

**KRANTIGURU SHYAMJI KRISHNA VERMA KACHCHH
UNIVERSITY,
BHUJ**

Academic Year: 2023-2024



**Syllabus (NEP – 2020)
B.Sc. (Honours) ENVIRONMENT SCIENCE
(with Research /without Research)**

**Semesters: I and II
(with Multiple exit-entry options)**

FACULTY OF SCIENCE

**A Curriculum of Environment Science
Faculty of Science framed as per UGC Guidelines and norms of
National Education Policy (NEP) – 2020.**

With effect from June – 2023

B.Sc. (Honours) Environment Science Programme

(With Research/without Research)

As per NEP-2020

With effect from June – 2023

FACULTY OF SCIENCE

Subject: Environment Science

B. Sc. Semesters: I & II

INTRODUCTION OF BACHELOR'S DEGREE PROGRAMME IN ENVIRONMENT SCIENCE (HONOURS)

A bachelor's degree in Environment Science with Research or without Research is a 4-year degree course that is divided into 8 semesters.

A student pursuing 4 years undergraduate programme with research in a specific discipline shall be awarded an appropriate Degree in that discipline on completion of the 8th Semester if he/she secures **176** Credits. Similarly, for certificate, diploma and degree, a student needs to fulfill the associated credits. An illustration of credits requirements in relation to the type of award is illustrated above.

A Bachelor's Degree (Honours) is a recognized and specialized graduate-level qualification that provides structured education at the tertiary level. It is designed to equip students with knowledge, understanding, qualifications, skills, and values relevant to their chosen field of study or profession. The program attracts students from the secondary level, regardless of their prior subject knowledge, and prepares them for professional opportunities or further studies at the postgraduate level. The B.Sc. (Honours) Course in Environment Science specifically aims to prepare students for careers in the Environment science field or provide opportunities for advancement in related employment settings. Graduates of this program can pursue various job opportunities or continue their academic pursuits at a higher level.

AIM OF THE COURSE:

Aims of the B.Sc. (Honours) Course in Environmental Science:

- Foster a hands-on learning approach that encourages students to explore and discover the wonders of environmental science. The program aims to provide students with practical experiences and fieldwork opportunities, allowing them to actively engage in the study of environmental science. By promoting hands-on learning, students can develop a deeper understanding of environmental concepts and phenomena.
- The program acknowledges the importance of incorporating modern educational techniques to enhance the learning experience. By utilizing e-learning platforms, flipped classrooms, and hybrid learning models, students can actively participate in their education, collaborate with peers, and access resources anytime, anywhere.
- Cultivate environmentally responsible citizens who play a pivotal role in shaping the future of environmental science and contribute to sustainable development.
- The program seeks to instill a sense of environmental responsibility in students. By emphasizing the importance of sustainable development, graduates are prepared to contribute to the field of environmental science and make informed decisions that promote the well-being of the environment and society.
- Provide comprehensive theoretical and practical knowledge in environmental science, equipping graduates with the necessary skills for further studies or exciting careers in environment-related fields.
- The program aims to provide a solid foundation in environmental science, covering both theoretical concepts and practical applications. Graduates will acquire a deep understanding of environmental issues, research methods, data analysis, and problem-solving skills, preparing them for further studies or successful careers in various environment-related fields.
- Prepare students for national and international competitive examinations, empowering them to pursue advanced research opportunities or secure prestigious positions in environmental science and related fields.

By aligning with these aims, the B.Sc. (Honours) Course in Environmental Science strives to provide a well-rounded education that not only equips students with the necessary knowledge and skills but also instills a sense of environmental responsibility and prepares them for successful careers in the field.

COURSE INTRODUCTION

The proposed curriculum of the B.Sc. in Environmental Science offers a comprehensive education in studying environmental science from a holistic perspective. The program is designed to provide students with essential knowledge and technical skills in all areas of environmental science through a unique combination of Major, Minor, MDC, AEC, SEC, and VAC papers, with a strong emphasis on interdisciplinary components.

Students will receive training in cutting-edge technologies used in the study of environmental life forms, including their evolution and interactions within ecosystems. They will gain an understanding of the social and environmental significance of environmental life and its relevance to the national economy.

The B.Sc. Environmental Science program integrates both classroom and laboratory sessions to cover academic activities. Practical concepts are emphasized during laboratory sessions, allowing students to apply theoretical knowledge to real-world scenarios. Additionally, the program includes field trips, outstation activities, and projects to provide students with hands-on experience and a deeper understanding of environmental science in practical settings.

This program is ideal for candidates who possess a curiosity for the environment, nature, and ecosystems. Those who are passionate about exploring exotic places and aspire to work as researchers or professionals in fields such as environmental science, conservation, ecology, and more can benefit from the B.Sc. Environmental Science course.

Programme outcomes (POs):

This curriculum of the B.Sc. Environmental Science program aims to develop well-rounded individuals who possess not only knowledge in the field but also the drive to contribute to their nation's progress and shape the future. By studying environmental science, students will gain a deep understanding of the oceanic world and its potential for transformative impact across various sectors.

Programme specific objectives (PSOs): B.Sc. Environmental Science

- Dive into the fascinating realm of environmental science through this program that covers a wide range of topics.
- Prepare students for cutting-edge research in frontier areas of environmental science by providing them with a solid foundation in the subject.
- Explore the diverse habitats, morphologies, anatomies, and reproductive processes of various environmental organisms.
- Develop the skills of competent environmental biologists who can apply their knowledge to address critical issues in aquaculture, the fishery industry, environmental pharmacology, and environmental sustainability.
- Unlock students' potential for self-entrepreneurship and self-employability through certificate and diploma courses that offer multiple exit options.
- Foster a commitment to lifelong learning by encouraging students to delve into the vast wealth of knowledge surrounding environmental science and related subjects.
- Enhance critical thinking abilities, foster a scientific attitude, hone problem-solving skills, and promote effective communication and social interaction in the field of environmental science.
- Cultivate an awareness of ethical considerations in the responsible and sustainable use of environmental resources.

Equip students with the necessary training to pursue careers in the government and private sectors, including academia, research, and industry. Additionally, prepare them for national and international competitive examinations such as UGC-CSIR NET, UPSC Civil Services Examination, IFS, NSC, FCI, BSI, FRI, and encourage self-employment opportunities.

EVALUATION METHODS:

Evaluation Methods for Environment Science: To assess the achievement of students in the Environment Science subject and ensure their desired learning outcomes, a variety of assessment methods will be adopted. These methods will provide a comprehensive evaluation of the students' academic performance. Here are the innovative assessment methods for Environment Science:

1. **Engaging Examinations:** Both oral and written examinations, including scheduled and surprise tests, will be conducted. These exams will test students' theoretical knowledge, critical thinking, and problem-solving skills related to Environment science concepts.
2. **Diverse Testing Approaches:** Closed-book and open-book tests will be administered to assess students' understanding and application of Environment science principles. These tests will challenge their ability to think critically and apply concepts to real-world scenarios.
3. **Practical Assignments and Reports:** Students will be assigned practical assignments and laboratory reports to evaluate their hands-on skills and understanding of Environment science experiments and techniques. These assignments will provide insight into their ability to collect, analyze, and interpret data in the context of Environment environments.
4. **Observation of Practical Skills:** Practical skills, such as field sampling techniques or data collection methods, will be directly observed and evaluated. This assessment method allows instructors to assess students' competency in executing practical tasks related to Environment science.
5. **Collaborative Projects:** Both individual and group project reports will be assigned to encourage collaborative learning and foster teamwork. These projects will assess students' ability to conduct research, analyze data, and present findings on various Environment science topics.
6. **Innovative Seminar Presentations:** Students will deliver seminar presentations on specific Environment science subjects. This method will not only test their understanding and communication skills but also encourage them to explore cutting-edge research and advancements in the field.
7. **Viva Voce Interviews:** Viva voce interviews will be conducted to assess students' comprehensive understanding of Environment science concepts and their ability to articulate their knowledge effectively. This interactive assessment method will provide insights into their depth of understanding and critical thinking skills.
8. **Computerized Adaptive Testing:** Utilizing computerized adaptive testing methods will enable personalized assessment and help identify individual learning needs. These tests can adapt the difficulty level based on the students' responses, ensuring a tailored evaluation.

9. **Literature Surveys and Evaluations:** Students will be required to conduct literature surveys and evaluations on Environment science topics. This assessment approach will develop their research skills, and ability to critically analyze scientific literature, and synthesize information from various sources.

10. **Comprehensive Continuous Assessment (CCA):** Students will undergo continuous assessment throughout the course, including internal evaluations. The weightage of CCA will be 30% of the overall evaluation, ensuring a holistic evaluation of their progress.

Additionally, to enhance their learning experience, students will be required to participate in at least one Environment Science Excursion, where they will study environment ecosystems and biodiversity in their natural state. Laboratory work must be recorded in certified journals, which will be presented during practical examinations to showcase the students' hands-on expertise.

These innovative and varied assessment methods will enable a comprehensive evaluation of students knowledge, skills, and understanding of Environment Science, fostering their growth and development in this field.

Paper and Credit Scheme for Environment Science

Year	Semester	Paper Code	Paper Name	Credits	Marks		Total	
					CA	UA		
First Year	I	MAJENV-101 (Theory)	ENV Zoology Major 1	3	35	40	75	
		MAJENV-102 (Practical)	Practical ENV Zoology Major -1	1	10	15	25	
		MAJENV - 103 (Theory)	ENV Chemistry Major-2	3	35	40	75	
		MAJENV - 104 (Practical)	Practical ENV Chemistry Major -2	1	10	15	25	
		MINENV – 105 (Theory)	ENV Zoology Minor 1	3	35	40	75	
		MINENV – 106 (Practical)	Practical ENV Zoology Minor -1	1	10	15	25	
			TOTAL	12	135	165	300	
	First Year	II	MAJENV-201 (Theory)	ENV Chemistry Major-1	3	35	40	75
			MAJENV-202 (Practical)	Practical ENV Chemistry Major-1	1	10	15	25
			MAJENV - 203 (Theory)	ENV Botany Major-2	3	35	40	75
MAJENV - 204 (Practical)			Practical ENV Botany Major-2	1	10	15	25	
		MINENV – 205 (Theory)	ENV Chemistry Minor-1	3	35	40	75	
		MINENV – 206 (Practical)	Practical ENV Chemistry Minor-1	1	10	15	25	
			TOTAL	12	135	165	300	

DETAILED SYLLABUS OF B.Sc. 1st YEAR
SEMESTER - 1
CODE : MAJENV 101
PAPER NAME : ENVIRONMENTAL BOTANY
KSKV Kachchh University, Bhuj – Kachchh

UNIT	MAJENV 101 ENVIRONMENTAL BOTANY	NO.OF LECTURES
1	<p style="text-align: center;"><u>INTRODUCTION TO ANIMAL TISSUES</u></p> <ul style="list-style-type: none"> ▪ Definition and classification of animal tissues ▪ Overview of the four main types of animal tissues: epithelial, connective, muscle, and nervous tissues ▪ Epithelial Tissues: Characteristics, functions, Classification of epithelial tissues based on shape and layers, Location and roles of different types of epithelial tissues in the body. Connective Tissues: Properties and functions of connective tissues, Types of connective tissues: loose, dense, specialized (e.g., adipose, cartilage, bone), Blood as a connective tissue. Components of blood: red blood cells, white blood cells, platelets. Muscle Tissues: Structure and function of muscle tissues, Types of muscle tissues: skeletal, smooth, and cardiac. Mechanism of muscle contraction and its regulation. Nervous Tissues: Components of the nervous system, Structure, and function of neurons. Integumentary System: The skin as an organ and its layers, Functions of the skin: protection, sensation, thermoregulation, Structure, and role of skin appendages (hair, nails, glands) 	15
2	<p style="text-align: center;"><u>PHYSIOLOGY OF ANIMAL-I</u></p> <ul style="list-style-type: none"> ▪ Nervous System: Definition; Types of Neurons- Motor Nerve, Sensory Nerve. ▪ Comparative study of Nervous System of Invertebrates (from Phylum Protozoa to Echinodermata) and Vertebrates (From Chondrychthus to Mammals) ▪ General Account of Reflex Action. ▪ Endocrine System: Definition, General Characters of hormone, General functions of Hormone. ▪ Study of Endocrine Glands and their Hormone: Pituitary Gland, Penial gland, Thyroid gland, Parathyroid gland, Adrenal Gland, Pancreas, Testis and ovaries. ▪ Mechanism of Hormone action: Peptide hormone and steroid hormone. 	15

3	<p style="text-align: center;"><u>PHYSIOLOGY OF ANIMAL-II</u></p> <ul style="list-style-type: none"> ▪ Reproduction: Definition ; Types of Reproduction- Asexual and Sexual Reproduction. ▪ General Process of Reproduction: Pre reproductive events, reproductive events and Post reproductive events. ▪ Comparative study of Reproductive System of Invertebrates (from Phylum Protozoa to Echinodermata) and Vertebrates (From Chondrychthus to Mammals). ▪ Role of Sex hormones in Reproduction. ▪ Skeletal System: Parts of skeletal system- Axil skeletal system and Appendicular skeletal system. ▪ Comparative study of skeletal system of class Fish, Amphibia, Reptelia, Aves and Mammals.(Any one example of Each.) ▪ Color change of Animals; General account of Chromatophores ▪ Bioluminescence: Definition, Gland and organs, Process of production of light, Biological Importance. 	15
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LAB./ PRACTICAL PAPER

CODE : MAJENV 102

PAPER NAME : PRACTICAL ENVIRONMENTAL BOTANY

PRACTICAL	AIM OF PRACTICAL
1	To study the following animal tissues. Epithelial tissues, connective tissues, muscle tissue, and nervous tissue with its location, structure and functions, through Slides/ Photograph/ charts/ Specimens.
2	To study the structure and role of skin open appendages hair nails and glands (two examples of each appendages) through Slides/Photographs/ charts/ Specimens.
3	To study the comparative nervous system in coelentera Annelida and Arthropoda through Slides/Photographs/ charts/ Specimens.
4	To study the comparative nervous system in phase amphibia and Avis through Slides/ Photograph/ charts/ Specimens.
5	To study the following endocrine gland with their general function of hormones pituitary gland penial gland thyroid gland Parathyroid adrenal gland pancreas testis gland ovaries through Slides/Photographs/ charts/ Specimens.
6	To study the mechanism of action of peptide hormone through photographs/ charts.
7	To study the mechanism of action of steroid hormone through photograph/charts.
8	To study the method of asexual reproduction into bracket minify methods and reproduction any three methods through photograph charts specimen.
9	To study the comparative Reproductive system in column data analytic and Arthropoda through photograph charts specimen.
10	To study the comparative Reproductive systems in fish, amphibia and Aves through photographs/charts/specimens.
11	To study the comparative skeletal systems in fish, amphibia and Aves through photographs/charts/specimens.
12	To study the color change in any two animals through Photographs / Charts.
13	To study the role of chromatophores in animals - any three examples through Photographs / Charts.
14	To study the Bioluminescence in any three animals through Photographs / Charts.

DETAILED SYLLABUS OF B.Sc. 1st YEAR
SEMESTER - 1
CODE : MAJENV 103
PAPER NAME : ENVIRONMENTAL CHEMISTRY
KSKV Kachchh University, Bhuj – Kachchh

UNIT	MAJENV 103 ENVIRONMENTAL CHEMISTRY	NO.OF LECTURES
1	<p style="text-align: center;"><u>STRUCTURES OF ATOM AND MOLECULE</u></p> <ul style="list-style-type: none"> ▪ Basic Chemistry- Atoms and their structure, Lewis dot Structure, ▪ Bohr's Atomic Structure ▪ Electronic configuration of elements ▪ Classification of Elements on the basis of electron Configuration, Periodic table, and their Properties. ▪ Chemical Bonds- Ionic Bonds, Covalent Bonds, Metallic Bonds, Hydrogen Bond, van Der Waals Bond ▪ Valance Bond Theory (VBT), Valance Shell electron Pair Repulsion Theory (VSEPR) 	15
2	<p style="text-align: center;"><u>BASICS OF ORGANIC CHEMISTRY</u></p> <ul style="list-style-type: none"> ▪ Introduction to Organic Chemistry, Definition and scope of organic chemistry ▪ Covalent bonding in organic molecules Alkane, Alkene, Alkynes ▪ Hybridization and molecular geometry in organic compounds: sp,sp²,sp³ ▪ Functional Groups Overview of common functional groups in organic compounds ▪ Isomerism , Structural isomerism, Stereoisomerism (cis-trans isomerism and optical isomerism) Environmental implications of isomerism , ▪ Aliphatic compounds and Aromatic Compounds ▪ Nomenclature, IUPAC rules for naming organic compounds, Common names of some important organic compounds ▪ Naming pollutants and environmental contaminants, Environmental significance of organic reactions (e.g., degradation of pollutants) Alkanes and Cycloalkanes. Importance of organic chemistry in environmental science. 	15
3	<p style="text-align: center;"><u>AQUATIC CHEMISTRY:</u></p> <ul style="list-style-type: none"> ▪ Water quality parameters (e.g., pH, dissolved oxygen, turbidity) ▪ Nutrient pollution (eutrophication) and its effects on aquatic ecosystems ▪ Heavy metal contamination in water bodies ▪ Persistent organic pollutants (POPs) in water and their bioaccumulation ▪ Water treatment methods and technologies 	15

LAB./ PRACTICAL PAPER
MAJENV 104
PRACTICAL ENVIRONMENTAL CHEMISTRY

PRACTICAL	AIM OF PRACTICAL
1	Determination of Electronic Configuration: Perform flame tests on different metal salts and identify the characteristic color of the emitted light to determine the electronic configuration of the metal ions.
2	Ionic vs. Covalent Bonds: Demonstrate the difference between ionic and covalent bonds by dissolving table salt (NaCl) in water and sugar (C ₁₂ H ₂₂ O ₁₁) in water, observing the conductivity.
3	Investigation of Ocean Water Salinity: Use refractometer or salinometer to determine the salinity of a given sample of seawater.
4	Ocean Water Density: Measure the density of different water samples with varying salinity using a hydrometer or density meter.
5	Qualitative Analysis of Seawater: Test the presence of various ions in seawater using specific reagents to identify major constituents like chloride, sulfate, magnesium, calcium, etc.
6	Dissolved Oxygen (DO) vs. Biological Oxygen Demand (BOD): Investigate the relationship between DO and BOD in water samples from different sources.
7	Seawater Gas Analysis: Collect gases evolved from seawater samples and identify them using chemical tests (e.g., hydrogen gas test).
8	Preparation of Hydrogen Gas: Generate hydrogen gas in the lab by reacting a metal (e.g., zinc) with hydrochloric acid and collect the gas over water.
9	Electrolysis of Seawater: Use a Hoffman apparatus to perform the electrolysis of seawater and observe the products of electrolysis.
10	pH and Seawater Buffering: Investigate the buffering capacity of seawater by titrating it with small amounts of acid and base, and measure the change in pH.
11	Study of Water and Metal Reactions: Perform experiments to observe the reaction of water with metals (e.g., sodium, potassium) and classify them into their corresponding reactivity series.

DETAILED SYLLABUS OF B.Sc. 1st YEAR
SEMESTER - 1

CODE : MINENV 105

PAPER NAME : ENVIRONMENTAL BOTANY
KSKV Kachchh University, Bhuj – Kachchh

UNIT	MAJENV 105 ENVIRONMENTAL BOTANY	NO.OF LECTURES
1	<p style="text-align: center;"><u>INTRODUCTION TO ANIMAL TISSUES</u></p> <ul style="list-style-type: none">▪ Definition and classification of animal tissues▪ Overview of the four main types of animal tissues: epithelial, connective, muscle, and nervous tissues▪ Epithelial Tissues: Characteristics, functions, Classification of epithelial tissues based on shape and layers, Location and roles of different types of epithelial tissues in the body. Connective Tissues: Properties and functions of connective tissues, Types of connective tissues: loose, dense, specialized (e.g., adipose, cartilage, bone), Blood as a connective tissue. Components of blood: red blood cells, white blood cells, platelets. Muscle Tissues: Structure and function of muscle tissues, Types of muscle tissues: skeletal, smooth, and cardiac. Mechanism of muscle contraction and its regulation. Nervous Tissues: Components of the nervous system, Structure, and function of neurons. Integumentary System: The skin as an organ and its layers, Functions of the skin: protection, sensation, thermoregulation, Structure, and role of skin appendages (hair, nails, glands)	15
2	<p style="text-align: center;"><u>PHYSIOLOGY OF ANIMAL-I</u></p> <ul style="list-style-type: none">▪ Nervous System: Definition; Types of Neurons- Motor Nerve, Sensory Nerve.▪ Comparative study of Nervous System of Invertebrates (from Phylum Protozoa to Echinodermata) and Vertebrates (From Chondrychthus to Mammals)▪ General Account of Reflex Action.▪ Endocrine System: Definition, General Characters of hormone, General functions of Hormone.▪ Study of Endocrine Glands and their Hormone: Pituitary Gland, Penial gland, Thyroid gland, Parathyroid gland, Adrenal Gland, Pancreas, Testis and ovaries.▪ Mechanism of Hormone action: Peptide hormone and steroid hormone.	15

3	<p style="text-align: center;"><u>PHYSIOLOGY OF ANIMAL-II</u></p> <ul style="list-style-type: none"> ▪ Reproduction: Definition ; Types of Reproduction- Asexual and Sexual Reproduction. ▪ General Process of Reproduction: Pre reproductive events, reproductive events and Post reproductive events. ▪ Comparative study of Reproductive System of Invertebrates (from Phylum Protozoa to Echinodermata) and Vertebrates (From Chondrychthus to Mammals). ▪ Role of Sex hormones in Reproduction. ▪ Skeletal System: Parts of skeletal system- Axil skeletal system and Appendicular skeletal system. ▪ Comparative study of skeletal system of class Fish, Amphibia, Reptelia, Aves and Mammals.(Any one example of Each.) ▪ Color change of Animals; General account of Chromatophores ▪ Bioluminescence: Definition, Gland and organs, Process of production of light, Biological Importance. 	15
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LAB./ PRACTICAL PAPER

CODE : MINENV 106

PAPER NAME : PRACTICAL ENVIRONMENTAL BOTANY

PRACTICAL	AIM OF PRACTICAL
1	To study the following animal tissues. Epithelial tissues, connective tissues, muscle tissue, and nervous tissue with its location, structure and functions, through Slides/ Photograph/ charts/ Specimens.
2	To study the structure and role of skin open appendages hair nails and glands (two examples of each appendages) through Slides/Photographs/ charts/ Specimens.
3	To study the comparative nervous system in coelentera Annelida and Arthropoda through Slides/Photographs/ charts/ Specimens.
4	To study the comparative nervous system in phase amphibia and Avis through Slides/ Photograph/ charts/ Specimens.
5	To study the following endocrine gland with their general function of hormones pituitary gland penial gland thyroid gland Parathyroid adrenal gland pancreas testis gland ovaries through Slides/Photographs/ charts/ Specimens.
6	To study the mechanism of action of peptide hormone through photographs/ charts.
7	To study the mechanism of action of steroid hormone through photograph/charts.
8	To study the method of asexual reproduction into bracket minify methods and reproduction any three methods through photograph charts specimen.
9	To study the comparative Reproductive system in column data analytic and Arthropoda through photograph charts specimen.
10	To study the comparative Reproductive systems in fish, amphibia and Aves through photographs/charts/specimens.
11	To study the comparative skeletal systems in fish, amphibia and Aves through photographs/charts/specimens.
12	To study the color change in any two animals through Photographs / Charts.
13	To study the role of chromatophores in animals - any three examples through Photographs / Charts.
14	To study the Bioluminescence in any three animals through Photographs / Charts.

DETAILED SYLLABUS OF B.Sc. 1st YEAR
SEMESTER - 2
CODE : MAJENV 201
PAPER NAME : ENVIRONMENTAL CHEMISTRY

UNIT	MAJENV 201 : ENVIRONMENTAL CHEMISTRY	NO.OF LECTURES
1	<p style="text-align: center;"><u>ATMOSPHERIC CHEMISTRY</u></p> <ul style="list-style-type: none"> ▪ Composition and structure of the atmosphere ▪ Air pollutants (primary and secondary) and their sources ▪ Greenhouse gases and climate change ▪ Ozone depletion and the role of CFCs ▪ Acid rain formation, causes, and consequences ▪ Air quality indices and their interpretation ▪ Indoor air pollution and its effects ▪ Control technologies for air pollution abatement ▪ Environmentalist's role in air pollution research and policy-making 	15
2	<p style="text-align: center;"><u>ENVIRONMENTAL SOIL HEALTH</u></p> <ul style="list-style-type: none"> ▪ Soil components and their functions ▪ Soil formation processes and factors affecting soil formation ▪ Soil texture, structure, and classification ▪ Soil fertility and essential nutrients for plant growth ▪ Soil-water relationship and soil moisture content ▪ Soil pollution and contamination: Heavy metals, Pesticides, herbicides residues, ▪ Organic pollutants in Soil 	15
3	<p style="text-align: center;"><u>GREEN CHEMISTRY AND SUSTAINABLE PRACTICES</u></p> <ul style="list-style-type: none"> ▪ Principles of Green Chemistry ▪ Green synthesis of nanomaterials and their applications ▪ Renewable energy sources and their environmental benefits ▪ Sustainable agriculture and agrochemicals ▪ Biodegradable polymers and their role in reducing plastic pollution ▪ Environmental impact of pharmaceuticals and green drug design ▪ Green analytical techniques in Environmental Chemistry ▪ The role of Environmentalist in shaping sustainable practices ▪ Green Chemistry innovations and patents ▪ Group projects on designing sustainable chemical processes 	15

LAB./ PRACTICAL PAPER

CODE : MAJENV 202

PAPER NAME : PRACTICAL ENVIRONMENTAL CHEMISTRY

PRACTICAL	AIM OF PRACTICAL
1	Determination of Carbon Dioxide (CO ₂) content in the atmosphere and its variations. Aim: To understand the composition of the atmosphere and the presence of carbon dioxide as a greenhouse gas.
2	Analysis of Air Pollutants using Gas Chromatography. Aim: To identify and quantify priENVy and secondary air pollutants present in a given air sample.
3	Synthesis of Biodegradable Polymer (e.g., PLA) from Renewable Resources. Aim: To explore green chemistry principles and sustainable materials for reducing plastic pollution.
4	Determination of pH of Rainwater Samples and Analysis for Acid Rain. Aim: To investigate the acidity of rainwater and understand the formation and consequences of acid rain.
5	Assessment of Heavy Metal Contamination in Soil using Atomic Absorption
6	Estimation of Soil Moisture Content by Gravimetric Method. Aim: To determine the moisture content in soil samples and its importance for plant growth.
7	Synthesis of Biodiesel from Waste Cooking Oil as a Renewable Energy Source. Aim: To explore sustainable practices in energy production and utilization.
8	Group Project: Designing a Sustainable Chemical Process for Waste Treatment. Aim: To work collaboratively and devise a sustainable chemical process for waste management.
9	Assessment of Soil Fertility through Nutrient Analysis (NPK content). Aim: To determine the nutrient content in soil samples and their importance for plant growth.
10	Assessment of Air Quality Index in Different Locations. Aim: To compare the air quality in various locations and interpret the results using air quality indices.
11	Comparative Study of Conventional vs. Green Agrochemicals on Crop Growth. Aim: To analyze the impact of conventional and green agrochemicals on plant growth and soil health.
12	Green Synthesis of Silver Nanoparticles using Plant Extracts. Aim: To demonstrate green chemistry principles and explore the applications of nanoparticles.
13	Determination of Carbon Dioxide (CO ₂) content in the atmosphere and its variations. Aim: To understand the composition of the atmosphere and the presence of carbon dioxide as a greenhouse gas.

DETAILED SYLLABUS OF B.Sc. 1st YEAR
SEMESTER - 2
CODE : MAJENV 203
PAPER NAME : ENVIRONMENTAL BOTANY
KSKV Kachchh University, Bhuj – Kachchh

UNIT	MAJENV 203 ENVIRONMENTAL BOTANY	NO.OF LECTURES
1	<p style="text-align: center;"><u>INTRODUCTION TO ENVIRONMENT SCIENCE & CLASSIFICATION</u></p> <ul style="list-style-type: none"> ▪ Introduction to ENVIRONMENT Science: Definition, Scope & Carrier, Approaches, Relation to other branches of Science. ▪ Past, Present & Future Scenario, Various fields of ENVIRONMENT Science. ▪ Classification: Definition, types (Natural, Artificial and Phylogenetic classification systems), R.H. Whittaker's five kingdom classification system, Eichler's system of Plant classification, ▪ Taxonomy: Definition, History, Binomial Nomenclature, Principles of taxonomy, Hierarchy. 	15
2	<p style="text-align: center;"><u>PHOTOSYNTHESIS AND ENVIRONMENT</u></p> <ul style="list-style-type: none"> ▪ Definition and significance of photosynthesis, ▪ Overview of photosynthetic pigments - chlorophylls and their roles. ▪ Light Reactions (Light-Dependent Phase) : Structure and function of the photosystems (PS I and PS II) ▪ Dark Reactions, Light-Independent Phase : Calvin Cycle, C₃, C₄, and CAM pathways ▪ Factors Affecting Photosynthesis, Photoperiodicity, Vernalization. ▪ Photosynthesis and the Environment: Adaptations of plants to different light conditions. ▪ Impact of environmental stressors on photosynthesis – Water Stress, Drought Stress (Introduction) ▪ Photosynthesis as a carbon sink and its impact on climate regulation. 	15
3	<p style="text-align: center;"><u>INTRODUCTION TO RESPIRATION</u></p> <ul style="list-style-type: none"> ▪ Definition and significance of respiration, Overview of aerobic and anaerobic respiration. ▪ Glycolysis, Krebs Cycle, Electron Transport Chain (ETC) and Oxidative Phosphorylation, ▪ Fermentation and Anaerobic Respiration, Respiratory quotient. ▪ Environmental Factors Affecting Respiration - Impact of temperature, oxygen availability, and pollutants on cellular respiration. ▪ Respiration and global climate change. 	15

LAB./ PRACTICAL PAPER

MAJENV 204

PAPER NAME : PRACTICAL ENVIRONMENTAL BOTANY

PRACTICAL	AIM OF PRACTICAL
1	To study the RH. Whittaker's Five Kingdom classification through- Photography / Chats / Specimens.
2	To study the following specimens of plants with their classifications General characters with suitable Examples (Any two examples of each, through photographs/charts/specimen. Schizophyta, Algae, Fungi, Lichen, Bryophyte, Pteridophyte, Gymnosperm and Angiosperm.
3	To Demonstrate chlorophyll pigments through chromatography.
4	To study the Calvin cycle through Chart / Photograph.
5	To study C ₄ Cycle through Chart / Photograph.
6	To Demonstrate the process of aerobic respiration.
7	To study the CAM pathway.
8	To study the Importance of Photosynthesis in Carbon sink.
9	To Demonstrate the effects of pollution on photosynthesis.
10	To study the process of glycolysis.
11	To study the process of Krabs' cycle.
12	To study the Process of Electron Transport chain (ETC).
13	To Demonstrate the effects of pollution on respiration of plants.

DETAILED SYLLABUS OF B.Sc. 1st YEAR
SEMESTER - 2
CODE : MINENV 205
PAPER NAME : ENVIRONMENTAL CHEMISTRY

UNIT	MINENV 205 : ENVIRONMENTAL CHEMISTRY	NO.OF LECTURES
1	<p style="text-align: center;"><u>ATMOSPHERIC CHEMISTRY</u></p> <ul style="list-style-type: none"> ▪ Composition and structure of the atmosphere ▪ Air pollutants (primary and secondary) and their sources ▪ Greenhouse gases and climate change ▪ Ozone depletion and the role of CFCs ▪ Acid rain formation, causes, and consequences ▪ Air quality indices and their interpretation ▪ Indoor air pollution and its effects ▪ Control technologies for air pollution abatement ▪ Environmentalist's role in air pollution research and policy-making 	15
2	<p style="text-align: center;"><u>ENVIRONMENTAL SOIL HEALTH</u></p> <ul style="list-style-type: none"> ▪ Soil components and their functions ▪ Soil formation processes and factors affecting soil formation ▪ Soil texture, structure, and classification ▪ Soil fertility and essential nutrients for plant growth ▪ Soil-water relationship and soil moisture content ▪ Soil pollution and contamination: Heavy metals, Pesticides, herbicides residues, ▪ Organic pollutants in Soil 	15
3	<p style="text-align: center;"><u>GREEN CHEMISTRY AND SUSTAINABLE PRACTICES</u></p> <ul style="list-style-type: none"> ▪ Principles of Green Chemistry ▪ Green synthesis of nanomaterials and their applications ▪ Renewable energy sources and their environmental benefits ▪ Sustainable agriculture and agrochemicals ▪ Biodegradable polymers and their role in reducing plastic pollution ▪ Environmental impact of pharmaceuticals and green drug design ▪ Green analytical techniques in Environmental Chemistry ▪ The role of Environmentalist in shaping sustainable practices ▪ Green Chemistry innovations and patents ▪ Group projects on designing sustainable chemical processes 	15

LAB./ PRACTICAL PAPER

CODE : MINENV 206

PAPER NAME : PRACTICAL ENVIRONMENTAL CHEMISTRY

PRACTICAL	AIM OF PRACTICAL
1	Determination of Carbon Dioxide (CO ₂) content in the atmosphere and its variations. Aim: To understand the composition of the atmosphere and the presence of carbon dioxide as a greenhouse gas.
2	Analysis of Air Pollutants using Gas Chromatography. Aim: To identify and quantify priENVy and secondary air pollutants present in a given air sample.
3	Synthesis of Biodegradable Polymer (e.g., PLA) from Renewable Resources. Aim: To explore green chemistry principles and sustainable materials for reducing plastic pollution.
4	Determination of pH of Rainwater Samples and Analysis for Acid Rain. Aim: To investigate the acidity of rainwater and understand the formation and consequences of acid rain.
5	Assessment of Heavy Metal Contamination in Soil using Atomic Absorption
6	Estimation of Soil Moisture Content by Gravimetric Method. Aim: To determine the moisture content in soil samples and its importance for plant growth.
7	Synthesis of Biodiesel from Waste Cooking Oil as a Renewable Energy Source. Aim: To explore sustainable practices in energy production and utilization.
8	Group Project: Designing a Sustainable Chemical Process for Waste Treatment. Aim: To work collaboratively and devise a sustainable chemical process for waste management.
9	Assessment of Soil Fertility through Nutrient Analysis (NPK content). Aim: To determine the nutrient content in soil samples and their importance for plant growth.
10	Assessment of Air Quality Index in Different Locations. Aim: To compare the air quality in various locations and interpret the results using air quality indices.
11	Comparative Study of Conventional vs. Green Agrochemicals on Crop Growth. Aim: To analyze the impact of conventional and green agrochemicals on plant growth and soil health.
12	Green Synthesis of Silver Nanoparticles using Plant Extracts. Aim: To demonstrate green chemistry principles and explore the applications of nanoparticles.
13	Determination of Carbon Dioxide (CO ₂) content in the atmosphere and its variations. Aim: To understand the composition of the atmosphere and the presence of carbon dioxide as a greenhouse gas.

Government Science College, Mandvi – Kachchh

B. Sc. Semester – 2 (2023-24)

Multi-Disciplinary Course (MDC)

CODE : MDCENV 107

PAPER NAME : Environmental Awareness

Unit – 1

1. Environment – Definition, Scope and Importance
2. Environmental Awareness – Need of time
3. Renewable and Non-Renewable Resources
4. Equitable use of Resources

Unit – 2

1. Ecosystems – Concept, Structure and Function
2. Ecosystems – Introduction, Types and Characteristics
3. Biodiversity – Definition, Genetic and Species
4. Hotspots of Biodiversity

Unit – 3

1. Environmental Pollution – Definition, Causes and Effects
2. Solid Waste Management – Causes, Effects and Control Measures
3. Sustainable Development
4. Various Acts for Environment

PRACTICALS WILL BE BASED ON THE THEORY (MDCENV 108-PRACTICALS)

LAB./ PRACTICAL PAPER

CODE : MDC ENV 208

PAPER NAME : PRACTICAL ENVIRONMENTAL AWARENESS

PRACTICAL	AIM OF PRACTICAL
1	To study food chain and food web using photographs/chart/specimen.
2	To study ecological pyramids using photographs/chart/specimen.
3	To study biodiversity hotspots of world and India using Map.
4	To study natural resources mapping of suggested area instructed by teacher.
5	To study atmosphere, lithosphere and hydrosphere using digital and non-digital images.
6	To study dessert ecosystem using photographs/chart/specimen.
7	To study grassland ecosystem using photographs/chart/specimen.
8	To study forest ecosystem using photographs/chart/specimen.
9	To perform any one environmental awareness activity suggested by the teacher and prepare report of it.

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Theory assessment

Pattern for Semester end Examination

Question	Question Type	Total Marks	Remarks
1 (From Unit – 1)	Descriptive Questions with Internal Option.	10 Marks	Question may be of 10 marks/ 5 + 5 marks
2 (From Unit – 2)	Descriptive Questions with Internal Option.	10 Marks	Question may be of 10 marks/ 5 + 5 marks
3 (From Unit – 3)	Descriptive Questions with Internal Option.	10 Marks	Question may be of 10 marks/ 5 + 5 marks
4 (From Unit – 1, 2, 3, 4)	Short Questions, fill in the Blanks, MCQ etc. 12 questions (4 questions x 3 units) will be asked with option (10 out of 12)	10 Marks	Total 12 questions from all units will be ask ; students have to attempt any 10

Note:

1. The descriptive questions i.e. Question 1, 2, 3 will be like *Explain, describe, discuss* etc. type which may be of 10 marks or 05 + 05 marks.
2. Examiner can ask two questions of 10 marks, of which one must be attempt or examiner can ask three questions of 05 marks, of which two must be attempt.

The forth question can ask from all three units. Total 12 questions (4 questions x 3 units) will be asked, of which 10 must be attempt. Each question carries 01 mark

For Internal / College theory assessment

Continuous evaluation method will be applied for college assessment. Internal theory examination/ Unit test, Seminar, Assignments, Group discussions etc. will be the key parts for the internal/ college assessment. The internal assessment will be of 35 marks.

The passing criteria for Internal/ college assessment are 40% i.e. students have to secure 14 marks out of 35 marks.

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Practical assessment

Pattern for Semester end Examination

For university assessment of practical, 4 to 5 exercise will be arranged for students according to prescribed syllabus.

The University Practical assessment is of 10 marks.

The passing criteria for practical assessment are 40% i.e. students have to secure 04 marks out of 10 marks.

For Internal / College assessment

For Internal/ college assessment of practical, 4 to 5 exercise will be arranged for students according to prescribed syllabus.

The Internal/ college Practical assessment is of 15 marks.

The passing criteria for practical assessment are 40% i.e. students have to secure 06 marks out of 15 marks.