimation of Acidity from provided water sample.	4
13	Estimation of total hardness from water sample by E. D. T. A. method.	4
14	Estimation of calcium and magnesium from water samples	4
15	Estimation of chlorides from water sample by Argentometric method.	4
	Total	**60**

Reference Books:

- Hand Book of Methods in Env. Studies by S. K. MAITI, ABD Publishers, Jaipur, India.
- Instrumental Methods of Chemical Analysis G. R. Chatwal and Anand Himalaya Publishing house, New Delhi.
- Environmental Science Principle & Pract. R. C. Das & Behera Prentice Hall of India Pvt. Ltd. New Delhi

ENVIRONMENTAL SCIENCE- CURRICULUM

B. Sc. FIRST YEAR

SEMESTER – II

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

Teaching Scheme

	Course Code	CourseName	CreditsAssigned			TeachingScheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	SENVCT1151	Basic Concepts in Ecology	02	--	**04**	02	--
	SENVCP1152	Practical Based on SENVCT 1151	-	02			04
Optional 2	SDSCMT1101	Title of paper 1	02	--	**04**	02	--
	SDSCMP1101	Title of paper 2 (practical)	-	02			04
Optional 3	SDSCMT1101	Title of paper 1	02	--	**04**	02	--
	SDSCMP1101	Title of paper 2 (practical)	-	02			04
Generic BOTctives *(from other Faculty)*	SENVGE1151	Environment & Society	02	--	**02**	02	--
Skill Based Course (related to Major)	SENVSC1151	Soil Quality & Soil Health	--	02	**02**	--	04
Ability Enhancement Course	AECENG1101	L1 – Compulsory English	02	--	**02**	02	--
Indian Knowledge System (IKS)	IKSXXX1101	SBOTct from **Basket 5**	02	--	**02**	02	--
Community Engagement Services (CES)	CCCXXX1101	Any one of NCC/ NSS /Sports/ Culture /Health Wellness /Yoga Education / Fitness **(Basket 6)**	-	02	**02**	--	04
Total Credits			**14**	**08**	**22**	**12**	**20**

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

Examination Scheme

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits assigned to individual paper)

Subject (1)	Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Average of T1 & T2 (6)	Total (7)	CA (8)	ESA (9)	
Optional 1	SENVCT1151	Basic Concepts in Ecology	10	10	10	40	--	--	50
	SENVCP1152	Practical Based on SENVCT 1151	--	--	--	--	20	30	50
Optional 2	SDSCMT1101	Title of paper 1	10	10	10	40	--	--	50
	SDSCMP1101	Title of paper 2 practical	--	--	--	--	20	30	50
Optional 3	SDSCMT1101	Title of paper 1	10	10	10	40	--	--	50
	SDSCMP1101	Title of paper 2 practical	--	--	--	--	20	30	50
Generic BOTctive	SENVGE1151	Environment & Society	10	10	10	40	--	--	50
Skill Based Course	SENVSC1151	Soil Quality & Soil Health	--	--	--	--	20	30	50
Ability Enhancement Course	AECENG1101	**L1 – Compulsory English**	10	10	10	40	--	--	50
Indian Knowledge System	IKSXXX1101	Title **(Basket 5)**	10	10	10	40	--	--	50
Community Engagement Services (CC)	CCCXXX1101	Any one of NCC/ NSS/Sports/ Culture /Health Wellness /Yoga Education / Fitness **(Basket 6)**	--	--	--	--	20	30	50

SENVCT1151: Basic Concepts in Ecology (2 credits)

Course pre-requisite:

- The course is offered for a student registered for undergraduate programme in the Faculty of Science and Technology who had primary training in the field of Environmental Science at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in Environmental Science as Major subject.
- The students should have basic knowledge of Environment science.

Course objectives:

- To get familiarity with the basic concepts of Ecology.
- To understand the relationship of Abiotic and biotic factors.
- To know how the nature is working in all together.

Course outcomes:

- Students will know how both the factors are important for living system.
- Students will understand the benefits of adaptations. They will learn how important is species diversity to maintain the ecological balance

Curriculum Details SENVCT1151: Basic Concepts in Ecology

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introduction**	**07**
	1.1	Introduction of Ecology: Definition, Scope, Relation to Other Disciplines	
	1.2	Applications and Significance to Human Beings	
	1.3	Environmental Factors: A biotic- water, sunlight, temperature, soil, Humidity, wind	
	1.4	Biotic-Producers, Consumers and Decomposers.	
2.0		**Ecosystems**	**08**
	2.1	Aquatic ecosystem: Pond, Lake, River, Marine	
	2.2	Terrestrial ecosystem. biome. Deforestation; Desertification; Afforestation, Conservation of forest	
	2.3	Food chain: Grazing food chain, Detritus food chain; Food web,	
	2.4	Ecological pyramids: Pyramid of Number, Biomass and Energy.	
3.0		**Ecological Relationship and Adaptations**	**07**
	3.1	Ecological Relationship: Inter specific and intra-specific relationships- Neutralisms, Mutualism, Commensalisms, Ammensilism, Antagonisms,	

	3.2	Antagonistic Relationships, Symbiosis, Parasitism, Competition, Predation	
	3.3	Ecological adaptations: Adaptations in plants- Hydrophytes, Mesophytes, Xerophytes.	
	3.4	Adaptations in Animals- Aquatic and desert.	
4.0		**Community Ecology and Ecological Succession**	
	4.1	Community Ecology: Introduction and Definition,	
	4.2	Characteristics – Species Diversity, Growth Form, Dominance, Tropic Structure, Density. Frequency, Abundance.	**08**
	4.3	Ecological Niche, Eco-tone and Edge Effect.	
	4.4	Ecological Succession: Definition, Types of Ecological Succession.	
		Total	**30**

Text Books:

1.. Principles of Ecology: P. S. Verma, V. K. Agarwal S. Chand and Co. New Delhi .

2. Environmental Biology: P. D. Sharma Rastogi Publications, Meerut .

3. Ecology and Environment: P. D. Sharma Rastogi Publications, Meerut .

4. Principles of Environmental Biology: P. K. G. Nair Himalaya Publishing House, New Delhi .

5. Environmental Biology: M. P. Arora Himalaya Publishing House, New Delhi

6.. General Ecology: H. D. Kumar , Vikas Publishing house, New Delhi

7.. BOTments of Ecology: Brijgopal, N. Bharadwaj Vikas Publishing house, New Delhi.

8. Concepts of Ecology: N. Arumugam Saras Publication, Kottar, Dist. Kanyakumari .

9. Plant Ecology: P. L. Kochhar

10. A textbook of Environmental Studies: G. R. Chatwal, Harish Sharma, Himalaya Publishing House, New Delhi

Reference Books:

1. Fundamentals of Ecology: Eugene P. Odum, Natraj Publishers, Dehradun…

2. Ecology and Field Biology: Robert Leo Smith Harper Collins college publication

3.. Environmental Ecology: Bill Freedman Academic Press, New York

SENVCP1152: Practical Based on SENVCT1151 (2 credits)

Course pre-requisite:

- The course is offered for a student registered for undergraduate programme in the Faculty of Science and Technology who had primary training in the field of Environmental Science at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in Environmental Science as Major subject.
- The students should have basic knowledge of Environment science.

Course objectives:

- To enhance the knowledge about Physico chemical Analysis of Water
- To develop new methodologies to tackle environmental Problems.
- To encourage students to develop and promote awareness among the society regarding Ecology
- To understand chemical laboratory safety guidelines.

Course outcomes:

- To develop an understanding of the interdisciplinary and holistic nature of the environment;
- To develop knowledge and understanding of environmental issues and principles and the ability to apply these to environmental management;
- To develop the ability to collect, collate, analyze and interpret environmental data;
- To assess physicochemical and biological water quality assessment

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1	Measurement of Atmospheric Humidity by Psychrometer.	4
2	Measurement of Light intensity by Lux meter.	4
3	Measurement of Relative Humidity	4
4	Determination of Plant population density	4
5	To determine the soil temperature by soil thermometer	4
6	Measurement of turbidity	4
7	Identification and description of Phytoplankton's	4
8	Identification and description of Zooplankton's	4
9	Study of Vegetation density by quadrant method.	4
10	Study of vegetation frequency by quadrant method	4
11	Study of Drinking water Standards	4
12.	Estimation of CO2 from provided water sample	4
13.	Determination of Oil & Grease from Water sample	4
14.	Estimation of Dissolved Oxygen from water by Winkler's method	4
15	Visit to Forest Reserve/National Park/Sanctuaries/Water reservoirs, and submission of Report	4
	Total	**60**

SENVGE 1151: ENVIRONMENT AND SOCIETY (2 credits)

Course pre-requisite:

- The course is offered for a student registered for undergraduate programme in the Faculty of Science and Technology who had primary training in the field of Environmental Science at higher secondary school level evident in terms of certificate by CBSC/ ICSC/HSC for entry level core courses in Environmental Science as Major subject.
- The students should have basic knowledge of Environment science.

Course objectives:

- To aware about Environmental issues.
- To Understand Man and Environment
- To create Environmental Awareness

Course outcomes:

- Students will know issues in Environment.
- Students will understand conflict between development & Environment .

Curriculum details SENVGE1151: Environment and Society

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Introduction**	**07**
	1.1	Social and cultural construction of environment	
	1.2	Environmental thought from historical and contemporary perspective	
	1.3	Concepts of Gross Net Happiness	
	1.4	Concept of Aldo Leopold's Land Ethic	
2.0		**Issues of Environment**	**07**
	2.1	Significant global environmental issues such as acid rain, climate change, and resource depletion;	
	2.1	Historical developments in cultural, social and economic issues related to land, forest, and water management in a global context;	
	2.2	Interface between environment and society.	
	2.3	National issues of Environment	
3.0		**Development-environment conflict**	**08**
	3.1	Developmental issues and related impacts such as ecological degradation; environmental pollution;	
	3.2	Development-induced displacement, resettlement, and rehabilitation: problems, concerns	
	3.3	Compensative mechanisms; discussion on Project Affected People (PAPs).	
	3.4	Development-environment conflicts in India	
4.0		**Urbanization and environment**	**08**
	4.1	Production and consumption-oriented approaches to environmental issues in Indian as well as global context	
	4.2	Urban sprawl, traffic congestion and social-economic problems;	
	4.3	Impact of industry and technology on environment;	
	4.4	Urbanization and society, Conflict between economic and environmental interests.	
		Total	**30**

Reference Books:

1. Chokkan, K.B., Pandya, H. &Raghunathan, H. (eds). 2004. Understanding Environment. Sagar Publication India Pvt. Ltd., New Delhi.
2. Elliot, D. 2003. Energy, Society and Environment, Technology for a Sustainable Future Routledge Press.
3. Guha, R. 1989. Ecological change and peasant resistance in the Himalaya. Unquiet Woods,Oxford University Press, Delhi.
4. National Research Council (NRC). 1996. Linking Science and Technology to Society's Environmental Goals. National Academy Press.
5. Pandit, M.K. 2013. Chipko: Failure of a Successful Conservation Movement. In: Sodhi, N.S.,Gibson, L. & Raven, P.H. Conservation Biology: Voices from the Tropics. pp. 126-127. Wiley-Blackwell, Oxford, UK.
6. Environmental Chemistry : B. K. Sharma Goel Publishing House, Meerut.
7. Environmental Science :Enger Smith, Smith, W. M. C. Brown , Company Publishing.
8. Fundamentals of Environmental Science : G. S. Dahliwal, G. S. Sangha, P. K. ralhan, Kalyani Publishers, New Delhi
9. Textbook of Environmental Studies for Undergraduate Courses: ErachBharucha (Universities Press), 2013.
10. Introduction to Environmental Science: Y. Anjaneyulu (B.S. Publication), 2008.
11. Environmental Science: UGC NET/SET (Danika Publishing Company), 2018.

SENVSC1151: Soil Quality & Soil Health

Objectives of Course:

To provide soil Quality testing for scientific farming with formalized way to build fundamental knowledge and skill in areas of soil sciences & Health

Course Outcomes:

- Acquire the skill of soil Quality testing.
- It helps to get knowledge of equipment required for soil testing.
- This course helps to file written reports on their findings of soil testing.
- This course gives the skill of survey, Laboratory analysis, and interpretation of results

Sr. No	Practical Exercises	Hrs. Required to cover the contents
1	Study of Soil sampling and collection methods	
2	To determine the soil temperature by soil thermometer	4
3	Determination of Total organic matter by Ignition method	4
4	Determination of Soil pH	4
5	Determination of water holding capacity of soil.	4
6	Determination of N. P. K.	4
7	Determination of bulk density of soil.	
8	Determination of soil conductivity.	4
9	Determination of Sodium from soil sample.	4
10	Determination of carbonates and Bicarbonates from soil sample	4
11	Determination of specific gravity of soil.	4
12	To identify the soil profile in the field	4
13	Determination of Texture from soil.	4
14	Identification of soil colour using Munshell Chart	4
15	Field visit to Agricultural area/Forest area/Grass-land and submission of Report	4
	Total	**60**

Reference Books:

• The Nature and Properties of Soils (Brady and Weil; Pierson/Prentice Hall Publisher) The current edition is the 14th edition.
• Hand Book of Methods in Env. Studies by S.K. MAITI ABD Publishers, Jaipur, India
• Environmental Science Principle & Pract. R.C. Das & Behera Prentice Hall of India Pvt. ltd. New Delhi 978-81-203-3330-7

Guidelines for the Course Assessment:

A. Continuous Assessment (CA) (20% of the Maximum Marks) of theory and practical courses:

i. **For Theory Course:** CA shall form 20% of the Maximum Marks and shall be carried out over the entire semester. It shall be done by conducting **Two Tests** (Test I on 40% curriculum) and **Test II** (on remaining 40% syllabus) and average of the marks scored by a student in these two tests of a particular paper shall be taken as the **CA** score.

ii. **For Practical Course:** CA score of the practical course shall be marks scored by a student in the internal practical examination conducted by the concerned teacher.

B. End Semester Assessment (80% of the Maximum Marks) of theory and practical courses:

(For illustration a paper of 02 credits, 50 marks has been considered and shall be modified appropriately depending upon credits of the individual paper)

Question Paper Pattern of the ESA:

i. **ESA Question paper shall consist 6 questions, each of 10 marks**
ii. **Question No.1 shall be compulsory and shall be based on the entire syllabus**
iii. Students shall have to solve ***ANY THREE*** of the remaining Five Questions (i.e. from question 2 to 6)
iv. **Students shall have to solve a TOTAL of 4 Questions.**

C. Assessment of On Job Training (OJT) Course (for 04 credits):

a. Continuous assessment part (**40%, 40 marks out of 100**) of this course shall be done by the mentor of the student, where he /she is supposed to complete his On Job Training. This shall be based on the regularity, participation and performance of the students at the place of OJT.

b. Semester End Assessment (ESA) (**60% of the total marks, 60 marks out of 100**) of this course shall be done by a panel of examiners in two parts

i. based on the work report submitted by the student (**50% i.e. 30 marks)** and

ii. **Remaining 50%** (30 marks) shall be based on his presentation and viva-voce on the work carried to be assessed by the panel of examiners. This assessment shall be done along with practical examinations of respective courses / subjects.

D. Assessment of Field Project (FP) and Research Project (RP) (e.g. for 02 credits)

a. Continuous assessment part (**40%, 20 marks out of 50**) of this course shall be done by the mentor of the student and shall be based on regularity, experimental work and performance of the student.

b. Semester End Assessment (ESA) (**60% of the total marks, 30 marks out of 50**) of this course shall be done shall be done by a panel of examiners in two parts

i. based on the work report submitted by the student (**50% i.e. 30 marks)** and

ii. **Remaining 50%** (30 marks) shall be based on his presentation and viva-voce on the work carried out by the student. This assessment shall be done along with practical examinations of the respective courses / subjects.

E. Assessment of Co-Curricular courses (CCC):

a. Assessment of the CCC course shall be done by the respective course coordinator as a part of CA and be based on the regularity, performance of a student and his participation in various activities as prescribed in the regulations prepared in this regard.

b. The End Semester Assessment (ESA) of the CCC courses shall be done as per the regulations prepared in this regard and shall be done on the basis of the write-up, presentation by the student on the activities that he has carried out in a semester.

c. Students shall have freedom to opt for more than one CCC courses. However, score of the best performing CC shall be considered for preparing his result.

F. Syllabi, Teaching and Examination Scheme for the courses in Column 7 and Column 8 (AEC, VEC, IKS, CI, EVS, CCCs, etc.) shall be common for all the students from different faculties.

Note: Number of lectures required to cover syllabus of a course depends on the number of credits assigned to a particular course. One credit of theory corresponds to 15 Hours lecturing and for practical course one credit corresponds to 30 Hours. For example, for a course of two credits 30 lectures of one hour duration are assigned, while that for a three credit course45 lectures.