Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA
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शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

Ref.No.SU/BOS/Science/451 **Date: 25/07/2025**

To,

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur.

Subject: Regarding revised syllabi of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0)

Ref: No.SU/BOS/Science/270 & 271 Date: 03/05/2025 Letter.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi, nature of question paper of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

B.Sc. Part-II (Sem. III & IV) as per NEP-2020 (2.0)			
1.	Physics	3.	Astrophysics and Space Science
2.	Pollution	4.	Sugar Technology (Entire)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2025 & March/April 2026. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours Faithfully,

Dy Registrar
Dr. S. M. Kubal

Encl: As above

for Information and necessary action

Copy to:

1	Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations and Evaluation	7	I.T.Cell /Computer Centre
3	Chairman, Respective Board of Studies	8	Eligibility Section
4	B.Sc.-M.Sc. Exam Section	9	Affiliation Section (T.1) (T.2)
5	Internal Quality Assurance Cell (IQAC Cell)	10	P.G. Seminar Section

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B.Sc.Part-II (Sem. III & IV) as per NEP-2020 (2.0)			
1.	Botany	8.	Geology
2.	Physics	9.	Zoology
3.	Statistics	10.	Chemistry
4.	Mathematics	11.	Electronics
5.	Microbiology	12.	Drug Chemistry
6.	Plant Protection	13.	Industrial Microbiology
7.	Astrophysics and Space Science	14.	Sugar Technology (Entire)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

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SHIVAJI UNIVERSITY, KOLHAPUR.

A++

Accredited By NAAC

Syllabus For

Bachelor of Science II

(POLLUTION)

(MAJOR COURSE)

PAPER III, IV (SEMESTER – III)

PAPER V, VI (SEMESTER –IV)

(NEP 2020)

Syllabus Implemented From Academic Year 2025- 2026

SHIVAJIUNIVERSITY,KOLHAPUR

NEP-2020(2.0): Credit Framework for UG (B.Sc.) Programme under Faculty of Science and Technology

SEM (Level)	COURSES			OE	VSC/SEC	AEC/VEC/IKS	OJT/FP/CEP /CC/RP	Total Credits	Degree/Cum.Cr. MEME
	Course-1	Course-2	Course-3						
	MAJOR		MINOR						
SEM III (5.0)	**Major V** (2) Air Pollution and control **Major VI** (2) Water and water Resource **Major P III** (2) Practical Course-III (Based On Paper –V and VI)	--	**Minor V (2)** Environmental Ecology **Minor VI (2)** Environmental Ethics **Minor PIII (2)** Practical Course-III (Based On Paper – V and VI)	OE-3(2)(T/P) Natural Disaster and Environmental Issues	SEC-I(2)(T/P) Population and Environmental Statistical Analysis **VSC-I (2) (P)** Ecological Restoration Techniques	AECI(2) (English)	CC-I(2)	22	UG Diploma 88
SEM IV (5.0)	**Major VII** (2) Environmental Pollution and Waste Management- **Major VIII** (2) Natural Resources and Sustainability-I **Major P IV** (2) Practical Course-IV (Based On Paper –VII and VIII)	--	**Minor VII (2)** Community Health and Environment **Minor VIII (2)** Basics of Environmental Pollution **Minor PIV (2)** Practical Course-IV (Based On Paper –VII and VIII)	OE-4(2)(T/P) Global warming and climate change	SEC-II(2)(T/P) Organic Farming	AEC-II(2) (English) VEC-II(2) (Environmental studies)	CEP-I(2)	22	
Credits	**8 (T) + 4 (P) = 12**		**8 (T) + 4 (P) = 12**	**2 + 2 = 4 (T/P)**	**4 (T/P) + 2(P) = 6**	**2 + 4 = 6**	**2 + 2 = 4**	**44**	**Exit Option: 4 credits NSQF/Internship/ Skill courses**

Shivaji University, Kolhapur

Revised Syllabus for Bachelor of Science Part – II: Pollution

1. TITLE: Pollution (Major/Minor)

2. YEAR OF IMPLEMENTATION:- Revised Syllabus will be implemented from June, 2025 onwards.

Guide lines shall be as per B.Sc.Regular Programme.
Rules and Regulations shall be as per B.Sc.Regular Programme.

Preamble

In alignment with the vision of the National Education Policy (NEP) 2020, the B.Sc. Degree Course in Pollution Studies aims to promote a multidisciplinary, holistic, and application-oriented approach to learning. With growing global and national concern over environmental degradation, pollution control, and sustainable development, this program seeks to equip students with both foundational knowledge and practical skills to understand and address environmental challenges effectively.

The curriculum integrates concepts from physical, chemical, biological, and earth sciences, offering a strong interdisciplinary foundation. In line with NEP 2020's emphasis on experiential learning, the course incorporates laboratory work, field studies, and project-based learning to help students apply theoretical knowledge to real-world environmental problems.

The program encourages critical thinking, innovation, environmental ethics, and research aptitude among students. It also promotes flexibility through multiple entry-exit options and skill-based courses to enhance employability and lifelong learning in the environmental sector.

This syllabus is designed to produce responsible graduates who can contribute meaningfully to national and global efforts in pollution control, environmental management, and sustainable development, thereby supporting India's commitments under the Sustainable Development Goals (SDGs) and the Paris Agreement.

Programme Specific Outcomes (POs)

After completion of the course successfully, students would be able to

1. Apply environment related technical skills for sustainability.
2. Develop the skills to identify Environmental problems.
3. Use the fundament also finder disciplinary subjects to solve environmental problems
4. Understand concept and components of environment, history and meaning and Interdisciplinary nature of Environmental Pollution.
5. Identify sources, nature and effects of pollutants on global and local environment.
6. Perform procedure for qualitative and quantitative analysis of pollutants.
7. Assess the effects of pollutants and suggest the control
8. Apply the environmental conservation strategies
9. Create the interest of the society in the conservation of natural resources and improve the environmental quality through exhibitions and other similar activities.

6. **DURATION** - The course shall be a full time course.

7. PATTERN - Pattern of Examination will be Semester type

8. STRUCTURE OF THE COURSE - B. Sc. II Pollution

SECOND YEAR (SEMESTER III / IV) (NUMBER OF PAPERS 4)

Sr. No.	Subjects/Papers	Theory	Min.Mks For Passing	Internal	Min.Mks For Passing	Total Marks
1.	Paper-V	40	14	10	04	50
2.	Paper-VI	40	14	10	04	50
3.	Paper-VII	40	14	10	04	50
4.	Paper-VIII	40	14	10	04	50
	Practical-III					50
	Practical-IV					50
Total						**300**

SCHEME OF EXAMINATION:-

- The examination shall be conducted at the end of each term for semester pattern.
- The theory paper shall carry 40 marks.
- The evaluation of the performance of the students in theory papers shall be on
- The basis of Semester Examination of 40 marks.
- The internal evaluation for each paper shall carry 10 marks.
- (Semester I:Group activity/assignments and Semester Il: practical's/Oral examination)
- Question paper will be set in the view o f the /in accordance with the entire syllabus
- And preferably covering each unite of syllabi.

10.EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF PAPERS- (FOR REVISED SYLLABUS)

(Implemented from 2025-2026 onwards)

Theory Syllabus

Old Syllabus (Semester pattern)			Revised Syllabus (Semester pattern)	
Paper No.	**Title of Old Paper**	**Semester**	**Paper No.**	**Title of New Paper**
I	Ecology and Environment	Semester- III	V	Air Pollution and Control
II	Environmental Pollution		VI	Water and water resources
III	Soil and Solid Waste Pollution Air and Water Pollution	Semester- IV	VII	Environmental Pollution and Waste Management
IV	Soil and Solid Waste Pollution		VIII	Natural Resources and Sustainability

Practical Syllabus

Old Syllabus (Annual)			Revised Syllabus (Semester pattern)	
Paper No.	**Title of Old Practical**	**Semester**	**Paper No.**	**Title of New Practical**
I II	Practical –I Based on paper –I and II	Semester- III	V VI	Practical –III Based on paper –V and VI
III IV	Practical –II Based on paper –III and IV	Semester- IV	VII VIII	Practical –IV Based on paper –VII and VIII

10.Nature of Question Paper for B.Sc. Part – I, II & III (40 + 10 Pattern) according to Revised Structure as Per NEP - 2020 to be implemented from academic year 2025-26

Maximum Marks: 40
Duration: 1:30 hrs

Q. 1 Select the most correct alternative from the following **[8]**

i) to viii) MCQ one mark each with four options

A)

B)

C)

D)

Q.2 Attempt any TWO of the following **[16]**

A)

B)

C)

Q. 3 Attempt any FOUR of the following **[16]**

A)

B)

C)

D)

E)

F)

****

Practical Examination

(A) The practical Examination is of semester type.

(B) The practical examination will be conducted on two consecutive days for four hours per day per batch of the practical examination.

(C) Each candidate must produce a certificate from the Head of the Department in her/his college, stating that he/she has completed in a satisfactory manner the practical course on lines laid down from time to time by Academic Council on the recommendations of Board of Studies and that the journal has been properly maintained. Every candidate must have recorded his/her observations in the laboratory journal and have written a report on each exercise performed. Every journal is to be checked and signed periodically by a member of teaching staff and certified by the Head of the Department at the end of the year. Candidates must produce their journals at the time of practical examinations.

Note: - At least 80% Practicals should be covered in practical examination.

Nature of Practical Question Paper III

Q.1.	Experiment - Physical / Chemical parameter of water	10 Marks
Q.2.	Experiment - Biological/Chemical parameter of water.	12 Marks
Q.3.	Experiment - Estimation of aerosols in air by Slide/Beaker method	12 Marks
Q.4.	Isolation of Microorganism from air / water by SPC	10 Marks
Q.5.	Submission of field visit report	06 Marks

Nature of Practical Question Paper IV

Q.1.	Experiment - Transect / Quadrant Method	10 Marks
Q.2.	Experiment - Ecological adaptations plants / animal (four)	10 Marks
Q.3.	Experiment - Determination of composition of solid waste / Insoluble fractions from given solid waste / quartering and coining method	10 Marks
Q.4.	Spotting - A, B, C, D & E	10 Marks
Q.5.	Certified Journal Submission	05 Marks
Q.6.	Submission of document on local flora and Viva-voce	05 Marks

TITLES AND CONTENTS OF PAPERS-(FOR NEW SYLLABUS)

(Introduced from Academic Year 2025-2026)

			MAJOR PAPERS	MINOR PAPERS
Sr.No.	**Paper No.**	**Semester**	**Title of the Paper**	**Title of the Paper**
1	V	III	Air Pollution and Control -I	Environmental Ecology
2	VI	III	Water and water resources-I	Environmental Ethics
Sr.No.	**Paper No.**	**Semester**	**Title of the Paper**	**Title of the Paper**
1	VII	IV	Environmental Pollution and Waste Management-I	Community Health and Environment
2	VIII	IV	Natural Resources and Sustainability -I	Basics of Environmental Pollution

Open Elective Papers (OE)

Sr.No.	Paper No.	Semester	Title of the Paper
3	III	III	NATURAL DISASTER AND ENVIRONMENTAL ISSUES
4	VI	IV	GLOBAL WARMING AND CLIMATE CHANGE

Skill Enhancement Course (SEC) Papers

Sr.No.	Paper No.	Semester	Title of Open Elective Paper
1	I	III	Population and Environmental statistical Analysis
2	II	IV	Organic Farming

SEMESTER-III VSC Papers-I

Sr.No.	Paper No.	Title of VSC Paper
1	I	ECOLOGICAL RESTORATION AND TECHNICQUES

SEMESTER–III

POLLUTION Paper V (Major): DSC: Air Pollution and Control-I

CREDIT: 2. LECTURE PERIODS: 2 PER WEEK **MARKS: 50**

MODULE	SUB- MODULE	TOPICS	LECTURE PERIODS
1	**Introduction and Types of air pollutions**		
	1.1 Introduction	Definition of air pollution, classification of air pollutants , units and expression of air pollution data sources of Air Pollution : Natural, industrial , automobiles and domestic	**08**
	1.2 study of air Pollutants	Dust , Suspended Particulate matter (SPM); Carbon monoxides : Sulphur oxides ;Nitrogen oxides , ammonia , Hydrogen Sulphide; Fluorides; Asbestos; Ozone, PAN and Photochemical smog	**08**
2	**Effect of Air Pollutant and Control**		
	2.1 Effect of air pollutant	Effect of air pollutant on man, animal and environment Effect of air pollutant on physical factors.	**06**
	2.2 Air Pollutant control	Source collection methods : Particulate pollution control by mechanical collector, cyclones , bags filters and electrostatic precipitators: gaseous pollution control by scrubbers, absorbers and combustion	**08**
		Total Lectures	**30**

Course Outcome (COs):-

1. Analyze the state and trends of air pollution
2. Classify and describe air pollutants with their impact.
3. State and formulate air sample collection methods and analysis.
4. Understand and explain the impact of air pollution on physical and biotic factors.

POLLUTION Paper VI(Major): DSC: Water and water resources-II

CREDIT: 2. LECTURE PERIODS: 2PER WEEK **MARKS: 50**

MODULE	SUB-MODULE	TOPICS	LECTURE PERIODS
1	**Introduction of water Resources**		
	1. 1 Properties of water	Physical: temperature, colour, odour, total dissolved solids and total suspended solids; hydrological cycle; Chemical: Molecular structure of water, dissolved gases, DO, COD, BOD, acidity and alkalinity, electrical conductivity,; Biological: phytoplankton, zooplankton, macro-invertebrates.	**06**
	1.2 Surface and subsurface water	Introduction to surface and ground water; surface and ground water pollution; water recharge; watershed and ; importance of watershed and watershed management; rain water harvesting in urban settings. Marine resources; commercial use of marine resources; threats to marine ecosystems and resources.	**08**
2	**Wetlands and Water Resources**		
	2.1 Wetlands and their management	Definition of a wetland; types of wetlands (fresh water and marine); ecological significance of wetlands; threats to wetlands; wetland conservation and management; Ramsar Convention, 1971; major wetlands of India, ecological and economic impacts.	**08**
	2. 2 Water resources and treaties	Water resources (oceans, rivers, lakes and wetlands) and types of water; Overexploitation of surface and ground water resources; role of state in water resources management; Ganges water treaty; Teesta water treaty	**08**
Total Lectures			**30**

Course Outcome (Cos):-

1. Understand and explain basics properties of water
2. Illustrate and explain different resources of waters.
3. Explain and assess importance of wetlands.
4. Understand different laws, treaties of water resources.
5. Elucidate the characteristics of wetlands.
6. Develop skills in water resource modeling for water management

POLLUTION Paper VII (Major): DSC: Environmental Pollution And Waste Management-I

CREDIT: 2. LECTURE PERIODS: 2PER WEEK **MARKS: 50**

MODULE	SUB- MODULE	TOPICS	LECTURE PERIODS
1	**Noise and Radioactive Pollution**		
	1.1 Environmental pollutants	Definition of pollution; pollutants; classification of pollutants; solubility of pollutants (hydrophilic and lipophilic pollutants), transfer of pollutants within different mediums, concept of biotransformation and bioaccumulation.	**06**
	1.2 Noise and Radioactive pollution	Noise pollution – sources; permissible ambient noise levels; effect on communication, impacts on life forms and humans; control measures: Radioactive Pollution-Sources, effects and control measures.	**08**
2	**Resource Recovery and Industrial waste management**		
	2.1 Resource Recovery	Resource Recovery 4R- reduce, reuse, recycle and recover; biological processing - composting, anaerobic digestion, aerobic treatment; biological treatment; green techniques for waste treatment	**08**
	2.2Solid & industrial waste management	Sources and generation of solid waste, their classification and chemical composition; characterization of municipal solid waste; hazardous waste and biomedical waste; impact of solid waste on environment, human and plant health; landfill; thermal treatment (pyrolysis and incineration) of waste material; effluent treatment plant and sewage treatment plant.	**08**
Total Lectures			**30**

Course Outcome (Cos):-

1. Enhanced knowledge and understanding the types of Environmental Pollution
2. Analyzing the complex causes and effects of environmental pollution and waste management challenges.
3. Awareness about the severity of environmental pollution problems.
4. Interpret importance of solid waste management.

POLLUTION Paper VIII (Major): DSC: Natural Resources and Sustainability-I

CREDIT: 2. LECTURE PERIODS: 2 PER WEEK **MARKS: 50**

MODULE	SUB-MODULE	TOPICS	LECTURE PERIODS
1	**Introduction of Natural Resources**		
	1.1 Natural Resources and Land Resources.	Definition of Natural resources; Classification of natural resources based on utility potential. Land resources in India- Agriculture : Types and cropping patterns ;Management; Mining, Quarrying and their impacts ;Soil erosion: causes- Types-Impacts- 'Control measures	**08**
	1.2 Energy Resources and Conservation	Energy Resources and Conservation: Definition- Classification of energy resources; Conventional: Fossil flues, Nuclear energy and their impacts. Non-conventional: Solar, Wind, Tidal, Ocean Thermal energy, Geothermal.	**08**
2	**Forest And Biodiversity Resources**		
	2.1 Forest Resources	Forest Resources: Importance of Forest- Types of Forests- Impacts of Deforestation; Minor forest Products; Forest based Industries.	**06**
	2.2 Biodiversity Resources	Biodiversity : Definition -Levels of Biodiversity; values of biodiversity; Biodiversity Hotspots; Threats to Biodiversity, Strategies of Conservation and Management ; Threats and Extinction - Endangered Species-Endemic species- In-situ and Ex-situ Conservation -Protected areas National parks- Sanctuaries- Biosphere Reserves; Role of Indian organizations, IUCN, WWF and Greenpeace in Wildlife conservation	**08**
Total Lectures			**30**

Learning Outcomes

1. Understand and explain basics of natural resources.
2. Illustrate and explain about renewable resources.
3. Explain and assess about biodiversity resources..
4. Understand and recall different uses of renewable resources.
5. Interpret and formulate different energy resources.

LABORATORY COURSE PRACTICAL –III (Major)

Based on Paper V & VI (Total Marks-50)

1. Determination of free Carbon Dioxide in water sample
2. Quantitative estimation of aerosols in air by slide and beaker method
3. Study of sulphation rate candle
4. Fumigation of sulphur dioxide on plants and study of visible injury
5. Determination of Acidity in given water sample
6. Study of temperature of water (any two samples)
7. Isolation of microorganisms from air by expose plate method**.**
8. Isolation of microorganisms from water sample by standard plate count method**.**
9. Demonstration of an Electrostatic Precipitator.
10. Field visit -PUC center/Stone crusher/any air polluted area.
11. Determination of settling rate of sediments of waste water.
12. Determination of dissolved oxygen in given water sample.

LABORATORY COURSE PRACTICAL –IV (Major)

Based on Paper VII & VIII (Total Marks-50)

1. Identify and document local flora..
2. Study of ecological plant adaptations.(Hydrophytes, Mesophytes,Epiphytes,Xerophytes)
3. Study of ecological animal adaptations
   (Structural:Camouflage,mimicry,vestigiliaty.Behavioural:Hibernation,migration)
4. Determination of minimum size of quadrate for study of local grassland species
5. Estimate of local grassland species richness by using the belt transects method.
6. Determination of light penetration by Secchi disc
7. Determination of chlorophyll in aquatic plant *Hydrilla*.
8. Determination of composition of solid waste.
9. Determination of insoluble fractions from given solid waste.
10. Measurement of primary productivity in a water body by Light and Dark bottle method
11. Solid waste sampling by quartering and coning method.
12. Measurement of Noise Pollution by Noise Meter in different Zones.

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2. A text book on soil science, D.K.Das,Kalyani Publications
3. An Introduction to Behavioural Ecology, J R Krebs & N B Davies. Sinauer Associates
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25. United Nations General Assembly (1987) Report of the World Commission on Environment and Development: Our Common Future.

OPETIONAL ELECTIVE

Pollution Paper-III

OE: NATUEAL DISASTER AND ENVIRONMENTAL ISSUES

CREDIT: 2 **LECTURE PERIODS: 2PER WEEK** **MARKS: 50**

MODULE	SUB- MODULE	TOPICS	LECTURE PERIODS
1	**Introduction of Natural Disasters**		
	1.1 Introduction to Natural Disasters	Introduction of natural disasters. Definition and types of natural disasters, Causes and effects of natural disasters, Impact of natural disasters on human societies	**06**
	1.2 Types of Natural Disasters	Types of Natural Disasters , Earthquakes: causes, effects, and case studies, Volcanic eruptions: causes, effects, and case studies, Floods and landslides: causes, effects, and case studies, Droughts and wildfires: causes, effects, and case studies	**08**
2	**Environment and Disaster Management**		
	2.1 Environmental Issues	Climate change: causes, effects, and mitigation , Climate change and human migration ; Deforestation and land degradation: causes, effects, and conservation strategies,	**06**
	2.2 Human Impact on the Environment and Disaster Management	Population growth and consumption patterns, Urbanization and environmental degradation, Industrialization and pollution, Disaster Management, Disaster preparedness and response, Sustainable development and environmental protection.	**10**
		Total Lectures	**30**

Learning Outcomes:-

1. Understand the concept of natural disasters and their impact on the environment.
2. Identify the causes and effects of different types of natural disasters.
3. Analyze the role of human activities in exacerbating environmental issues.
4. Develop critical thinking skills.
5. Evaluate the impact of natural disasters and environmental issues on human societies.

OPETIONAL ELECTIVE

Pollution Paper-IV OE: GLOBAL WARMING AND CLIMATE CHANGE

CREDIT: 2 LECTURE PERIODS: 2PER WEEK **MARKS: 50**

MODULE	SUB-MODULE	TOPICS	LECTURE PERIODS
1	**Introduction global warming**		
	1.1 Introduction to global warming	Earth's climate through ages; trends of global warming and climate change; drivers of global warming and the potential of different green house gases (GHGs) causing the climate change; weather patterns, sea level rise.	**06**
	1.2 Productivity and biological responses-	Introduction of agricultural productivity and biological responses - range shift of species, CO2 fertilization and agriculture; impact on economy and spread of human diseases.	**08**
2			
	2.1 Importance of ozone layer	Ozone layer or ozone shield; importance of ozone layer; ozone layer depletion and causes; Chapman cycle; process of spring time ozone depletion over Antarctica; ozone depleting substances; effects of ozone depletion	**08**
	2.2 Mitigation measures And Environmental policy	Mitigation measures and international protocols. Environmental policy debate; International agreements; Montreal protocol 1987; Kyoto protocol 1997; Convention on Climate Change; carbon credit and carbon trading; clean development	**08**
		Total Lectures	**30**

Learning Outcomes:-

1. Understand the fundamentals of global warming and climate change
2. Analyze the impacts of global warming and climate change
3. Evaluate climate change mitigation and adaptation strategies
4. Apply knowledge of climate change to real-world scenarios

SEC-Skill Enhancement Course:-I

SEMESTER-III

Pollution Paper I: SCE

SCE: Population and Environmental statistical Analysis

CREDIT: 2. PRACTICAL: 60 MARKS: 50

SEC: - Pollution Paper I Population and statistical analysis

PRACTICAL - I

Population and statistical analysis

1. To estimate the population size of given area or organisms.
2. To compare different sampling methods and their effects on population.
3. Calculation of Mean and Standard deviation from given sampled data.
4. Diagrammatic representation using Line and Bar from given field data**.**
5. Graphical representation of data by Histogram, Frequency polygons.
6. To calculate and compare the mean and median of AQI data.
7. To analyze and compare the standard deviation and variance coefficient of climate change data
8. Diagrammatic representation using Pie diagram from given field data**.**
9. Graphical representation of data by frequency curves and stem and Leaf Plot.
10. To construct a population pyramid using age distribution data and interpret the result.
11. To analyze the population structure of given population data and interpret the result.
12. To calculate the population growth rate using census data.

Learning Outcomes:-

1. Analyze and Calculate demographic indicators and understand the implication of population aging**.**

2. Apply Statistical techniques to environmental data

3. Evaluate the impact of population growth on the environment.

4. Collect and analyze populatation and environmental data.

SEC-Skill Enhancement Course:-II

SEMESTER-IV

Pollution Paper II: SCE

SEMESTER-IV

ORGANIC FARMING

CREDIT: 2. PRACTICAL HOURS: 60 MARKS: 50

PRACTICAL-II

1. Introduction to various farm machines and equipment used on the farm.
2. To study the application of different organic fertilizers on plant growth
3. To study the pH of different soil samples.
4. Measurement of soil organic matter and soil organic carbon.
5. To study the effect of different concentration of different pesticides on plant growth.
6. To study the effect of different types of Biofertilizer on plant growth
7. To study the effect of different biopesticides on plant growth.
8. Determination of water holding capacity of soil.
9. Determination of soil moisture and field capacity
10. To study the formation methods of composting.
11. Cost benefit analysis of organic farming
12. Visit to organic farm for study the various components and their utilization.

Learning Outcomes:-

1. Understand the principals of organic farming
2. Analyze the importance of soil health in organic farming
3. Evaluate the use of natural pest control methods in organic farming
4. Develop the knowledge of soil management plan.

Semester –III VSC –I (Credit-2)
Ecological Restoration Techniques

CREDIT	TITLE	LECTURE PERIOD
CREDIT- I	Soil Seed Bank Analysis	15
	Plant Propagation using Cuttings	
	Seed Germination Test	
	Soil Texture Analysis Using the -" Feel Method	
	Determination of Particle Bulk Density of Soil	
CREDIT- II	To Study The Antimicrobial Properties of Plants	15
	To Study of Seed Dormancy and Germination	
	To Introduce Students to the Basis of Ecological Restoration Monitoring and Evaluation by Providing data.	
	Description of Soil Profile	
	To Introduce Students to the Invasive Species Identification and Management by Providing data	
	Total Lecture	**30**

Learning Outcomes-

- Students should be able to understand –
- Students will be able to explain the concept of ecological restoration plans.
- Students will be able to identify various tools and equipments for ecological restoration.
- Students will be able to design and implement ecological restoration plans.
- Students will be able understand the importance of ecological restoration.

Books recommended for Practicals (References) –

1. "Ecological Restoration: Principles, Values, and Structure of an Emerging Profession" by Andre F. Clewell and James Aronson

10. The Society for Ecological Restoration (SER): A professional organization dedicated to advancing the science and practice of ecological restoration.

11. The International Union for Conservation of Nature (IUCN): A global organization that works to conserve and restore ecosystems.

12. The Ecological Restoration Alliance: A network of organizations and individuals working to advance ecological restoration.

2. "Restoration Ecology: The New Frontier" by Richard J. Hobbs and Donald A. Norton

3. "Ecological Restoration: A Practical Approach" by Martin R. Perrow and Anthony J. Davy

4. "The Handbook of Ecological Restoration" by Martin R. Perrow and Anthony J. Davy

5. "Ecological Restoration: A Guide for Practitioners" by the Society for Ecological Restoration

6 "Restoration Ecology: A Guide for Practitioners" by the International Union for Conservation of Nature (IUCN)

7. "Ecological Restoration: An International Journal" (a peer-reviewed journal)

8. "Restoration Ecology" (a peer-reviewed journal)

9 "The Encyclopedia of Ecological Restoration" by the Society for Ecological Restoration

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Syllabus For

Bachelor of Science II

(POLLUTION)

(MINOR COURSE)

PAPER III, IV (SEMESTER – III)

PAPER V, VI (SEMESTER –IV)

(NEP 2020)

Syllabus Implemented From Academic Year 2025- 2026

SEMESTER–III

POLLUTION Paper V (Minor): DSC: **Environmental Ecology**

CREDIT: 2. LECTURE PERIODS: 2 PER WEEK **MARKS: 50**

MODULE	SUB- MODULE	TOPICS	LECTURE PERIODS
1	**Introduction Of Environment**		
	1.1 Introduction of Environment	Introduction, Scope and importance ,components of environment, rife account of Cryosphere and Anthroposphere	**07**
	1.2 Introduction of Ecology	Introduction, Definition, Population and population growth Community Ecology (Natality, Mortality), Community Characteristics (Density, Abundance, Frequency),	**08**
2	**Factors Of Environmental Ecology**		
	2.1 Ecosystem	Concept of Ecosystem, Organisation and significance, Food chains, Food Webs and trophic levels.	**07**
	2.2 Ecosystems	Types of ecosystems, Ecological pyramids, Energy flow, Ecosystem productivity ,Decomposition	**08**
		Total Lectures	**30**

Course Outcome (COs):-

1. Analyze the state and trends of environment
2. Describe the environmental factors with their impact.
3. State and formulate simple examples of different types of ecosystems.
4. Understand and explain the concept of Environment and Ecology

SEMESTER–III

POLLUTION Paper VI (Minor): DSC: **Environmental Ethics-**

CREDIT: 2. LECTURE PERIODS: 2 PER WEEK MARKS: 50

MODULE	SUB- MODULE	TOPICS	LECTURE PERIODS
1	**Introduction to Environment and Ethics**		
	1.1 Introduction of Environmental Ethics	Meaning of environment and ethics, Need for ethical behavior toward nature, Relationship between humans and the environment, Indian traditional views on nature, Movements: Chipko, Appiko,Narmada Bachao.	**07**
	1.2 Ethical Issues in Resource Use	Overuse of water, forests, land – moral responsibility, Consumerism and its environmental cost, Responsible use of energy and materials	**08**
2	**Environmental Problems and Ethical Solutions**		
	2.1 Environmental Problems	Deforestation, plastic use, animal cruelty – ethical reflections, Eco-friendly alternatives and local solutions	**07**
	2.2 Ethical Solutions	Value education and climate action, Role of youth in environmental action, Environmental rights and duties (citizenship and responsibility)	**08**
		Total Lectures	**30**

Course Outcome (COs):-

1. Understand and explain the trends of environmental ethics..
2. Describe the meaning of environmental ethics.
3. State and formulate simple examples of environmental problems.
4. Understand and explain the concept of Environment ethics.

SEMESTER–IV

POLLUTION Paper VII (Minor): DSC: **Community Health and Environment**

CREDIT: 2. LECTURE PERIODS: 2 PER WEEK MARKS: 50

MODULE	SUB- MODULE	TOPICS	LECTURE PERIODS
1	**Introduction to Environmental Health**		
	1.1 Introduction environmental Health	Environmental health, Importance of clean environment for human well-being, Link between environment and disease,	**07**
	1.2 Water, Sanitation and Hygiene	Safe drinking water – traditional and modern methods Personal hygiene (bathing, hand washing, nail care, menstrual hygiene) , Household sanitation (latrines, sewage) , Water-borne diseases (cholera, diarrhea, typhoid)	**08**
2	**Waste and Vector Control**		
	2.1 Introduction of Waste and Vector Control	Household waste types and health hazards, Open dumping and flies, mosquitoes, rats, Vector-borne diseases: malaria, dengue, chikungunya, Simple waste segregation and control strategies	**07**
	2.2 Food, Nutrition and Clean Environment	Clean cooking and indoor air, Food contamination from environment, Different types of food storage motheds, Eco-friendly food storage and waste management.	**08**
		Total Lectures	**30**

Course Outcome (COs):-

1. Improves daily life habits,
2. Builds practical health and hygiene knowledge
3. Creates social responsibility
4. Village/rural-based projects and extension activities**.**

SEMESTER–IV

POLLUTION Paper VIII (Minor): DSC: **Basics of Environmental Pollution**

CREDIT: 2. LECTURE PERIODS: 2 PER WEEK **MARKS: 50**

MODULE	SUB- MODULE	TOPICS	LECTURE PERIODS
1	**Introduction to Pollution and Pollutants**		
	1.1 Introduction pollution and pollutants	Definition of pollution and pollutants, Classification: physical, chemical, biological, radioactive, Sources: natural vs anthropogenic, Examples from village/town/campus environments	**07**
	1.2 Pollution-Environment-Human Link	pollution affects on ecosystems (plants, animals, microbes), Impact on agriculture (soil fertility, crop yield), Human exposure pathways (inhalation, ingestion, contact),Concept of bioaccumulation and biomagnifications (simple explanation)	**08**
2	Pollution in Daily Life and Community Role		
	2.1 Pollution in Daily Life and Its Reduction	Pollution from detergents, cosmetics, cleaners, packaged food,Waste burning and indoor smoke, Eco-friendly practices at home: reuse, composting, safe disposal, Green consumer behavior and low-carbon lifestyle	**07**
	2.2 Pollution Control and Community Role	Role of citizens in pollution control (local action, awareness),Green technologies: biogas, rainwater harvesting (basic level), Role of local governments, schools, NGOs	**08**
		Total Lectures	**30**

Course Outcome (COs):-

1. Understand modern pollution issues
2. Build observation and critical thinking skills
3. Learn how to apply simple solutions at home, college, or village level
4. Foster civic responsibility and eco-ethics in daily life

LABORATORY COURSE PRACTICAL –III
Based on Minor Paper V & VI

CREDIT: 2. PRACTICAL HOURS: 60 MARKS: 50

1. Study of Biotic and Abiotic Components of an Ecosystem
2. To Soil Texture and Composition Test
3. Case study of Chipko Movement.
4. Case study of Narmada Bachao Andolan.
5. To study the Eco-footprint" Self-Assessment
6. To Prepare Ethical Action Plan
7. Visit /Interview a farmer/environmental worker to learn traditional eco-practices
8. Field Visit to a Local Ecosystem**.**
9. Measurement of Plant Population Density using Quadrate Method.
10. Measurement of Frequency and Abundance of Plant Species using Quadrats
11. Study of Ecological Pyramids through Models/Charts.

LABORATORY COURSE PRACTICAL –IV
Based on Minor Paper VII & VIII

CREDIT: 2. PRACTICAL HOURS: 60 MARKS: 50

1. To Study the Leaf Dust Test
2. To Study the Plastic Use Audit
3. Visit to Local Site- Observe pollution signs in river, roadside, market or dumping site.
4. Create a Pollution Control Plan.
5. Poster Making related to awereness e.g. Topic: "My Pollution-Free Home/Street"
6. To Study the Kitchen Audit.
7. Visit a village/area and note environmental health issues
8. Case study of Swachh Bharth Mission
9. Identification of Common Food Contaminants.
10. Eco-Friendly Food Storage Demonstration.
11. Mini Project: 1-Week Kitchen safety rules Diary

REFERENCE BOOK LIST

1. A text book on **Basics of Ecology** M. P. Arora Himalaya Publishing House
2. F**undamentals of Ecology** M. C. Dash Tata McGraw-Hill.
3. A text book on **Environmental Ecology and Field Biology** R. Mishra Anmol Publications
4. Environmental Pollution – Causes, Effects and Control S.S. Dara S. Chand
5. Introduction to Environmental Ethics Anubha Kaushik & C.P. Kaushik. New Age International
6. Introduction to Environmental Pollution P.K. Goel New Age International
7. Clark, William; Harley, Alicia (2020). "Sustainability Science: Toward a Synthesis". Annual Review of Environment and Resources. 45 (1): 331–86.
8. Ecology and Environment, P.D. Sharma, Rastogi Publications
9. Ecology, Environment and Resource Conservation. Anamaya Publications, New Delhi. Sodhi, N.S. & Ehrlich, P.R. (Eds). 2010.
10. Elements of Ecology, Clerke. John Wiley & Son
11. Environment and Sustainable Development by M.H. Fulekar, Bhawana Pathak, R K Kale, Springer Nature (2013)
12. Environmental Chemistry, A K De. New Age International Pvt. Ltd.
13. Environmental Science, Richard T Wright. Pearson, Prentice Hall
14. Environmental Science: Earth as a Living Planet, Daniel B Botkin & Edward A Keller. John Wiley & Sons, Inc.
15. Environmental Studies, A K De. New Age International Pvt., Ltd.
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21. Essentials of Community Health Nursing K. Park Banarsidas Bhanot.
22. Public Health and Preventive Medicine J.E. Park (reference for sanitation and hygiene units) Publication of Banarsidas Bhanot
23. Fundamentals of Ecolog Eugene OdumW.B. Saunders Co.
24. Target 3 Billion: Innovative Solutions Towards Sustainable Development by APJ Abdul Kalam, Srijan Pal Singh, Penguin India (2011)
25. Ecology and Field Biology R.L. Smith Harper & Row
26. Ecology: Principles and Applications J.L. Chapman & M.J. ReissCambridge University Press.