



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 तृतीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६-२७ पासून लागू करण्याबाबत.

परिपत्रक

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २२ एप्रिल २०२६ रोजी संपन्न झालेल्या मा.विद्यापरिषद बैठकीतील विषय क्र.०८/६४-२०२६ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण-२०२० नुसार पदवी तृतीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६-२७ पासून लागू करण्यास मा.विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी.एस्सी. तृतीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६-२७ पासून लागू करण्यात येत आहे.

01	B.Sc. III Year Botany	10	B.Sc. III Year Biochemistry
02	B.Sc. III Year Chemistry	11	B.Sc. III Year Agriculture Microbiology
03	B.Sc. III Year Mathematics	12	B.Sc. III Year Electronics
04	B.Sc. III Year Zoology	13	B.Sc. III Year Seed Technology
05	B.Sc. III Year Microbiology	14	B.Sc. III Year Horticulture
06	B.Sc. III Year Geology	15	B.Sc. III Year Analytical Chemistry
07	B.Sc. III Year Environment & Earth Science	16	B.Sc. III Year Agrochemical & Fertilizers
08	B.Sc. III Year Statistics	17	B.Sc. III Year Industrial Chemistry
09	B.Sc. III Year Dairy Science	18	B.Sc. III Year Industrial Microbiology

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.

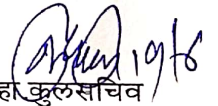
'ज्ञानतीर्थ' परिसर,

विष्णुपुरी, नांदेड - ४३१ ६०६.

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दिनांक : १९.०६.२०२६




सहा कुलसचिव

शैक्षणिक (१-अभ्यासमंडळे) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :-

- १) मा. कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ.
- २) मा. प्र.कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ
- ३) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
- ४) मा. संचालक, परिक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
- ५) मा. प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.



**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 – III 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.
Mobile: 9881737252
E- Mail: wagh.vasant@gmail.com

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 Sudhakarrrao 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
Invitee members	
1) Dr. Amol Late Shivneri mahavidalya, Shiruranantpal 2) Dr. Rangnath Mahadev Gochade Shri Renuka Devi Arts, Commerce and Science College, Mahur 3) Dr. Ashish Diwde HJPM, HimayatNagar 4) Dr. Anand Renukadas Ashturkar Netaji subhashchandra Bose College, Nanded	5) Dr. Rahul Apte Sanjivani Mahavidyalaya, Chapoli 6) Dr. Krishnanand Bhaurao Patil H. J. P. Mahavidyalaya, Himayatnagar, Dist. Nanded 7) Dr. Abhijit Ashokrao Kandlikar Shrirenukadevi Art's Commerce and Science College, Mahur



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

General Guidelines for Selection of Courses

- i. The **Major subject** is the discipline or course of main focus, bachelors' degree shall be awarded in that Discipline / subject.
- ii. **Minor Subject(s)** is/are the subjects from the same discipline / faculty and shall act as supporting subjects to the Major.
- iii. At the entry level of the 3/4-year UG program students shall be required to choose any **THREE** of the available subjects in a college/institute as **Major (Optional 1), Minor 1 (Optional 2) and Minor 2 (Optional 3) subjects, respectively**
- iv. No. of credits assigned to the **Major (Optional 1), Minor 1 (Optional 2) and Minor 2 (Optional 3) shall be same in Semesters I and II.**
- v. **In the second year of the degree program students shall select one of the three subjects (Optional 1, 2 and 3) as a Major Subject and one as Minor Subject, while third optional shall be discontinued.**
- vi. Students shall have an option to switch over from **Major to Minor or vice-versa after first year.**
- vii. Once they finalize their **Major subject** in the beginning of the second year of the programme, they shall pursue their further education in that particular subject as the **Major** subject. Therefore, from second year onwards curriculum of the **Major** and **Minor** subjects shall be different.
- viii. Students are required to select **Generic /Open Elective (vertical 3 in the credit framework) compulsorily from the faculties different than that of their Major / Minor subjects** (select from **Basket 3**).
- ix. **Content and other details of the GE are available in the document prepared by the respective BOS from which the candidate has chosen his/her GE.**
- x. Students shall be required to complete the Skill based courses of 06 credits in the first two years.
- xi. Vocational Courses (VSEC or VSC) shall be related to the **Major** course
- xii. Ability Enhancement Courses (AEC):
 - a) English Communication Course (Language) of 2 credits shall be offered in Semester I and III
 - b) Modern Indian Languages shall be of 2 credits and shall be offered in Semester II and IV
- xiii. Courses marked as VEC, CI, IKS and CCC in Column Nos. 7 and 8 shall be common for all the students irrespective of their faculties of studies.
- xiv. Curriculum of VEC, CI, IKS and CCC shall be provided by the University separately.



**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,
NANDED - 431 606**

**Summary of the Credits Assigned to various courses to be proposed by the Board of
Studies under the Faculty of Science and Technology**

A. No. Of Credits assigned to various courses:

Sr No.	Heads	Credits assigned in each Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Major Subject	4	4	8	8	16	16	18/14	18/14	92/84
2	Minor 1 Subject	4	4	2	2	--	--	--	--	12
3	Minor 2 Subject	4	4	--	--	--	--	--	--	08
3	Generic Electives / Research Methodology	2	2	4	2	--	--	4	--	10 + 4 (14)
4	Vocational and Skill Enhancement Course / Indian Knowledge System	2	2	2	2	4	2	--	--	8+6 (14)
5	Ability Enhancement Course L1 (English)	2	--	2	--	--	--	--	--	4
6	Ability Enhancement Course L2 (SL)	--	2	--	2	--	--	--	--	4
7	Value Added Course /IKS (Constitution of India / EVS)	2	2	--	2	--	--	--	--	6
8	Community Engagement Services NCC/NSS/Sports/Culture	2	2	2	2	--	--	--	--	8
9	Project/ Field Work/ OJT /Internship	--	--	2	2	2	4	--/4	4/8	14/22
10	Total Credits	22	22	22	22	22	22	22	22	176

1. Major Courses (92 / 84 credits, Basket-1): Each BOS shall suggest Major Courses of 04 credits (02 credit Theory and 02 credit practical papers) for semesters I and II

As the University has adopted Three Optional credit framework, therefore, every student have a freedom to chose three courses of his choice from among the options made available by a particular college / institute. As number of credits assigned to all the three optional are same, therefore, he / she have a freedom to select any one of them as Major and one as Minor course from second year onward.

- 2. Minor Courses (20 + 04 credits, Basket-2): Total numbers of credits assigned to the Minor Courses are 20 and a course on Research Methodology of 4 credits in VIIth semester.**
- [Note: *i.* Each Board of studies is required to develop curriculum of **two theory papers and a practical course each of 02 credits**. This would be **common for major and minor courses** during semesters I and II. **No need of preparing Minor courses separately for First Year.**
- ii.* Students have option to select any of the three optional as **Major** and one **Minor** at the beginning of the **Third Semester (Second Year)** of their degree programme.]
- 3. Generic Electives (10 credits; for students from faculties other than Science and Technology, Basket-3): One paper each of 02/04 credits to be offered in semester I to VI** as Generic Electives. As these papers shall be opted by the students from other faculties; therefore, difficulty level of these courses shall at beginners' level (4.0). Each BOS shall **suggest a minimum of one and a maximum of four Generic Elective papers** to be offered during semesters I to VI. Students have freedom to choose one **Generic Elective paper** from **Basket-3** (common for all faculties) in each semester, provided these GE courses are from other faculty.
- 4. Ability Enhancement Course (AEC) (08 credits; common for all faculty students, Basket-4): One Language course each of 02 credits in the first four semesters.**
- L1 – First Language English (Compulsory for all disciplines) (02 credits each in semesters I and III)**
- L2 – Second Language** (Students have option to choose second language from the **Language Basket-IV**) (02 credits each in semesters II and IV)
- 5. Vocational and Skill Enhancement Courses (VC/SC) (08 +06 credits, shall be related to the Major Course):**
- Each BOS shall suggest four Vocational and three Skill Enhancement Courses each of 02 credits to be offered in semesters I to VI. These courses shall be related to the **Major subject**.
- 6. Indian Knowledge System (IKS) (Generic) (02 credits, common for all faculties, Basket-5): Students have a freedom to choose a course on **Indian Knowledge System** of 02 credits from **Basket-5** and shall be common for the students from all faculties of study.**
- 7. Value Education Courses (VEC) (04 credits, common and compulsory for all faculty students): Students have to complete two Value Added courses each of 02 credits during semester V and VI and are compulsory for students of all faculties.**
- a. Constitution of India (02 credits) – in Semester V*
- b. Environmental Studies (02 credits) – in Semester VI*
- 8. Community Engagement Services (CES / CCC)(08 credits, common for all faculty students): Students need to complete four **Community Engagement Services** courses like **NCC, NSS, Sports, Cultural Studies** each of 02 credits in first four semesters I, II, III and IV and are common across the faculty.**
- Grades of NCC/NSS/Sports/Cultural courses shall be awarded to the students on the basis of their participation in University, Regional, National, International, Inter-University and Intra-University level activities. Guidelines for the award of grades for NCC/NSS/Sports/Cultural studies shall be prepared by a Committee constituted by the University.

9. Field Work / Projects/ OJT/ Internship/Apprenticeship related to DSC major subjects (14 credits for Honours and 22 credits for Honours with Research credits): The students shall have to complete Field Work, Project, Case Study, Internship or Apprenticeship, etc. as per the credit framework.

10. Bachelor of Science in DSC Honors and Minor in DSM.

For the award of **Bachelor of Science in DSC Honors and Minor in DSM** students have to complete **92 credits** from Major, **20 credits** of Minor and the required number of credits of Field Work / Projects/ Internship/Apprenticeship/Case study **related to Major subject**.

11. Bachelor of Science in DSC Honors with Research and Minor in DSM.

For the award of **Bachelor of Science in DSC Honors with Research and Minor in DSM** students have to complete **84 credits** theory courses of Major subject, **20 credits** of Minor and required number of credits of Field Work / Projects/ Internship/Apprenticeship/Case study **related to Major subject**.

12. These guidelines are as per the present instructions from Government of Maharashtra and are subject to change time-to-time as per the guidelines from Govt. of Maharashtra.

MULTIPLE EXIT Options for Students:

1. Exit Option after First year

Students may take exit after completion of first year with **Certificate in Major (DSC) and Minor (DSM) subject** on completion of minimum 44 credits and additional 4 credits of NSQF skill / vocational in major/minor subject or internship during summer vacation.

2. Exit Option after Two years

Students may take exit after completion of second year of the programme with **Diploma in Major (DSC) and Minor (DSM) subject** on completion of minimum 88 credits and additional 04 credits on NSQF skill / vocational or Internship on major/minor courses during summer vacation.

3. Exit Option after Three years

Students may take exit with a Degree as **Bachelors of Science in Major (DSC) and Minor (DSM)** after earning minimum of 132 credits.

4. Exit Option after Four Years after completing 176 credits

(a) Bachelor of Science in DSC Honours and Minor in DSM.

(b) Bachelor of Science in DSC with Research and Minor in DSM.



Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology (Three Optional in the First Year)

**Credit Framework for Four Year Multidisciplinary Degree Program
 with Multiple Entry and Exit**

Subject: DSC (Major) /DSM (Minor 1 and Minor 2)

(For illustration ENV SCI, CHE and BOT combinations are considered, which may change for different combinations)

Year & Level	Semester	Optional 1 (Major) <i>(From the same Faculty)</i>	Optional 2 (Minor 1) <i>(From the same Faculty)</i>	Optional 3 (Minor 2) <i>(From the same Faculty)</i>	Generic Elective (GE) <i>(select from Basket 3 of Faculties other than Science and Technology)</i>	Vocational & Skill Enhancement Course	Ability Enhancement Course (AEC) (Basket 4) Value Education Courses (VEC) / Indian Knowledge System (IKS) (Basket 5) <i>(Common across all faculties)</i>	Field Work / Project/Internship/ OJT/ Apprenticeship / Case Study Or Co-curricular Courses (CCC) <i>(Basket 6 for CCC) (Common across all faculties)</i>	Credits
1	2	3	4	5	6	7	8	9	10
3 (5.5)	V	Major 51 (T 3Cr) SENVCT1301 Waste water analysis and treatment Major 52 (T 3Cr) SENVCT1302 Environment and wildlife management Major 53 (T 2Cr IKS) SENVCT1303 Ancient Environmental knowledge Major 54 (P 2CR) SENVCP1301 Waste water analysis and treatment Major 55 (P 2CR) SENVCT1302 Environment and wildlife management 12 Credits	Major E1 (2 Cr) SENVMT1301 Environmental pollution and human health SENVMP1301(2 cr) Environmental pollution and human health OR SENVMT1302(2 Cr) Environmental Instrumentation SENVMP1302(2 Cr) Environmental Instrumentation (Select any one) (2T+2P) 4 Cr	-	-	SENVSC 3 Industrial safety and occupational health 2 Credits	-	FPI (4 cr) (FP/CS) 4 credits	22

	VI	<p>Major 61 (T 3 Cr) SENVCT1351 Environmental impact assessment</p> <p>Major 62 (T 3 Cr) SENVCT1352 Solid waste management</p> <p>Major 63 (T 2Cr) SENVCT1353 Environmental education and legislation</p> <p>Major 64 (P 2Cr) SENVCP1351 Environmental impact assessment</p> <p>Major 65 (P 2Cr) SENVCP1352 Solid waste management</p> <p>12 credits</p>	<p>Major E2 (2T 2P) SENVMT1351 (T) Urbanization and Environmental issues</p> <p>SENVMP1351 (P) Urbanization and Environmental issues</p> <p>OR</p> <p>Major E2 (2T 2P) SENVMT1352 (T) Energy Resource Management</p> <p>SENVMP1352 (P) Energy Resource Management</p> <p>(Select any one)</p> <p>(2T+2P) 4 Credits</p>	-	-	SENVSC 4 Environmental Journalism 2 Credits	-	OJT (4Cr) 4 Credits	22
	Cum. Cr.	24	08	-	-	04	-	08	44
Exit option: B.Sc. (Bachelor in science) with Major in <u>DSC</u> and Minor in <u>DSM</u>									

Abbreviations:

- 1. DSC:** Department/Discipline Specific Core (Major)
- 2. DSE:** Department/Discipline Specific Elective (Major)
- 3. DSM:** Discipline Specific Minor
- 4. GE/OE:** Generic/Open Elective
- 5. VSEC:** Vocational Skill and Skill Enhancement Course
- 6. VSC:** Vocational Skill Courses
- 7. SEC:** Skill Enhancement Courses
- 8. AEC:** Ability Enhancement courses
- 9. MIL:** Modern Indian languages
- 10.IKS:** Indian Knowledge System
- 11.VEC:** Value Education Courses
- 12.OJT:** On Job Training: (Internship/Apprenticeship)
- 13.FP:** Field Projects
- 14.CEP:** Community Engagement and Service
- 15.CC:** Co-Curricular Courses
- 16.RM:** Research Methodology
- 17.RP:** Research Project/Dissertation



Swami Ramanand Teerth Marathwada University, Nanded

Assigning TEN DIGIT Codes to the CoursesALPHANUMERIC 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 inaffiliated 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	2251 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



B. Sc. Third Year Semester V (Level 5.5)

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1 (Major) From the same faculty	SENVCT1301	Waste water analysis and treatment	03	--	12	03	--
	SENVCP1301	Practical Based on SENVCT1301	-	02			04
	SENVCT1302	Environment and wildlife management	03	--		03	
	SENVCP1302	Practical Based on SENVCT1302	-	02			04
	SENVCT1303	Ancient Environmental knowledge	02	-		02	
Optional 2 (Major Elective) (Select any one)	SENVMT1201	Environmental pollution and human health	02	--	04	02	--
	SENVMP1201	Environmental pollution and human health (practical)	-	02			04
	SENVMT1202	Environmental Instrumentation	02			02	
	SENVMP1202	Environmental Instrumentation		02			04
Skill Based Course (related to Major)	SENVSC1301	Industrial safety and occupational health	--	02	02	--	04
Field project	SENVFP1301	Field project	-	04	04		
Total Credits			11	11	22	12	20



B. Sc. Third Year Semester V (Level 5.5)

Examination Scheme

[40% Continuous Assessment (CA) and 60% 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	CA (8)	ESA (9)	
			Class Test (4)	Assignment/Pres entation/Viva/Q uiz/Open Book etc (5)	Attendance (6)	Total (7)			
Optional 1 (major) From the same faculty	SENVCT1301	Waste water analysis and treatment	15	09	06	45	--	--	75
	SENVCP1301	Practical Based on SENVCT1301	--	--	--	--	20	30	50
	SENVCT1302	Environment and wildlife management	15	09	06	45	--	--	75
	SENVCP1302	Practical Based on SENVCT1302	--	--	--	--	20	30	50
	SENVCT1303	Ancient Environmental knowledge	10	06	04	30	-	-	50
Optional 2 (Major Elective) (Select any one)	SENVMT1201	Environmental pollution and human health	10	06	04	30	--	--	50
	SENVMP1201	Environmental pollution and human health (practical)	--	--	--	--	20	30	50
	SENVMT1202	Environmental Instrumentation	10	06	04	30	--	--	50
	SENVMP1202	Environmental Instrumentation	--	--	--	--	20	30	50
Skill Based Course (related to Major)	SENVSC1301	Industrial safety and occupational health					20	30	50
Field project	SENVFP1301	Field project	-	-	-	-	40	60	100



B. Sc. Second Year Semester VI (Level 5.5)

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)		
			Theory	Practical	Total	Theory	Practical	
Optional 1 (major) From the same faculty	SENVCT1351	Environmental Impact Assessment	03	--	12	03	--	
	SENVCP1351	Practical Based on SENVCT1351	-	02			04	
	SENVCT1352	Solid waste management	03			03	-	
	SENVCP1352	Practical Based on SENVCT1352		02			04	
	SENVCT1353	Environmental education and legislation	02	-		02		
Optional 2 (Major Elective) (Select any one)	SENVMT1351	Urbanization and Environmental issues	02	02	04	02	--	
	SENVMP1351	Practical Based on SENVMT 1351	-				04	
	SENVMT1352	Energy Resource management	02					
	SENVMP1352	Practical Based on SENVMT 1352					04	
Skill Based Course (related to Major)	SENVSC1351	Environmental Journalism	--	02	02	--	04	
OJT	SENVFP1351	On Job Training (OJT)		04	04	02	--	
Total Credits			12	12	22	12	20	



B. Sc. Second Year Semester VI (Level 5.5)

Examination Scheme

[40% Continuous Assessment (CA) and 60% 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	CA (8)	ESA (9)	
			Class Test (4)	Assignment/ Presentation/Viva/Quiz/ Open Book etc (5)	Attendance (6)	Total (7)			
Optional 1 (major) From the same faculty	SENVCT1351	Environmental Impact Assessment	15	09	06	45	--	--	75
	SENVCP1351	Practical Based on SENVCT1351	--	--	--	--	20	30	50
	SENVCT1352	Solid waste management	15	09	06	45	--	--	50
	SENVCP1352	Practical Based on SENVCT1352	--	--	--	--	20	30	50
	SENVCT1353	Environmental education and legislation	10	06	04	30	-	-	50
Optional 2 (Major Elective) (Select any one)	SENVMT1351	Urbanization and Environmental issues	10	06	04	30	--	--	50
	SENVMP1351	Practical Based on SENVMT 1351	--	--	--	--	20	30	50
	SENVMT1352	Energy Resource management	10	06	04	30	--	--	50
	SENVMP1352	Practical Based on SENVMT 1352	--	--	--	--	20	30	50
Skill Based Course (related to Major)	SENVSC1351	Environmental Journalism	--	--	--	--	20	30	50
OJT	SENVFP1351	On Job Training (OJT)	-	-	-	-	40	60	100

B. Sc. Third year
Environmental Science
SEMESTER – V

Major: 51-SENVCT-1301-Waste Water Analysis & Treatment (45 hrs)- credit-3

1. Course Pre requisite

- Fundamental concepts of **Environmental Science**
- Basics of **Chemistry** (pH, acids–bases, organic & inorganic compounds)
- Elementary **Biology/Microbiology** (microorganisms and their role)
- Understanding of **Water resources and pollution**

2. Course Objectives

- To introduce the **concepts and importance of wastewater management**.
- To develop understanding of **physical, chemical, and biological characteristics of wastewater**.
- To familiarize students with **standard methods of wastewater analysis**.
- To explain various **treatment processes (primary, secondary, tertiary)**.
- To create awareness about **sustainable wastewater reuse and environmental protection**.

3. Course Outcomes

- **Identify** sources and types of wastewater and their environmental impacts.
- **Analyze** wastewater quality using key parameters (pH, BOD, COD, TDS, etc.).
- **Explain** different wastewater treatment methods and their working principles.
- **Evaluate** efficiency of treatment processes for pollution control.
- **Apply** knowledge for basic design and selection of suitable treatment methods.
- **Understand** the importance of wastewater reuse, recycling, and sustainable management.

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Introduction	15
	1.1	Definition and Sources of water pollution: Domestic, Industrial; Agricultural runoff; Urban runoff	
	1.2	Types of water pollutants: organic pollutants, inorganic pollutants, pathogens, suspended solids, nutrients and agriculture pollutants, thermal, radioactive pollutants	
	1.3	Techniques for representative sampling; preservation of	

		sample and safety protocols ; Standards for disposal of waste water	
	1.4	Types of water pollution: Physical, Chemical and Bacteriological pollution.	
2.0		Quality of sewage	
	2.1	Physical property: color, odor, solids and turbidity	10
	2.2	Chemical property: pH, DO, CO ₂ , nutrients, hardness, Chloride.	
	2.3	Biological property: Bacteria, Algae, fungi, protozoa	
	2.4	Aerobic and Anaerobic decomposition	
3.0		Analysis of sewage	
	3.1	Physical tests: Color, Odor, Temperature, Turbidity	10
	3.2	Chemical tests: Chlorine, Oil & Grease, Nitrogen, Oxygen, Hydrogen ion concentration (pH),	
	3.3	Total Solids; Total Dissolved Solids, BOD & COD	
	3.4	Bacteriological tests: MPN test.	
4.0		Treatment of sewage	
	4.1	Natural method of sewage disposal: Disposal by dilution, Self purification of natural waters, disposal by land treatment.	10
	4.2	Primary treatment of sewage: Screen, Grit, Detritus tank, Skimming tank, plain sedimentation tank.	
	4.3	Secondary Treatment of Sewage: Aerobic method: Contact beds, Oxidation pond, Trickling filters.	
	4.4	Anaerobic method: Septic tank, Imhoff tanks, sludge digestion tanks.	
		Total	45

Reference book:

1. Waste water treatment for pollution control: Soli J. Arceivala (Tata Mc-Grew Hill Publishing Company, New Delhi)
2. Water supply and sanitary engineering: R. C. rangwala and S. C. rangwala (Charcoal publishing house, Anand)
3. Waste water treatment: M. N. Rao, A. K. Datta (Oxford and IBH publishing company, New Delhi)

4. A Text book of Sanitary Engineering: Vinayak Gharpure (Engineering Book Publishing Company, Pune)
5. Water Pollution: V. P. Kudesia (Pragati Prakashan, Meerut) (15)
6. Environmental Chemistry: B. K. Sharma (Goel Publishing House, Meerut)
7. Waste water Engineering: Metcalf and Eddy (Tata Mc-Grew Hill Publishing Company, New Delhi)
8. Environmental Chemistry: A. K. De (Wiley eastern limited, New Delhi)
9. Environmental Pollution: H. M. Dix (New York)
10. Aquatic Plants for the Waste Water Treatment: Alkarani Upadhaya (Daya Publishing House, New Delhi)
11. Environmental Chemistry: B. K. sharma and H. Kour (Villa Publication, Meerut)
12. Introduction to Environmental Engineering: Mackenzie L. Davis & David A. Cornwell (Mc-Grew Hill Publishing Company, New Delhi)
13. Basic Water Treatment: George Smethurst (Scientific Publishers, Jodhpur)
14. Water Pollution and disposal of Waste water on Land: U. N. Mahida (Tata Mc-Grew Hill Publishing Company, New Delhi)
15. A Manual on Water and Waste Water Analysis : National Environmental Engineering Research Institute, Nagpur.

Major-54- SENVCP1301- Practical based on theory paper- SENVCT-1301
(Cr-02) Hours-60

Sr. No.	Practical Exercises	Hrs required to cover the contents
1	Study of sewage sampling Equipments and methods of sample collection.	4
2	Preservation of sewage samples.	4
3	Determination of pH of provided sewage sample.	4
4	Determination of Turbidity of provided sewage sample by turbidity meter method.	4
5	Determination of Total solids from the sewage sample.	4
6	Determination of Total dissolved solids from the sewage sample.	4
7	Determination of Conductivity of sewage sample.	4
8	Determination of Chlorides from provided sewage sample.	4
9	Determination of dissolved oxygen from sewage sample.	4
10	Determination of Carbon dioxide from sewage sample.	4
11	Determination of Oil & Grease from Sewage sample.	4
12	Determination of Ammonia from sewage sample.	4
13	Estimation of hydrogen Sulphide from the waste water.	4
14	Estimation of Biochemical oxygen demand of waste water.	4
15	Estimation of Chemical oxygen demand of waste water.	4
	Total	60

Major 52 SENVCT 1302-Environment & Wild life Management (3 Cr)

Course pre-requisite

This course teaches the essential elements, concepts and skills related to wildlife conservation and management. This includes implementing habitat management practices; identifying wildlife conflicts; and participation in personal and community level.

Key pre-requisites for effective wildlife management in India includes scope and importance of wildlife, wildlife conservation, wildlife management .

Course objectives:

The main objectives of the course are to:

1. Provide understanding and knowledge on modern concepts in wildlife management,
2. To produce skilled professionals who can actively contribute to wildlife conservation, research, policy development, and sustainable management.
3. Students can work as faculties in forest services. , animal trainers, forest ecologists,
4. Students can find employment in zoos, museums, zoological parks, tiger reserves, sanctuaries and national parks, wildlife forensic laboratories.

Course outcomes:

- 1.The goal of the course is to teach a critical and conceptual knowledge of wildlife in the context of natural landscape exploration, ecosystem functioning, and ecosystem service provision.
- 2.This course focuses on the fundamental principles, concepts and abilities associated with plant and animal conservation and management.
- 3.Implementing habitat management strategies, identifying animal conflicts, and taking part in personal and community level
4. The course work will also be guided by work on scientific papers and field experience

SENVCT 1302 - Environment & Wild life Management

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		INTRODIUCTION TO ENVIRONMENT	
	1.1	Introduction; Definition, principles and scope of Environmental Science Segments of Environment: atmosphere, hydrosphere, lithosphere, biosphere; Concept of sustainability	15
	1.2	Physico-chemical and Biological Factors in the Environment	
	1.3	Earth, Man and Environment. Ecosystems, Pathways in Ecosystems	
	1.4	Geographical classification and zones, law of thermodynamics, heat transfer processes. The scale of meteorology, pressure, temperature, precipitation	
2.0		SCOPE AND IMPORTANCE OF WILDLIFE	
	2.1	Definition of Wildlife: Causes of wildlife depletion; Economic importance of wildlife; need for wildlife conservation	10
	2.2	Categories of wildlife: Rare, endangered, threatened and endemic species in India- India as a mega wildlife diversity country.	
	2.3	Wildlife Census Techniques: Planning census – Total counts - Sample counts – Basic concepts and applications .	
	2.4	Behavior Of Wildlife; Instinctive behavior-classical and modern concepts-fixed action pattern and reutilization; Learning-Imprinting-habituatation	
3.0		WILDLIFE CONSERVATION;	
	3.1	Historical background: Need of conservation projects in India, Ex- situ & in-situ conservation.	10
	3.2	National parks, Wildlife sanctuaries, wildlife reserves, Biosphere reserves. National parks and wildlife .	
	3.3	Umbrella species, Mitigation of human-wildlife conflicts	
	3.4	Role of NGOs in conservation; International NGOs	
	4.1	WILDLIFE MANAGEMENT Elements of Wildlife Management: Public Participation: ,Public	10
4.0	4.2	Purpose of Wildlife Management, Constitutional provisions, National and International guidelines and protocols.	
	4.3	Wildlife and forest protection acts Wildlife Trade and Laws ;	
	4.4	Approaches to Wildlife Management; Preservation, Conservation	
		Total	45

Reference book:

1. Odum, E.P., Odum, H.T. & Andrews, J. (1971) Fundamentals of Ecology. Philadelphia: Saunders
2. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. (2011) Environmental and Pollution Science. Academic Press
2. Singh, J.S., Singh, S.P. and Gupta, S.R. (2014) Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi .
3. Producing skilled professionals who can actively contribute to wildlife conservation, research, policy development, and sustainable management.
4. Mills, L. Scott: Conservation of Wildlife Populations, 2nd edn., Wiley Black well: Dem

Major-55 (Practical): SENVCP1302 Based on SEVCT1305 Environment & Wild life Management

Sr. No.	Practical	Hrs
01	To identify flora in college campus	04
02	To identify fauna in college campus	04
03	To demonstrate different field techniques for flora and fauna	04
04	To study the trail/ transect monitoring for abundance and diversity estimation animals direct and indirect evidences).	04
05	To study the trail/ transect monitoring for abundance and diversity estimation birds (direct and indirect evidences).	04
06	Documentation of different species of birds, insects, mammals, etc. in the nearby areas (Collect information in text)	08
07	Documentation of different species of reptiles, amphibians, etc. in the nearby areas (Collect information in text)	08
08	Preparation of a digital album of local wildlife (Collect photographs)	08
09	In this practical student must visit a National Park/ any natural habitat/ Sanctuary and prepare a report of the same.	08
10	Use of Quadrature method for floral density	04
11	Prepare report on field visit	04
Total		60

Major 53 (IKS) Ancient Environmental Knowledge (Theory) – (2 Cr)

Course pre-requisite:

1. For a course on **Ancient Environmental Knowledge** under the Indian Knowledge Systems (IKS) framework, the prerequisites are designed to ensure students have both the foundational scientific understanding and the cultural context necessary for the curriculum.
2. A basic grasp of India's physical geography, including its major river systems and climatic zones, which are central to ancient environmental management.

Course objectives:

1. To examine the interrelationship between Bharat's civilizational wisdom, nature, and natural resources, and to analyze the traditional conservation ethics, ideas, and practices that have been prevalent since the Vedic period.
2. To evaluate the significance of indigenous knowledge systems in promoting sustainability and ecological balance while highlighting the continuity and relevance of cultural traditions in shaping human–nature interactions.
3. To integrate insights from traditional wisdom with contemporary approaches to environmental conservation and resource management.

Course outcomes:

- Students will be able to understand and demonstrate the interconnections between Bharat's Civilizational wisdom, nature, and natural resources.
- They will be able to explain the principles and practices of traditional conservation approaches rooted in the Vedic and post-Vedic period, and critically evaluate the relevance of indigenous knowledge systems in addressing contemporary challenges of environment and sustainability.
- They will be able to apply insights from Indian knowledge systems to complement modern strategies of sustainable development climate mitigation and resource management.

Module No.	Unit No.	Topic	Hrs. Required
1.0		Philosophy of Nature in Ancient India	
	1.1	Concepts of Panchamahabhutas: The five primordial elements (Earth, Water, Fire, Air, and Ether) and their role in sustaining life.	08
	1.2	Vedic Perspectives: Environmental hymns from the Rigveda and Atharvaveda; the concept of <i>Rta</i> (Cosmic Order) and its relation to ecological balance.	
	1.3	Sacred Landscapes: The spiritual significance of mountains (Himalayas), rivers (Ganga, Yamuna, Saraswati), and the concept of <i>Tirthas</i> as ecological conservation zones.	
	1.4	Ethno-forestry: The tradition of <i>Panchavati</i> and <i>Shanti Vanas</i> (Peaceful forests).	
2.0		Biodiversity and Wildlife Conservation Traditions	
	2.1	Sacred Groves (Devrai): Traditional methods of community-based forest conservation and their relevance in modern ecology.	07
	2.2	Animal Welfare in Ancient Texts: Study of <i>Pashu-Ayurveda</i> ; protection of wildlife in the <i>Arthashastra</i> and Ashokan Edicts.	
	2.3	Vrikshayurveda: Ancient Indian plant science; techniques for planting, nourishing, and treating diseases in flora as described by Varahamihira and Surapala.	
	2.4	Flora in Mythology: The ecological importance of Tulsi, Peepal, Bilva, and Neem in daily life and rituals.	
3.0		Water Management and Soil Science	
	3.1	Traditional Water Harvesting: Study of ancient structures like <i>Baolis</i> (stepwells), <i>Talabs</i> , and the irrigation systems of the Indus Valley and Chola Empire.	08
	3.2	Rainwater Prediction: Ancient meteorological observations and Varahamihira's <i>Briha tSamhita</i> regarding rainfall and groundwater detection.	
	3.3	Soil Classification: Ancient methods of testing soil fertility and land use categorization (<i>Urvara</i> vs. <i>Ushara</i>).	
	3.4	Sustainable Agriculture: Traditional organic manuring, crop rotation, and Vedic farming practices (<i>Krishi-Parashara</i>).	
4.0		Environmental Ethics and Sustainable Living	
	4.1	Ahimsa and Ecology: The influence of Jainism and Buddhism on environmental stewardship and non-violence toward all living beings.	07
	4.2	Daily Rituals as Conservation: The logic behind <i>Arghya</i> , <i>Yajna</i> (purification of air), and dietary laws for seasonal health (<i>Ritucharya</i>).	
	4.3	Legal Frameworks: Environmental laws and penalties for pollution in the <i>Manusmriti</i> and <i>Arthashastra</i> .	
	4.4	IKS for Modern Challenges: Integrating ancient wisdom with contemporary climate change mitigation and sustainable development goals (SDGs).	
		Total	30

Reference book:

- **Science and Society in Ancient India: Debiprasad Chattopadhyaya:** *K P Bagchi & Company, 2014.*
- **Science and Technology in Ancient Indian Texts: Bal Ram Singh, D.K:** *Print World Ltd, 2012.*
- **Environmental Crisis and Hindu Religion: O.P. Dwivedi:** *Gitanjali Publishing House, Delhi, 1987.*
- **A framework for incorporating indigenous knowledge systems into agricultural research and extension organizations for sustainable agricultural development in India: Rajasekaran, B.:** *Iowa State University, 1993.*
- **Religion and Ecology in India and Southeast Asia:David L. Gosling:** *Routledge, London & New York, 2001*
- **Environmental Consciousness and Sustainable Development in the Indian Knowledge System: Dr. Vedprakash Bokar:** *Deep and Deep Publications, New Delhi, 2003*
- **The Human Footprint On Environment: Issues in India: Vipul Singh:** *Macmillan India, New Delhi, 2012*
- **The Legacy of Charaka: Valiathan M.S:** *University Press (India) Private Limited, Hyderabad, 2015.*
- **The Legacy of Susruta: Valiathan M.S.:** *University Press (India) Private Limited, Hyderabad, 2015.*
- **“The Legacy of Vagbhata: Valiathan M.S:** *University Press (India) Private Limited, Hyderabad, 2015.*
- **The Roots of Ayurveda: Wujastyk Dominik:** *Penguin classics, Haryana, India, 2001.*

Major E1 SENVMT1301 Environmental Pollution and Human Health (Theory 2 Cr)

Course pre-requisite:

- This paper deals with the Environmental pollution and Human health. The paper aims to identify the quality and to mitigate the adverse effects of contaminants of air, water and soil on population health.
- The key goals include reducing mortality due to pollutants fostering sustainable clean energy practices and implementing policies to protect vulnerable groups like children and the elderly people from diseases such as asthma, cancer and cardiovascular disorders.

Course objectives:

- **Identify and Map pollutants:**
Determine the sources and types of contaminants (PM_{2.5}, Heavy Metals, Chemicals) that directly enter the body through the Air, Water and Soil.
- **Assess Health Risk:**
Quantify the link between pollutant exposure and diseases such as Respiratory issues, Reproductive problems, Neurological disorders and Cardiovascular illness.
- **Protect Vulnerable Populations:**
Reduce pollution levels specifically to protect vulnerable groups including children, the elderly people and pregnant women.
- **Mitigation and Intervention:**
Develop effective policies waste management improvements and strict regulations to reduce emission levels at source.
- **Increase public Awareness:**
Educate individuals on environmental risk and promote behaviours that reduce, say the environmental health initiative footprint.

Course outcomes:

1. Analyze causes and effects of pollution in air, water and soil including solid waste.
2. Evaluate the effects of contaminants on human health, ecosystems and material.
3. Design or suggest strategies for remediation and control of pollution.

Module No.	Unit No.	Topic	Hours
1.0		Introduction	
	1.1	Pollution: Definition	08
	1.2	Types of pollution: Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal Pollution, Radioactive pollution, Solid waste pollution.	
	1.3	Pollutant: Definition Types of pollutants: Physical (Fly Ash, Dust, Smoke, Mist, Soot), Chemical (NO _x , SO _x , CO, O ₃) and Biological pollutants(Bacteria, Virus, Fungi, Pollen Grains)	
	1.4	Classification of Pollutant: Primary Pollutant, Secondary Pollutant	
2.0		Air and Radioactive Pollution	
	2.1	Major air pollutants: SO ₂ , NO ₂ , CO, CH ₄ , H ₂ S, CFC, PM-10, PM 2.5 Sources: Domestic, Industrial, Agricultural, Automobiles, Volcanoes, Forest Fires.	07
	2.2	Effects of Air pollution : Biological system: Animals, Plants, Humans. Non biological system- Material (Fabrics, Leather, Rubber) Metal, Historical Monuments, Buildings.	
	2.3	Sources of Radioactive Pollution: Nuclear power plant operations, Uranium mining, Nuclear weapon Testing / fallout, Medical and industrial waste, Effects of Radioactive pollution	
	2.4	Mitigation of Air and Radioactive pollution	
3.0		Water and Thermal Pollution	
	3.1	Sources of water pollution: Domestic pollution, sewage discharge, Industrial Effluents: Cd, Hg, asbestos. Storm water, oil spills, Agricultural Runoff. Case study Itai Itai, Minamata(Japan), Arsenic poisoning (West Bengal)	08

	3.2	Effects of water pollution: Eutrophication, Waterborne Diseases (cholera, typhoid, Dysentery)	
	3.3	Thermal pollution: Definition, Sources: Power plants, Textile Industry, Paper Industry. Effects: Environments, Aquatic life	
	3.4	Control Measures of water and thermal Pollution	
4.0		Soil pollution	
	4.1	Definition, Soil Composition, Properties of soil	07
	4.2	Sources of Soil pollution: Pesticides, Fertilizers, hazardous industrial Waste dumping, Mining operations, Urban Waste.	
	4.3	Effects of Soil pollution: Soil quality, Soil productivity; Acidification, Salination, Desertification, Heavy metal deposition, Effects on Soil microorganisms and plants	
	4.4	Control measures of Soil pollution: Use of Biofertilizers, Pest management, Organic Farming, Appropriate irrigation	

Reference Books:

1. Air Pollution:M.N.Rao;(TataMcGraw-HillPublishing companyLtd.,New Delhi)
2. Air Pollution : B. K. Sharma, H. Kour; (Krishna Prakashan Media, Meerut)
3. Environmental Chemistry: B. K. Sharma; (Goel Publishing House, Meerut)
4. Water Pollution: V. P. Kudesia;(Pragati Prakashan, Meerut)
5. Environmental Pollution: Shafi S. M.; (Atlantic Publishers)
6. Solid Waste Management: Amul Late and M. B. Mule; (Lambart Academic Publishing, Mauritius,2020)
7. Environmental Chemistry; A. K. De; New Age International publisher 6thEdtn.
8. Environmental Science; S.C. Santra; New Central Book Agency (P)Ltd.;2ndEdtn.

SENVEP1301: Practical Based on (Elective-1) Environmental Pollution and Human Health (2credit)

Course pre-requisite:

- This paper deals with different aspects of environmental contamination, which have adverse effects on human health

Course Objectives:

- It will emphasize on understanding mechanisms of pollutants impacting human health by developing and understanding of different types of pollutants.
- The students also introduce permissible limits and standards.

Course Outcomes:

- To develop the ability to analyze water, air and soil quality parameters.
- Obtain the scientific knowledge about the various types of environmental pollution.

Sr. No.	Practical Exercise	Hrs. Required
1	Collection and Preservation of water and soil samples	4
2	Collection and Preservation of soil samples	4
3	Determination of pH of Soil Sample	4
4	Determination of Chlorides of Water Sample	4
5	Determination of Dissolved Oxygen of Water Sample	4
6	Determination of Nitrates of Water Sample	4
7	Determination of soil temperature	4
8	Determination of Organic Content from soil	4
9	Detection of CO ₂ from ambient air	4
10	Determination of Air Pollution Index	4
11	Estimation of dust fall by tile exposure method	4
12	Study of International & National Standards of air pollution	4
13	Study of International & National Standards of water pollution	4
14	Field visit	8
	Total	60

Major E2 (SENVMT1302): Environmental Instrumentation (2 Cr)

Course Prerequisite

- Basic knowledge of Environmental Science
- Fundamentals of Physics and Chemistry
- Understanding of environmental pollution (air, water, noise)
- Basic knowledge of laboratory instruments

Course Objectives

- To understand the principles of environmental instrumentation
- To study working and applications of various analytical instruments
- To develop skills in environmental monitoring and sampling
- To introduce modern techniques used in environmental analysis

Course Outcomes

- Understand principles and operation of environmental instruments
- Apply instruments for analysis of air, water, and soil parameters
- Analyze environmental samples using standard techniques
- Evaluate pollution levels using monitoring instruments
- Gain practical knowledge of analytical and noise monitoring tools.

Module No.	Unit No	Topic	Hrs. Required to cover the contents
1.0		Introduction to Environmental Instrumentation	
	1.1	Definition and scope of environmental instrumentation; importance of environmental monitoring	08
	1.2	Environmental parameters : physical, chemical, biological	
	1.3	Principals of measurement and sensors	
	1.4	Sampling techniques for air, water, soil Instruments :Fluoride Meter, Colorimeter Conductivity Meter: principle, working, Applications	
2.0		Air and Meteorological Monitoring	
	2.1	Air pollution monitoring methods : High Volume Air Sampler (HVAS),Respirable Dust Sampler (RDS),Gas analyzers for SO ₂ , NO ₂ , CO, O ₃	07
	2.2	Meteorological Instruments : Thermometer, Hygrometer, Anemometer, Rain gauge Barometer	
	2.3	Introduction to weather systems and parameters: light, rainfall, wind direction, wind velocity, temperature, pressure, humidity, etc	
	2.4	Data recording and interpretation techniques	
3.0		Water Quality Monitoring	
	3.1	water monitoring: Objectives and importance	08
	3.2	Sampling techniques: groundwater and surface water	
	3.3	Monitoring physical, chemical, and biological parameters	
	3.4	Water Quality standards : BIS and WHO	
4.0		Environmental Monitoring	
	4.1	Soil monitoring: Objectives and methodologies	07
	4.2	Soil Sampling techniques: site selection & frequency	
	4.3	Biodiversity monitoring :Definition and scope	
	4.4	Vegetation assessment: Height, girth, biomass, density, diversity indices	
		Total	30

Reference Books:

- Instrumental Methods of Chemical Analysis – Chatwal & Anand
- Environmental Engineering & Instrumentation – Relevant standard texts
- APHA – Standard Methods for Examination of Water and Wastewater

- Basic Environmental Instrumentation Manuals

SENVMP1302: Practical based on Environmental Instrumentation SENVMT1302
Hours: 60 (1 Cr)

Sr. No.	Practical Exercises	Hrs required to cover the contents
1	Study of basic environmental instruments and their components	4
2	Calibration and use of pH meter	4
3	Determination of conductivity using conductivity meter	4
4	Measurement of turbidity using turbidity meter	4
5	Colorimetric analysis using colorimeter	4
6	Sampling techniques for air, water, and soil	4
7	Measurement of fluoride using fluoride meter	4
8	Operation of High Volume Air Sampler (HVAS)	4
9	Measurement of particulate matter using Respirable Dust Sampler (RDS)	4
10	Demonstration of spectrophotometer (UV-Vis)	4
11	Estimation of pollutants using spectrophotometric methods	4
12	Demonstration of chromatography techniques (TLC/Column)	4
13	Measurement of noise using sound level meter	4
14	Meteorological data collection using basic instruments	4
15	Field visit / instrument demonstration report	4
16	Biodiversity monitoring related practicals	4
	Total	60

SENVSC1301: INDUSTRIAL SAFETY & OCCUPATIONAL HEALTH (ISOH) (2 cr)

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 and Industrial safety.

Objectives:

The main objective of course is to improve the awareness and skills of the students about Industrial Safety & Occupational Health- principles, importance and issues. industrial safety techniques, prevent workplace accidents and injuries, ensure safe working conditions and protect equipment and property.

Learning Outcomes

- Acquire the skill of Industrial Safety & Occupational Health.
- It helps to get knowledge of hazard identification and risk assessment.
- This course gives the skill of Industrial Safety techniques, understand causes and prevention of **industrial accidents and occupational diseases and prioritize control measures.**
- Contribute to building a **safe and healthy work environment.**

Curriculum Details:

SENVSC1301: INDUSTRIAL SAFETY & OCCUPATIONAL HEALTH (60 hrs)

Sr. No.	Practical Exercises	Hrs required
1	To study and classify different industrial safety signs.	04
2	To study types and operation of fire extinguishers.	04
3	To learn basic first aid techniques.	04
4	To study personal protective equipment.	04
5	To measure noise levels.	04
6	To identify workplace hazards.	04
7	To study proper posture.	04
8	To study electrical hazards.	04
9	To practice evacuation drill.	04
10	To study industrial hygiene.	04
11	To Prepare industrial Safety audit	04
12	TO measure light intensity using LUX meter	04
13	To evaluate air flow and ventilation condition in work place	04
14	To determine dust fall measurement by tile exposure method	04
15	To measure temperature to assess heat stress	04
	Total	60

Reference Books:

1. Industrial Safety, Health and Environment Management Systems: R.K. Jain & Sunil S. Rao.
2. Industrial Safety Management: Hazard Identification and Risk Control: L.M. Deshmukh.
3. Lees' Loss Prevention in Process Industries: Frank Lees.
4. Safety at Work: John Ridley & John Channing.
5. Techniques of Safety Management: Dan Petersen.
6. Safety Management Systems: Alan Waring.
7. Fundamentals of Industrial Hygiene: National Safety Council.

8. Handbook of Occupational Safety and Health: S.Z. Mansdorf.
9. Encyclopedia of Occupational Health and Safety: International Labour Organization.
10. Patty's Industrial Hygiene: Barbara Cohrssen.

ENVIRONMENTAL SCIENCE- CURRICULUM

B. Sc. THIRD YEAR

SEMESTER – VI

Major 61: SENVCT1351 Environmental Impact Assessment (Credit -3)

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.

Course objectives:

- Scope & Objectives of EIA, Relation Between EIA& Sustainable Development
- Various Components of EIA, Impact Interpretation & Analysis
- EIA Notification 2006 & Amendment, Public Participation in EIA.
- Scope & Objectives of Environmental Audit.

Course outcomes:

- Define scope and objectives of EIA,Relation between development and environment, EIA to sustainable development
- Identify social, economical and environmental impact for human welfare
- Evaluate EIA notification 2006 and amendments, public participation in EIA
- Assess screening process in EIA as well as protocols for evaluation of impacts and impact analysis.
- environmental audits, hazardous waste auditand safety audit

Curriculum details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Introduction To EIA	
	1.1	Introduction, Scope, and Objectives of EIA	15
	1.2	Rational & Historical Development of EIA Relationship between EIA and sustainable development	
	1.3	Key provisions of EIA Notification 1994 & 2006 (with amendments) Components and Process- Screening, scoping, impact analysis, mitigation, reporting, public participation	
	1.4	Baseline Data - Physical, biological, and socio-economic components, Methods of data collection	
2.0		Methods of EIA	
	2.1	Qualitative & Quantitative Approaches	10
	2.2	Ad Hoc Method – Expert judgment and rapid assessment	
	2.3	Checklists – Simple, descriptive and weighted checklists	

	2.4	Matrices – Leopold and other impact matrices	
3.0		Environmental Management Plan (EMP)	
	3.1	Principles, problems and strategies	10
	3.2	Identification of significant environmental impacts Mitigation Plans, Relief & Rehabilitation	
	3.3	Review of Environmental Management Plan	
	3.4	Draft of EIA report-Structure and content of an EIA report	
	3.5	Cost-Benefit analysis; Life cycle assessment; environmental appraisal	
4.0		EIA Practices in India	10
	4.1	EIA regulations in India, status of EIA in India	
	4.2	current issues in EIA, case study of hydropower projects/ thermal projects.	
	4.3	Environmental audit; introduction to ISO and ISO 14000	
	4.4	Environmental Audit: Process, Types, Need & Importance	
		Total	

Reference book:

- 1. Environmental Impact Assessment: A. K. Shrivastava APH Publication 2003.**
- 2. Environmental Impact Assessment, L. W. Canter, McGraw Hill publication, New Delhi**
- 3. Environmental Impact Assessment: N. S. Raman, A. R. Gajbhiye, S. R. Khandeshwar, I. K. International Pvt. Ltd., New Delhi**

Major 64: SENVCP1351: practicals based on Environmental Impact Assessment
SENVCT1351 (3 Cr)

Sr. No	Practicals	Hrs
1	To Study Environmental Audit of Sugar Industry with Reference to Environment Protection Act (Form 5)	04
2	Conduct a social impact assessment for a proposed development project.	04
3	Environmental and Social Survey Based on Questionnaire: A Case Study of Construction Site	04
4	Propose and evaluate mitigation measures for identified environmental impacts.	04
5	Preparation of checklist and network diagrams for environmental impacts	04
6	Preparation of Outline of EIA Report: A Case Study of Dam Site	04
7	Prepare a report based on threats to biological diversity observed	04
8	To Perform Green Audit of College campus / city	04
9	To Perform Energy Audit of College campus / city	04
10	To Perform water audit of College campus / city	04
11	To Perform Environmental Audit of College campus / city	04
12	To prepare a EIA Document of college campus / city	04
13	To measure noise level at construction site by dB meter	04
14	To prepare a checklist for impacts of small projects(Road Construction)	04
15	A case study of public hearing on proposed project	04
	Total	60

Major-62 SENVCT 1352 SOLID WASTE MANAGEMENT (Theory) 3 Cr

Course pre-requisite:

- Students are typically expected to have basic knowledge of
- Environmental Science, Environmental Engineering fundamentals
- Basic Chemistry (waste composition, reactions, treatment processes)
- Microbiology / Biology (biodegradation, composting)
- Basic Mathematics / Engineering concepts (for design and calculations)

Course Objectives:

- Understand sources, types, and characteristics of solid waste
- Study different methods of waste collection, storage, and transportation
- Learn processing and treatment techniques (biological, mechanical, thermal)
- Analyze disposal methods like sanitary landfill
- Understand management of hazardous, biomedical, and e-waste
- Study environmental and public health impacts of improper waste management
- Develop sustainable and integrated solid waste management strategies

Course Outcomes:

After completing the course, students will be able to:

- Identify and classify different types of solid waste and their properties
- Estimate waste generation and analyze its characteristics
- Design efficient collection and transportation systems
- Select appropriate treatment methods (composting, incineration, recycling, etc.)
- Design and evaluate landfill systems for safe disposal
- Apply regulations and standards related to waste management

Curriculum Details:

Module No	Unit	No. Topic	Hrs. Required to cover the contents
1.0		Introduction to Solid Waste	15
	1.1	Definition, sources and types of solid waste- municipal, industrial, agricultural, domestic and biomedical waste	
	1.2	Quantification, composition and characteristics (physical, chemical and biological) of solid waste	
	1.3	Methods of collection, segregation, storage and transportation of Municipal Solid Waste.	
	1.4	Waste generation, Factors Affecting Waste Generation: Population growth, urbanization, lifestyle, economic development	
2.0		Impact of solid waste	05
	2.1	Outbreak of epidemics, problems during storage and transport, stray animals, drainage blockage,	
	2.2	Leachate pollution, ground water contamination	
	2.3	Green House Gases emissions	
	2.4	impact on environment and human health.	
3.0		Solid waste Management	15
	3.1	Methods of composting: Manual Composting – Bangalore method, Indore Method, windrow composting, Vermicomposting	
	3.2	Land filling techniques, methods and Factors to be considered for site selection of landfills.	
	3.3	Land filling methods: Area method, Trench method, Ramp method, Advantages and disadvantages of landfill method	
	3.4	Concept of Integrated Waste Management (Case study). Zero waste concept of solid waste management.	
4.0		Legal Aspects of Solid Waste Management	10
	4.1	Salient features of Municipal Solid Waste (Management and Handling) Rules, 2000;2016 & 2026	
	4.2	Salient features of Plastic Waste Management Rules, 2016; Plastic Waste Management (Amendment) Rules, 2024.	
	4.3	Role and responsibilities of Urban Local bodies in waste management	
	4.4	Governments initiative for cleanliness: Swachh Bharat Mission	

Reference Books

1. Bhide, A D and Sundaresan, B (2001) *Solid waste management: Collection, Processing and disposal*. NEERI, Nagpur.
2. CPHEEO (2000): “Manual on Municipal Solid Waste Management”, Central Public Health and Environmental Engineering Organization, Ministry of Urban Development, New Delhi.
3. Environmental chemistry: B K Sharma and H. Kaur, Meerut Krishna Prakashan.
4. Fundamentals of Environmental Science: G. S. Dhaliwal, G. S. Sangha, P. K. Ralhan Kalyani Publishers, New Delhi).
5. Integrated Application of Composting Techniques for Waste Management(Lambert Academic Publishing, Mauritius, 2025).
6. Introduction to Environmental science: Y Anjaneyulu (B S Publication, Hyderabad).
7. Solid and Hazardous Waste ManagementDr. Yogalakshmi K. N.
8. Solid Waste Management: Amul Late & Mahadeo Mule (Lambert Academic Publishing, Mauritius, 2020).
9. Solid waste Management: Bhide A. D. Indian National Scientific Documentation Centre, 1983 Vol. II, 2010.
10. Tyagi Anil (2008): Environmental Sciences, UGC – SET/NET IInd Paper, Truman’s publication, New Delhi; pp. 335 – 340.

Major-65 SENVCP1352: Practical's based on Solid Waste Management SENVCP1352 (2 Cr) (Marks: 50)

Course Pre-requisites

The students should have basic knowledge of Environmental Science, understanding with the familiarity with waste types and pollution concepts; Basic laboratory skills and safety practices

Course Objectives

The course aims to:

- Develop practical understanding of solid waste handling and analysis
- Train students in waste characterization techniques
- Provide exposure to waste collection, segregation, and processing methods
- Introduce recycling, composting, and disposal technologies
- Build skills for field surveys and data analysis in waste management systems

Course Outcomes

After completing the course, students will be able to:

- Identify and classify different types of solid waste
- Perform physical and chemical analysis of waste samples
- Demonstrate techniques for waste segregation and storage
- Apply methods like composting, vermin-composting, and recycling
- Conduct field studies and prepare waste management reports

Sr. No.	Practical Exercises	Hrs. required to cover the contents
1.	Study of solid waste management of city/ town/ village	4
2.	Survey of household municipal solid waste generation	4
3.	Quantification study municipal solid waste generation from city/town/village	4
4.	Characterization study of municipal solid waste generation from city/town/village	4
5.	Study of effects of improper disposal of solid waste	4
6.	Study of vermicomposting method	4
7.	Estimation of moisture content of municipal solid waste	4
8.	Estimation of pH of municipal solid waste	4
9.	Estimation of Total Nitrogen of municipal solid waste	4
10.	Effect of pH on growth of earthworms during Vermicomposting.	4
11.	Effect of Temperature on the growth of earthworms during Vermicomposting	4
12.	Visit to Urban local body office (Nagarpanchayat, Nagar Parishad, Municipal Corporation) for solid waste management study.	8
13.	Visit to nearest municipal solid waste dumping site	8
Total		60

Major 64:SENVCT1353 – Environmental Education & Legislation (Theory) – 2 Credits.

Course pre-requisite:

- This course is introduced to highlight the concept of Environmental Education. It covers the Goals, objectives and principles of environmental education.
- This course also introduces students the fundamentals of environmental legislation. Each unit will help the students to develop basic concepts of environmental legislation and policies in India and around the world for environmental protection.

Course objectives:

- To create awareness, knowledge, and concern for the environment, fostering positive attitudes and skills to address environmental challenges.
- To promote sustainable development, understanding of ecological interconnectedness, and active participation in environmental protection through policy knowledge and legal frameworks.
- To understand environmental legislation and their operations at national level.

Course outcomes:

- Environmental Education and Legislation focus on equipping students with a deep understanding of ecological system.
- Develop the ability to analyze environmental policies, and the skills to foster sustainable practices.
- Graduates are prepared to address environmental challenges through legal, scientific, and ethical frameworks, promoting conservation and sustainable development.

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Introduction	
	1.1	Introduction to Environmental Education. Definition of Environmental Education.	08
	1.2	Concept, scope and importance of Environmental Education.	
	1.3	Goals, objectives and principles of Environmental Education.	
	1.4	Modes of Environmental Education: A) Formal Environmental Education, B) Non formal Environmental Education.	
2.0		Environmental Education in India	
	2.1	Awareness of Environmental Education in India, Environmental Education at primary education level.	07
	2.2	Environmental Education at higher secondary level, Environmental education at college level.	
	2.3	Approaches to Environmental Education.	
	2.4	Role of Environmental Education in sustainable development.	
3.0		Environmental Legislation	08

	3.1	History of Environmental Legislation, Concept and importance of Environmental Legislation,	
	3.2	Principles of Environmental Legislation	
	3.3	Role of NGT in Environmental Protection	
	3.4	Need of Laws, Concept of National Environmental Policy Act (NEPA).	
4.0		Legislative Instruments in India	
	4.1	Constitutional Provision Related to Environment: Legal definitions (environmental pollution, natural resource, biodiversity, forest, sustainable development).	07
	4.2	Article 48A (The protection and improvement of Environment and safeguarding of forests and wildlife); Article 51A(g) (Fundamental duties), (Rules & Regulations).	
	4.3	Environmental Protection Act 1986, Role of Central/ State Pollution Control Board in Environmental Protection	
	4.4	The Biological Diversity Act (2002), Case Study	
		Total	30

Reference book:

- **Environmental Education:** *Bombay Natural History Society.*
- **Environmental Education: R. A Sharma:** *R Lall Books Depot, Meerut.*
- **Environmental Education: Principles, Concepts and Management: K. K. Shrivastava:** *APH Publishing, New Delhi.*
- **Environmental Education in Indian Perspectives: Dr. Md. I. Hussain & Dr. R Dixit:** *R Lall Educational Publishers.*
- **Environmental Education: P. K. Reddy & N. D. Reddy:** *Neelkamal Publications Hyderabad.*
- **Environmental Awareness and Education: V. P. Kudesia:** *Educational Publishers, Meerut.*
- **Environmental Legislation in India: K. R. Gupta:** *Atlantic Publishers & Distributors.*
- **Environmental Law and Policy: A. Venkat:** *PHI Learning Private Ltd.*
- **Environmental Law of India- An Introduction: CPR Environmental Education Centre,** *Chennai.*
- **Handbook of Environmental Laws, Acts, Rules, Guidelines, Compliance and Standard: R. K. Trivedi:** *Environmental Edition.*
- **Universal Environment and Pollution Law Manual: S. K. Mohanty.**

Major E2 (SENVET1351): Elective 2 A- Urbanization and Environmental Issues (2 Cr)

Course pre-requisite:

1. This course may be taken up by students from any discipline to understand the fundamental concepts related to the environmental issues and the science behind them.

Course objectives:

- To understand the concept, need, scope and objectives of Environment Education.
- Sensitize the Global Environmental problems and explain the different policies related to Environmental education.
- To make students aware with present issues obstructing the sustainable environmental development.
- To explain the teaching learning strategies and Evaluation techniques in Environment education.
- To develop new methodologies to tackle environmental problems.
- To encourage students to develop and promote awareness among the society regarding current environmental issues and related information with development of common solutions to the environmental issues.
- To undertake the role of individual/volunteer in managing these issues and to develop an awareness about environmental issues.

Course outcomes:

After successful completion of this course, a student should know

- It will help students to understand burning current environmental problems like epidemic issues, problems associated with Urbanization, Population, various pollutions like Greenhouse effect, global warming, ozone depletion, solid waste and its management etc.
- Students will learn about the basic environmental issues caused by anthropogenic and natural activities and their impact as well as they will understand preventive and corrective measures to deal with.
- It may recognize potential environmental impacts of associated problems.
- Students can think critically and contribute to research in solving contemporary environmental problems with professional and ethical accountability.

Curriculum details:

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Introduction to Urbanization	08
	1.1	Definition-Urbanization, difference between Urbanism and Urbanization.	
	1.2	Origin of Urbanization-Historical evolution of urbanization (Cities from ancient and medieval towns to modern cities)	
	1.3	Urbanization on basis of interdisciplinary approach, sociology, economics and geography.	
	1.4	Theories on urbanization: Concentric zone theory (Burgess model), Sector theory (wedge model) multiple-Nuclei Theory, Push-Pull Theory.	

2.0		Urbanization process in India	
	2.1	Morphology of Indian cities: Study of different case studies of Indian cities like Mumbai, Delhi to understand local structural evolution.	07
	2.2	Regional variations: Disparities in urban growth across different Indian states.	
	2.3	Patterns of Urbanization: Growth of metropolitan cities and rural to urban migration patterns, analysis of census data.	
	2.4	Urban Planning: Concepts of master plans, land use regulation and sustainable urban development.	
3.0		Issues and Challenges in Urbanization	
	3.1	Social Issues: Urban poverty, social stratification on basis of cast and class in cities.	08
	3.2	Environmental challenges: Pollution (Air/Water), impact of climate change on coastal cities, urban heat islands, solid waste management.	
	3.3	Governance and policy: Land use regulation, sustainable urban development, concept of master plan.	
	3.4	Government schemes: concept of smart cities, urban housing, Role of Urban Local Bodies(ULBs)	
4.0		Environmental Issues	
	4.1	Atmospheric Pollutions: Acid Rain Chemistry and its impact on ecosystem, Ozone layer Depletion (Causes, effects and Control) Water Pollution: Over exploitation of surface and ground water and global freshwater crisis, Marine pollution.	07
	4.2	Biodiversity Degradation: Loss of biodiversity its causes and effects, Conservation methods of Biodiversity.	
	4.3	Global Issues: Climate change/Green House Effect its causes and Impacts (Rising sea levels, ocean acidification, extreme weather events, and threats to food security.	
	4.4	Mitigations and Adaptations: Carbon sequestration, carbon credits, Major Agreements: UNFCCC (Climate Change), Kyoto Protocol, Paris Agreement, and the Convention on Biological Diversity (CBD), The UN Sustainable Development Goals (SDGs)	

Reference books:

- Odum, E.P., Odum, H.T. & Andrews, J. (1971) Fundamentals of Ecology. Philadelphia: Saunders.
- Pepper, I.L., Gerba, C.P. & Brusseau, M.L. (2011). Environmental and Pollution Science. Academic Press.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. (2012) Environment. 8th edition. John Wiley & Sons.
- Singh, J.S., Singh, S.P. and Gupta, S.R. (2014) Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
- Sengupta, R. (2003) Ecology and economics: An approach to sustainable development. OUP.
- Wilson, E. O. (2006) The Creation: An appeal to save life on earth. New York: Norton.
- Groom, Martha J., Gary K. Meffe and Carl Ronald Carroll (2006) Principles of Conservation Biology. Sunderland: Sinauer Associates.
- ErachBarucha (2004) Text book of Environmental Studies for Undergraduate courses (Prepared for University Grants Commission) Universities Press.
- Principles of Ecology: P. S. Verma, V. K. Agarwal, (S. Chand and Co. New Delhi)
- Environmental Biology: M. P. Arora (Himalaya Publishing House, New Delhi)
- Principles of Environmental Biology: P. K. G. Nair (Himalaya Pub. House, New Delhi)

SENVMP1351: Practical based on Urbanization and Environmental Issues

SENVMP1351 (2 Cr)

Course Prerequisites:

- Basic understanding of Environmental Issues caused by urbanization.
- Basic practical knowledge about environmental monitoring.

Course objective:

- To identify various urban sites and sources of various pollution caused due to urbanization.
- To understand the process of sample collections and analysis of various water and air samples.
- To Understand environmental monitoring by using new techniques (Remote sensing, GPS, Satellite images..etc)

Course Outcome:

- A course on Urbanization and Environmental issues is aim to equip students with knowledge of data collection, site selection, sample collection and to identify problems associated with urbanization.
- A course also useful for students to understand the methods of analysis and find the alternatives.

Sr. No.	Practical Exercises	Hrs. required to cover the contents
1.	Collection of Particulate Matter by using High Volume Air Sampler(HVAS)/ Respirable Dust Sampler (RDS)	4
2.	Collection of Gases by Impinger method	4
3.	Estimation of CO ₂ by Zircondroff technique	4
4.	Determination of Biochemical Oxygen Demand from provided water sample	4
5.	Determination of Chemical Oxygen Demand from Provided water sample	4
6.	Analysis of PM 2.5 from high traffic zones	4
7.	Analysis of PM 10 from high traffic zones	4
8.	To Study the Dust fall measurement by using Tile Exposure method	4
9.	To Study the Solid Waste Management system used at urban areas	4
10.	Field visit to any Effluent Treatment Plant and prepare the report	4
11.	To study the impact of urbanization on local livelihoods,	4

	migration patterns, and quality of life by questionnaire method and survey on household	
12.	To locate areas with high garbage accumulation and analyze the inefficiency of waste collection by data collection.	4
13.	To assess the amount of green space (parks, trees) available in your area by using satellite image	4
14.	Estimation of Sox by using RDS (Respirable Dust Sampler)/High Volume Air Sampler.	4
15.	Estimation of Nox by Using RDS (Respirable Dust Sampler)/High Volume Air Sample	4
	Total	60

Major E2 (SENVMT 1352): Energy Resources Management (Theory 2 Cr)

Course Prerequisites:

- Basic understanding of Energy resource management

Course objective:

- To understand the various sources of energy and their environmental impacts.
- To study the energy demand-supply gap specifically in the Indian context.
- To learn about renewable energy technologies and energy auditing basics.

Course Outcome:

- A course on Urbanization and Environmental issues is aim to equip students with knowledge of data collection, site selection, sample collection and to identify problems associated with urbanization.
- A course also useful for students to understand the methods of analysis and find the alternatives.

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Introduction to Energy Dynamics	08
	1.1	Fundamental Concepts: Definition, , laws of thermodynamics	
	1.2	Energy Classification: Conventional and Non-conventional	
	1.3	Global & National Scenario: Global energy consumption patterns; The Energy Scenario in India;	
	1.4	Growth of the energy sector in india	
2.0		Fossil Fuels and Nuclear Energy	07
	2.1	Coal & Petroleum: Formation, types, and extraction methods; Environmental impacts of mining and combustion (Acid rain, Greenhouse effect).	
	2.2	Process of Natural Gas production, Properties and advantages	
	2.3	Nuclear Energy: Basic principles of nuclear fission; Nuclear fuels (Uranium, Thorium); Indian Nuclear Power Program;	
	2.4	Disposal of radioactive waste and safety concerns.	
3.0		Renewable Energy Technologies	08

	3.1	Solar Energy: Solar heaters, Solar cookers and Solar Photovoltaics (PV cells); Solar Energy potential in Maharashtra.	
	3.2	Wind Energy: Principles and working of wind power; Site selection and environmental impacts.	
	3.3	Bio-energy: Biomass, Bio-gas plants and Liquid Biofuels (Ethanol/Biodiesel).	
	3.4	Introduction to, Tidal, Geothermal energy	
4.0		Energy conservation and Management	
	4.1	Energy Audit: Concept, types of audits, and importance in industries and domestic sectors.	
	4.2	Energy Conservation: Tools and techniques; Role of BEE (Bureau of Energy Efficiency).	07
	4.3	Sustainable Practices: Energy-efficient buildings; Demand-side management.	
	4.4	The concept of "Net Zero" and carbon footprints.	
		Total	30

Reference Books:

- B.H. Khan: Non-Conventional Energy Resources, Tata McGraw Hill.
- S.P. Sukhatme: Solar Energy, Tata McGraw Hill.
- G.D. Rai: Non-Conventional Energy Sources, Khanna Publishers.
- S.A. Abbasi & N. Abbasi: Renewable Energy Sources and their Environmental Impact, PHI.
- **Textbook on Energy Resources and Management** by *Renu Dhupper* (CBS Publishers)
- **Fundamentals of Renewable Energy** by *Shaji James P.* (Scientific Publishers India)
- **Energy Management, Conservation and Audits** by *Anil Kumar, Om Prakash, et al.* (CRC Press)
- **Renewable Energy Sources and Emerging Technologies** by *D.P. Kothari, K.C. Singal, and Rakesh Ranjan* (PHI Learning)
- **Environmental Science** by *S.C. Santra* (New Central Book Agency)
- **Non-Conventional Energy Sources** by *G.D. Rai* (Khanna Publishers)

SENVMP1352: Practical Based on Energy Resource Management SENVET1351 (2 Cr)

Sr. No.	Practical Exercises	Hrs. required to cover the contents
1.	Estimation of power Consumption of a house/institute.	4
2.	Study of renewable energy gadgets	4
3.	To study biogas plant	4
4.	To study solar photovoltaic system	4
5.	To study solar lamp	4
6.	To study solar pumping	4
7.	To study solar cooker	4
8.	To study solar drying system	4
9.	To study solar distillation	4
10.	To Study calorific value of Coal	4
11.	To Study Non-renewable energy gadgets	4
12.	To Visit local Solar Farming site and prepare report	8
13.	To Visit local Wind Energy site and prepare report	8
	Total	60

SENVSC: Environmental Journalism (2 Cr)

Course Prerequisites

- Basic understanding of Journalism and reporting techniques
- Familiarity with Environmental Studies concepts (climate, biodiversity, pollution, sustainability)
- Fundamental skills in writing, interviewing, and media tools
- Basic knowledge of digital platforms (blogs, social media, multimedia storytelling)

Course Objectives

- To develop practical skills in reporting environmental issues accurately and ethically
- To train students in field-based environmental observation and documentation
- To build the ability to translate complex environmental data into accessible stories
- To encourage critical understanding of environmental policies and challenges
- To enhance multimedia storytelling skills (photo, video, audio) for environmental communication
- To promote awareness of global issues like Climate Change and sustainable development

Course Outcomes

Students will be able to:

- Report and write news stories on environmental issues with clarity and accuracy
- Conduct fieldwork, interviews, and data collection related to environmental topics
- Produce multimedia content (articles, photo essays, short documentaries) on environmental themes
- Analyze environmental policies, case studies, and their social impact
- Communicate scientific and environmental information effectively to diverse audiences
- Demonstrate ethical responsibility in covering environmental and community issues

Course Curriculum:

Sr. No.	Practical Exercises	Hrs. required to cover the contents
14.	Collection and record keeping of news cutting regarding the environmental issues	04
15.	Photography of environmental issue of local site	04
16.	Writing news reports on environmental issues of local area	04
17.	Interview with a environmentalist / NGO worker using	04

	Questionnaire	
18.	Television Script Writing on environmental issue	04
19.	Development of effective ICT tools for environmental awareness (Poster/Slogan/Social media post etc)	04
20.	Interpretation of environmental data (charts, reports, surveys)	04
21.	Writing an Environmental Event Report (Environment Day / Earth Day/ Ozone Day/ Water Day/ Wild life week (Any one)	04
22.	Blog Writing on Environment	04
23.	Preparation of a short video/audio documentary on environmental issue	08
24.	Case Study Analysis of any environmental issue	08
25.	Visit to polluted area and write a report	08
	Total	60