KRANTIGURU SHYAMJI KRISHNA VERMA KACHCHH UNIVERSITY,
BHUJ

Academic Year: 2024 - 2025

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

Semesters: III and IV
(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 – 2024

Shyamji Krishna Verma Kachchh University BHUJ - Kachchh 370001

B.Sc. (Honours) Environment Science Programme

(With Research/without Research)

As per NEP-2020

With effect from June – 2024

FACULTY OF SCIENCE

Subject: Environment Science

B. Sc. Semesters: III & IV

AIM OF THE COURSE:

Aims of the B.Sc. (Honors) Course in Environment Science:

- Foster a hands-on learning approach that encourages students to explore and discover the wonders of Environment science.
- Embrace modern educational trends like e-learning, flipped classrooms, and hybrid learning to create an engaging and interactive learning environment.
- Cultivate environmentally responsible citizens who play a pivotal role in shaping the future of marine science subject and contribute their knowledge to sustainable development.
- Provide comprehensive theoretical and practical knowledge in Environment Science, equipping graduates with the necessary skills for further studies or exciting careers in related fields.
- Prepare students for national and international competitive examinations, empowering them to pursue advanced research opportunities or secure prestigious positions in environment science and related fields.

COURSE INTRODUCTION

The new curriculum of B.Sc. in Science (Environment science) offers the essential knowledge and technical skills to study Environment science in a holistic manner. Students would be trained in all areas of Environment science using a unique combination of Major, Minor, MDC, AEC, SEC and VAC papers with significant inter-disciplinary components. Students would be exposed to cutting-edge technologies that are currently being used in the study of marine life forms, their evolution, and interactions with other organisms within the ecosystem. Students would also become aware of the social and environmental significance of environment and its relevance to the national economy. B.Sc. Environment science Programme covers academic activities within the classroom sessions along with practical concepts at laboratory sessions. Infield, outstation activities, and projects would also be organized for real-life experience and learning. Candidates who have curiosity in the field of Environment, Nature, Ecosystems and eager to exploring various exotic places, and wish to work as researchers or professionals like Environmental Scientists, conservationists, Ecologists, etc. can choose the B.Sc. Environment science course.

Programme outcomes (POs)

This curriculum in B.Sc. Environment science aims to cultivate well-rounded individuals who are not only equipped with knowledge in the field of Environment science but are also driven to contribute to their nation's progress and shape the future. By studying Environment science, students will develop a deep understanding of the oceanic world and its potential for transformative impact on various sectors.

Programme specific objectives (PSOs): B.Sc. III Year Certificate Course in Basic Environment science

- Dive into the fascinating realm of Environment science through this certificate course that covers a wide range of topics.
- Prepare yourself for cutting-edge research in frontier areas of Environment sciences by gaining a solid foundation in the subject.
- Explore the diverse habitats, morphologies, anatomies, and reproductive processes of various marine organisms.
- Develop the skills of competent environmentalist who can apply their knowledge to address critical issues in environment, Climate change, Global warming, and environmental sustainability.
- Unlock your potential for self-entrepreneurship and self-employability through the certificate and diploma courses, which offer multiple exit options.
- Embrace lifelong learning by delving into the vast wealth of knowledge surrounding Environment 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 Environment science.
- Cultivate an awareness of the ethical considerations in the responsible and sustainable use of natural resources.

- Equip students with the necessary training to pursue careers in 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 student's 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 marine 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 student's 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.

11. **End of Semester Examination:** The semester-end examination, comprising 70% of the evaluation, will assess students based on their knowledge, understanding, skills, application, and higher-order thinking skills related to Environment science concepts. The assessment will be conducted by the university.

Additionally, to enhance their learning experience, students will be required to participate in at least one Environment science Excursion, where they will study marine 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 student's knowledge, skills, and understanding of Environment science, fostering their growth and development in this field.

Paper and Credit Scheme for Environment Science Semester - 3

Year	Semester	Paper Code	Paper Name	Credits	Marks		Total
					CA	UA	
2nd Year	III	MJES-301 (Theory)	Nature of India's Environment Major – 1	3	35	40	75
		MJES-302 (Practical)	Nature of India's Environment Major – 1	1	10	15	25
		MJES - 303 (Theory)	Ecological Environment Major – 2	3	35	40	75
		MJES - 304 (Practical)	Ecological Environment Major – 2	1	10	15	25
		MJES – 305 (Theory)	Analytic techniques in Environment Science Major – 3	3	35	40	75
		MJES – 306 (Practical)	Analytic techniques in Environment Science Major – 3	1	10	15	25
		MDES (Theory)	Basics of Ecology MDC – 3	3	35	40	75
		MDES (Practical)	Basics of Ecology MDC – 3	1	10	15	25
		TOTAL		12	90	110	300

Major Subject
Environment

DETAILED SYLLABUS OF B.Sc. 2nd YEAR

SEMESTER - 3

PAPER CODE: MJES 301

PAPER NAME: NATURE OF INDIA'S ENVIRONMENT

KSKV Kachchh University, Bhuj - Kachchh

UNIT	SEMESTER – 3 Environment Science MAJOR – 1	NO. OF LECTURES
1	**Land and water Resource** **Land Resource:** Land utilization, land use & land cover classification. Soils- Types and distribution, soil loss; soil salinity; soil erosion and conservation. **Impact of irrigation** -water logging, poor drainage, soil infertility; reclamation; nutrient loss; fertilizers. Desertification of the Thar. **Water Resource:** Concept of hydrological cycle, monsoon distribution, surface & ground water resources, utilization for various purposes. River valley projects. Effects of dams.	15
2	**Forest and Wildlife** **Forest:** Forest resources, Forest cover, Deforestation, Social forestry, Agro forestry, Minor and Major forest products. **Over grazing**: Definition and Problems. **Wildlife:** Definition, wildlife of India, Endangered flora and fauna of India, Wildlife management in India (non-government and government).	15
3	**Conservation of Indian Fauna** **Indian Fauna:** **Conservation:** Definition, Need of conservation, Indian board of wildlife (IBWL). **National parks, Sanctuaries and biosphere reserves of India:** total number, area covered, name of protected animals. **National parks, Sanctuaries of Gujarat:** total number, area covered, name of protected animals. **Special projects for endangered species:** Project tiger, Gir lion project, Project elephant, Crocodile breeding project.	15

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 3
PAPER CODE: MJES 302 (Practical)
PAPER NAME: NATURE OF INDIA'S ENVIRONMENT
KSKV Kachchh University, Bhuj - Kachchh

Practical	Aim of Practical
1	To study Soil type of India using Map.
2	To study the water cycle using charts / models.
3	To study various river – valley projects of India using Maps.
4	To study the water holding capacity of given soil samples.
5	To study the water moisture of given soil samples.
6	To study minor and major forest products through specimens/ photos/ charts.
7	To study endangered flora of India through specimens/ photographs.
8	To study endangered fauna of India through photographs/ charts.
9	To study the Soil profile of given Soil sample.
10	To study the Soil texture of the given Soil Sample.
11	Study of National parks of India and Gujarat though Map. (Any 10 national parks of India, any 5 National parks of Gujarat)
12	Study of Sanctuaries of India and Gujarat through Map. (Any 10 sanctuaries of India and any 5 sanctuaries of Gujarat)
13	Study of Biosphere reserve of India through Map. (any 5 biosphere reserves of India).

Major Subject
Environment

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 3
PAPER CODE: MJES 303
PAPER NAME : ECOLOGICAL ENVIRONMENT
KSKV Kachchh University, Bhuj - Kachchh

UNIT	SEMESTER – 3 Environment Science MAJOR – 2	NO. OF LECTURES
1	**Population and Habitat Ecology** **Population Ecology:** Definition, Monospecific & Polyspecific population. **Basic concept of Population ecology:** Population Characteristics (Size & density, dispersion, Age structure, Natality, Mortality). **Population dynamics:** Theory of Population growth (exponential growth curve, logistic growth curve), Population ecology and evolution (r- selected & k-selected). **Habitat Ecology:** Definition, Types of habitat, **Aquatic habitat:** Estuary, Marine, Fresh water habitat their climate, distribution in India, Flora and fauna. **Terrestrial Habitat:** Tropical rain forest, Mangrove forest, dessert their climate, distribution in India, flora and fauna.	15
2	**Community Ecology** **Community Ecology:** Definition & brief introduction; characteristics of community; composition and structure of community. **Characters used in community structure:** Analytic characters-quantitative characters and qualitative characters; Synthetic characters-presence and constant, fidelity, dominance, other synthetic characters.	15
3	**Biome Ecology:** **Biome:** Definition. **Major biomes of world:** Forest biome (Tropical rain forest, deciduous forest), Grassland biomes, Dessert biomes, Tundra biomes, Coniferous forest biomes (Climatic condition, flora and fauna of each biomes). Keystone species, dominant species, Ecotone and edge effect (definition and basic introduction)	15

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 3
PAPER CODE: MJES 304 (Practical)
PAPER NAME: BIOLOGICAL ENVIRONMENT
KSKV Kachchh University, Bhuj - Kachchh

Practical	Aim of Practical
1	Estimation of density of Plant community by using quadrate methods.
2	Estimation of abundance of Plant community by using quadrate methods.
3	Estimation of frequency of Plant community by using quadrate methods.
4	To study the distribution of Aquatic habitat – Estuary, Marine, Fresh water in Gujarat using Maps. (3 examples of each)
5	To study the distribution of Terrestrial habitat – Tropical rain forest, Mangrove forest, dessert in India using Maps. (3 examples of each)
6	To determine relative density of the given plant community by using random sampling unit method (Quadrate method).
7	To determine relative frequency of the given plant community by using random sampling unit method (Quadrate method).
8	To determine relative Abundance of the given plant community by using random sampling unit method (Quadrate method).
9	To study forest biomes (Tropical rain forest and deciduous forest) of the world using Map.
10	To study Dessert biomes of the world using Map.
11	To study Tundra biomes of the world using Map.
12	To study forest biomes (Tropical rain forest and deciduous forest) of India using Map.
13	To study Dessert biomes of India using Map.

Major Subject
Environment

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 3
PAPER CODE: MJES 305
PAPER NAME: ANALYTIC TECHNIQUES IN ENVIRONMENT SCIENCE
KSKV Kachchh University, Bhuj - Kachchh

UNIT	SEMESTER – 3 Environment Science MAJOR – 3	NO. OF LECTURES
1	**Separation Techniques** **Chromatography-** Principles, application methodology and types of planar and column chromatography HPLC, GC, Ion-exchange, Affinity and Gel chromatography. **Electrophoresis-** Principles and applications of paper, gel, SDS PAGE. **Centrifugation** – Principle, applications.	15
2	**Spectroscopy** **Spectrometry:** Principles and instrumentation, UV/visible/IR Spectrophotometry, Atomic absorption spectrometer, Mass spectrometry. Nuclear Magnetic resonance (NMR) spectroscopy: Principle and instrumentation and application.	15
3	**Instrumentation:** High Volume sampler, low volume sampler Ovens, shakers, centrifuge, pH meter, Electronic Balance BOD, Laminar Flow hood, glass Beed sterilizers, Autoclave Microscopy – Definition, Principles and application.; brief introduction of compound and electron microscope	15

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 3
PAPER CODE: MJES 306 (Practical)
PAPER NAME: ANALYTIC TECHNIQUES IN ENVIRONMENT SCIENCE
KSKV Kachchh University, Bhuj - Kachchh

Practical	Aim of Practical
1	To study separation of chlorophyll pigments by using paper chromatography.
2	To study principle and application of Electrophoresis through Instruments/ Photographs.
3	To study principle and application of Centrifuge through Instruments/ Photographs.
4	To demonstrate functioning of spectrophotometer through Instrument/ photographs.
5	To study the principle, functioning and applications of High-Volume sampler, low volume sampler through instrument/ photographs.
6	To study the principle, functioning and applications of Ovens and shakers through instrument/ photographs.
7	To study the principle, functioning and applications of pH meter and Electronic Balance through instrument/ photographs.
8	To study the principle, functioning and applications of BOD and Laminar Flow hood through instrument/ photographs.
9	To study the principle, functioning and applications of Glass Beed sterilizers and Autoclave through instrument/ photographs.
10	To study the principle, functioning and applications of Compound microscope through instrument/ photographs.
11	To study the principle, functioning and applications of Electron - Scanning microscope through instrument/ photographs.
12	To study the principle, functioning and applications of Electron - Transmission microscope through instrument/ photographs.

Multi-disciplinary Subject
Environment

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 3
PAPER CODE: MDES 307
PAPER NAME: BASICS OF ECOLOGY
KSKV Kachchh University, Bhuj - Kachchh

UNIT	SEMESTER – 3 Environment Science MDC	NO. OF LECTURES
1	**ECOLOGY** **Ecology:** Definition, Branches, Scopes, relation to other divisions of science, **Autecology and Synecology:** Definition. **Ecosystem:** Concept & structure of ecosystem, kinds of ecosystem, functions of ecosystem, biotic and abiotic component of ecosystems. **Food chain** (Definition, grazing & detritus food chain), **Food web**, trophic structure, **Ecological pyramids:** Definition, types and limitations. **Energy flow in ecosystem**- single chain model	15
2	**ECOSYSTEM** **Ecosystem:** Definition & types (terrestrial & aquatic ecosystem) **Terrestrial ecosystem:** Dessert ecosystem, grassland ecosystem, forest ecosystem (evergreen & deciduous forest). **Aquatic ecosystem:** Fresh water ecosystem, pond ecosystem, river ecosystem. **Marine ecosystem:** Ocean water ecosystem, estuarine ecosystem. **Productivity of ecosystem:** Definition, primary and secondary productivity	15
3	**ANIMAL INTERACTIONS AND SUCCESSION** **Animal Interaction and associations:** Mutualism, Commensalism, Parasitism, Predation, Ammensalism. **Defensive Adaptation:** Mimicry, Camouflage. **Pollination:** Definition, types (Self Pollination, Cross Pollination), biotic and abiotic agents of pollution, Role of animals in pollination. **Seed dispersal:** Definition, role of animals in seed dispersal. **Ecological Succession:** Definition, Cause of succession, basic types of succession, general process of succession, Hydrosere. Lithosere.	15

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 3
PAPER CODE: MDES 308 (Practical)
PAPER NAME: BASICS OF ECOLOGY
KSKV Kachchh University, Bhuj - Kachchh

Practical	Aim of Practical
1	To study the Food Chain (Grazing and detritus) by using photographs/ charts.
2	To study the Food Web (Terrestrial and Aquatic) by using photographs/ charts.
3	To study Ecological Pyramids by using photographs/ charts.
4	To study Energy flow in ecosystem by using photographs/ charts.
5	To study the dessert and grassland ecosystem by using photographs/ charts.
6	To study the Pond and River Ecosystem by using photographs/ charts.
7	Study of animal association through specimens/ photographs/ charts. -Mutualism, Commensalism, Competition, Parasitism, Predation Ammensalism. (any two examples of each)
8	Study of animal adaptation from specimen/ photographs/ charts- Mimicry, Camouflage (Any two examples of each).
9	To study the Process of Pollination and its types using specimens/ photographs/ charts.
10	To study Hydrosere by using photographs/ Charts.
11	To study Lithosere by using photographs/ Charts.

Paper and Credit Scheme for Environment Science Semester – 4

Year	Semester	Paper Code	Paper Name	Credits	Marks		Total
					CA	UA	
2nd Year	IV	MJES – 401 (Theory)	Biological Environment Major – 1	3	35	40	75
		MJES – 402 (Practical)	Biological Environment Major – 1	1	10	15	25
		MJES – 403 (Theory)	Current trends in Environment Science Major – 2	3	35	40	75
		MJES – 404 (Practical)	Current trends in Environment Science Major – 2	1	10	15	25
		MJES – 405 (Theory)	Environmental Pollution – 1 Major – 3	3	35	40	75
		MJES – 406 (Practical)	Environmental Pollution – 1 Science Major – 3	1	10	15	25
		MNES – 407 (Theory)	Biological Environment Minor – 1	3	35	40	75
		MNES – 408 (Practical)	Biological Environment Minor – 1	1	10	15	25
		TOTAL		12	90	110	300

Major Subject
Environment

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 4
PAPER CODE: MJES 401
PAPER NAME: BIOLOGICAL ENVIRONMENT
KSKV Kachchh University, Bhuj - Kachchh

UNIT	SEMESTER – 4 ENVIRONMENT MAJOR – 1	NO. OF LECTURES
1	**Phytogeography and Zoogeography** **Phytogeography:** Definition, Phytogeographic regions, Soils of India, Climate of India, Climatic regions of India, Vegetation of India. **Zoogeography:** Zoogeography: Definition, barriers to dispersal, Means of dispersal. Zoogeographic regions of the world, Zoogeography of India, geological distribution, diverse fauna of India, Biodiversity of India	15
2	**Ecological Microbiology** **Microbiology:** Definition, Classification of Microorganisms (Bacteria, Virus, Protozoa and Fungi), **General characteristics of Microorganisms:** Bacteria, Virus, Protozoa and Fungi. **Microorganisms and Nutrient cycle:** Role of microorganisms in Nitrogen, Sulpher, Phosphrus and Carbon cycle.	15
3	**Adaptation of Animals** Morphological/ Physiological/ Anatomical adaptations for survive in Deep sea, Polar regions, Cave. Morphological/ Physiological/ Anatomical adaptations for terrestrial life- Dessert, Tundra. Morphological/ Physiological/ Anatomical adaptations for aquatic life- Planktonic life, Wetland. Adaptation for aerial life: adaptation for respiration, flight, locomotion and colour. Special adaptation: Migration, Hibernation and aestivation.	15

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 4
PAPER CODE: MJES 402 (Practical)
PAPER NAME: BIOLOGICAL ENVIRONMENT
KSKV Kachchh University, Bhuj - Kachchh

Practical	Aim of Practical
1	Study of zoogeographical regions of world through Map.
2	Study of zoogeographical regions of India through Map.
3	To study Soil type of India using Map.
4	To study phytogeographical regions of India by using Maps.
5	To study the climatic regions of the India using Maps.
6	To study types of bacteria using photographs/ Charts/ Slides. (different shapes of Bacteria).
7	To study types of Virus using photographs/ Charts/ Slides. (TMV, Bacteriophage)
8	To study types of fungi by using photographs/ Charts/ Slides. (Any one fungus from each of Phycomycetes, Ascomycetes, Basidiomycetes)
9	To study types of Protozoa by using photographs/ Charts/ Slides. (Amoeba, Paramoecium, Plasmodium).
10	To study zooplanktons through photographs/ charts/ specimens.
11	To study animals of Deep sea, Polar regions, Cave, Dessert, Tundra and Wetland. (Two examples of each)
12	Write down morphological/ physiological/ anatomical adaptation of aerial life.
13	Study of Special adaptations - Migration, Hibernation and astivation with suitable examples using Photographs/ Charts.

Major Subject
Environment

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 4
PAPER CODE: MJES 403
PAPER NAME: CURRENT TRENDS IN ENVIRONMENT SCIENCE
KSKV Kachchh University, Bhuj - Kachchh

UNIT	SEMESTER – 4 ENVIRONMENT MAJOR – 2	NO. OF LECTURES
1	**Sustainable Development and Radiation Ecology** **Sustainable Development:** Concept and introduction, Causes of unsustainability, Threats and Principals of sustainable development, International efforts on sustainable development, sustainable development in India: Perspectives and strategies. **Radiation Ecology:** Radiation ecology, Kinds of radiation, Sources of radiation, Biological effects of radiation, Chemical toxicants, biological effects of chemical toxicants, Ecological changes and diseases, Ecotoxicology.	15
2	**Bioremediation and Climate change** **Bioremediation:** Need, Merits and Scope of Bioremediation, Approaches to bioremediation, ecotechnology of bioremediation, phytoremediation, Phyto mining, current status of bioremediation. **Climate change:** Global warming and climate change, causes and projected effects of global warming, Kyoto protocol, Ozone layer depletion, causes and effects of ozone layer depletion, Montreal protocol.	15
3	**Conservation of Biodiversity** **Biological diversity:** Definition, Types- Genetic diversity, species diversity, community diversity. **Measuring Biodiversity:** Alpha, Beta and Gama diversity. Bio-ethics and conservation, causes of species extinction, IUCN red data book. **Jhum Cultivation:** Definition, Jhum cultivation in India.	15

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 4
PAPER CODE: MJES 404 (Practical)
PAPER NAME: CURRENT TRENDS IN ENVIRONMENT SCIENCE
KSKV Kachchh University, Bhuj - Kachchh

Practical	Aim of Practical
1	To Prepare a report on sustainable development with title given by the teacher.
2	To Prepare a report on radiation ecology with title given by the teacher.
3	To Prepare a report on Bio remediation with title given by the teacher.
4	To Prepare a report on Climate Change with title given by the teacher.
5	To Prepare a report on Conservation of biodiversity with title given by the teacher.

***Note:** Prepare study reports of given topic and submit two copies to the college. Oral examination will be taken from the given topic for Internal and External practical examination.

Major Subject
Environment

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 4
PAPER CODE: MJES 405
PAPER NAME: ENVIRONMENTAL POLLUTION - 1
KSKV Kachchh University, Bhuj - Kachchh

UNIT	SEMESTER – 4 ENVIRONMENT MAJOR – 3	NO. OF LECTURES
1	**WATER CHEMISTRY** **Concept and scope of environmental chemistry:** Definition and description of various terms: - contaminant, pollutant, receptor, sink, aerosols, particulates, pathways of pollutants, TLV, COD, BOD, chemical toxicology, hazardous chemicals, carcinogens. Properties of water; Water quality, Water quality standards (Indian and International standards), water resources.	15
2	**POLLUTANTS OF WATER** Origin and types of water pollutions/pollutants, their impacts on environment. Waste water sampling techniques, Analysis of waste water – organic and inorganic substances, physical characteristics and biological contamination.	15
3	**WASTE WATER TREATMENT** Waste water treatment – Preliminary, primary, secondary and tertiary; removal of suspended and dissolved solids, nitrogen and phosphorous, advance biological and chemical methods for water treatment.	15

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 4
PAPER CODE: MJES 406 (Practical)
PAPER NAME: ENVIRONMENTAL POLLUTION - 1
KSKV Kachchh University, Bhuj - Kachchh

Practical	Aim of Practical
1	To study different instruments used in Water sample.
2	To study different techniques used in Water sample.
3	To estimate alkalinity of given water sample.
4	To Estimate acidity of given water sample.
5	To Estimate Total hardness of given water sample.
6	To Estimate DO of given water sample.
7	To Estimate BOD of given water sample.
8	To Estimate COD of given water sample.
9	To study the physical properties of water.
10	To study the pH, salinity and turbidity of given water sample.

Minor Subject
Environment

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 4
PAPER CODE: MNES 407
PAPER NAME: BIOLOGICAL ENVIRONMENT
KSKV Kachchh University, Bhuj - Kachchh

UNIT	SEMESTER – 4 ENVIRONMENT MINOR – 1	NO. OF LECTURES
1	**Phytogeography and Zoogeography** **Phytogeography:** Definition, Phytogeographic regions, Soils of India, Climate of India, Climatic regions of India, Vegetation of India. **Zoogeography:** Zoogeography: Definition, barriers to dispersal, Means of dispersal. Zoogeographic regions of the world, Zoogeography of India, geological distribution, diverse fauna of India, Biodiversity of India	15
2	**Ecological Microbiology** **Microbiology:** Definition, Classification of Microorganisms (Bacteria, Virus, Protozoa and Fungi), **General characteristics of Microorganisms:** Bacteria, Virus, Protozoa and Fungi. **Microorganisms and Nutrient cycle:** Role of microorganisms in Nitrogen, Sulpher, Phosphrus and Carbon cycle.	15
3	**Adaptation of Animals** Morphological/ Physiological/ Anatomical adaptations for survive in Deep sea, Polar regions, Cave. Morphological/ Physiological/ Anatomical adaptations for terrestrial life- Dessert, Tundra. Morphological/ Physiological/ Anatomical adaptations for aquatic life- Planktonic life, Wetland. Adaptation for aerial life: adaptation for respiration, flight, locomotion and colour. Special adaptation: Migration, Hibernation and aestivation.	15

DETAILED SYLLABUS OF B.Sc. 2nd YEAR
SEMESTER - 4
PAPER CODE: MNES 408 (Practical)
PAPER NAME: BIOLOGICAL ENVIRONMENT
KSKV Kachchh University, Bhuj - Kachchh

Practical	Aim of Practical
1	Study of zoogeographical regions of world through Map.
2	Study of zoogeographical regions of India through Map.
3	To study Soil type of India using Map.
4	To study phytogeographical regions of India by using Maps.
5	To study the climatic regions of the India using Maps.
6	To study types of bacteria using photographs/ Charts/ Slides. (different shapes of Bacteria).
7	To study types of Virus using photographs/ Charts/ Slides. (TMV, Bacteriophage)
8	To study types of fungi by using photographs/ Charts/ Slides. (Any one fungus from each of Phycomycetes, Ascomycetes, Basidiomycetes)
9	To study types of Protozoa by using photographs/ Charts/ Slides. (Amoeba, Paramoecium, Plasmodium).
10	To study zooplanktons through photographs/ charts/ specimens.
11	To study animals of Deep sea, Polar regions, Cave, Dessert, Tundra and Wetland. (Two examples of each)
12	Write down morphological/ physiological/ anatomical adaptation of aerial life.
13	Study of Special adaptations - Migration, Hibernation and astivation with suitable examples using Photographs/ Charts.

B.Sc. Environment Science Programme (NEP 2020)

Theory assessment

Pattern for Semester end Examination (For Semester – 3 & 4)

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.
3. 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 carry 01 mark.

For Internal / College theory assessment

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

The passing criteria for Internal/ college assessment is 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 Semester – 3 & 4)

For university assessment of practicals, 4 to 5 exercises will be arranged for students according to theprescribed syllabus.

The University Practical assessment is of 10 marks.

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

For Internal / College assessment

For Internal/ college assessment of practicals, 4 to 5 exercises will be arranged for students according to theprescribed syllabus.

The Internal/ college Practical assessment is of 15 marks.

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

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