

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

Syllabus

Effective from June 2016

B.Sc. SEMESTER III

SUBJECT: ENVIRONMENT SCIENCE

Paper no.	Name
CEES-307	Analytic Techniques
CEES-308	Nature of India's Environment-1
CEES-309	Bio-statistics and its applications- 2
CEES-310	Environmental Development,

	Challenges and effects
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B.Sc. SEMESTER III & IV - ENVIRONMENT SCIENCE

SYLLABUS FOR ENVIRONMENT SCIENCE SEMESTER - III

TYPE OF SUBJECT	SUBJECT CODE/ PAPER NO.	SUBJECT/ PAPER NAME	ASSESSMENT TYPE	CREDIT	BRIEF INTRODUCTION OF SUBJECT
CORE ELECTIVE-1	CEES-307	Analytic Technique	Theory	04	Students will learn about basic concepts Instrumentation and other processes.
			Practical	03	Practical related to Instruments and other processes.
CORE ELECTIVE-2	CEES-308	Nature of India's Environment-1	Theory	04	Students will learn about Land, Soil, Climate, Flora and Fauna of India.
			Practical	03	Practical related to theory syllabus.
CORE ELECTIVE-3	CEES-309	BioStatistics and its applications	Theory	04	Student will learn about statistical analysis of data and its applications.
			Practical	03	Practical related to Biostatistics.
CORE ELECTIVE-4	CEES-310		Theory	04	
			Practical	03	
CORE COMPULSORY	USCCEN 001	COMPULSORY ENGLISH	Theory	03	English literature and Grammar.
Foundation Course	USFC001	RTI and Consumer Act	Theory	01*	—

KSKV Kachchh University, Bhuj – Kachchh
Environment Science Syllabus as CBCS System
Semester III
CORE ELECTIVE-I (CEES-307) Analytic Technique

Total Marks : 60

Unit I 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

Unit II Spectrometry:

Principles and instrumentation, UV/visible/IR Spectrophotometry

Atomic absorption spectrometer,

Mass spectrometry,

Unit III Instrumentation:

High Volume sampler, low volume sampler

Ovens, shakers, centrifuge, pH meter, Electronic Balance

BOD, Laminar Flow hood, glassbeed sterilizers, Autoclave

Microscopy – Principles and application.

Unit IV Microscopy:

Principle and application of light, phase contrast, fluorescence

Scanning and transmission electron microscopy, scanning tunneling microscopy

Atomic force microscopy, confocal microscopy Cytophotometry and flow cytometry,
fixation and staining

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Paper No. CEES307 Analytic Techniques

(PRACTICALS)

1. To study of chlorophyll pigments by using paper chromatography.
2. To study principle and application of electrophoresis and centrifugation through Instruments/ Photographs.
3. To demonstrate functioning of spectrophotometer through Instrument/ photographs.
4. To study the principle and functioning of Ovens, pH meter, Electronic balance, BOD instrument through instrument/ photographs.
5. To study functioning and principle of Compound microscope and florescent microscope through instrument/ photograph.
6. To study functioning and principle of electron microscope through photographs.
7. To study functioning and principle of atomic microscope and confocal microscope.

References:

1. Bioanalytic techniques and Instrumentation by Ghosal and Shrivastava.
2. Biological Instrumentation & Methodology by P.K. Bajpai
3. HANDBOOK OF BIOMEDICAL INSTRUMENTATION, THIRD EDITION by Dr R.S. Khandpur

Semester III (Environment Science) Paper no : CEES 307

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

Question No.	Sub Question	Question Type	Mark
Question 1 Unit I	A	Short question (No internal Option)	05
	B	Descriptive Questions with Internal Option	10
Question 2 Unit II	A	Short question (No internal Option)	05
	B	Descriptive Questions with Internal Option	10
Question 3 Unit III	A	Short question (No internal Option)	05
	B	Descriptive Questions with Internal Option	10
Question 4 Unit IV	A	Short question (No internal Option)	05
	B	Descriptive Questions with Internal Option	10

Note: Short questions may include: one to two line question/ definition/ drawing small figures/ filling the blanks/ multiple choice question/ match the pairs etc)

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Environment Science Syllabus as CBCS System
Semester III**

CORE ELECTIVE-II (CEES-308) Nature of India's Environment-1

Total Marks : 60

UNIT 1 Land Resources:

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; degradation of hillsides

UNIT 2 Water resources:

Concept of hydrological cycle, monsoon distribution, surface & ground water resources, utilization for various purposes. River valley projects. Effect of dams.

UNIT 3 Phytogeography

Definition, Phytogeographic regions, Soils of India, Climate of India, Climatic regions of India, Floristic (Botanical) regions of India, Vegetation of India.

UNIT 4 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).

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Paper No. CEES308 Nature of India's Environment-1
(PRACTICALS)

1. To study Soil type of India using Map.
2. Study of Botanical regions of India by using Maps.
3. To study the water holding capacity of given soil samples.
4. To study the water moisture of given soil samples.
5. To study minor and major forest products through specimens/ photos/ charts.
6. To study endangered flora of India through specimens/ photographs.
7. To study endangered fauna of India through photographs/ charts.

References:

1. Basic of environment science by Srivastava Anmol Pub.
2. Basic of Ecology by Pradhan Anmol Pub.
3. Men and Environment by P.R.Trivedi Anmol Pub.
4. Handbook of methods in environmental studies by S.k, Malti Oxford Pub.
5. Environmental Science by S.C. Santra New central Book.
6. Ecology and environment by P.D.Sharma Rastogi Pub..

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Unit I	B	Descriptive Questions with Internal Option	10
Question 2	A	Short question (No internal Option)	05
Unit II	B	Descriptive Questions with Internal Option	10
Question 3	A	Short question (No internal Option)	05
Unit III	B	Descriptive Questions with Internal Option	10
Question 4	A	Short question (No internal Option)	05
Unit IV	B	Descriptive Questions with Internal Option	10

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**KSKV Kachchh University, Bhuj - Kachchh
Environment Science Syllabus as CBCS System
Semester III
CORE ELECTIVE-III (CEES-309) Bio-Statistics and its
Application-2**

Total Marks : 60

Unit-1 TIME SERIES:

Definition and Meaning of time series. Components of time series. Trend, Seasonal, Cyclic and Random components, Elimination of trend by the method of Moving average, method of curve fitting, using or ordinary least squares principle only, curve fitting for numerical data for linear, quadratic and exponential case only.

Unit-2 LARGE SAMPLE TEST:

Statement of a hypothesis, null hypothesis, level of significance, critical region or rejection region, testing of hypothesis, two types of errors, standard error of statistic, significance of mean(s) and proportion(s) in case of one and two samples.

SMALL SAMPLE TEST:

Definition of t and F statistics, degree of freedom, properties of t and F distributions, use of t and F tests. Z-test.

Unit-3 CHI-SQUARE TEST:

Definition of Chi-square test as large sample Statistic. Properties of Chi-square distribution without proof. Application of Chi-square test. Test of independence of attributes up to 3x3 contingency table. Derivation of Chi-square in 2x2 contingency table. Goodness of fit test.

Unit-4 ANALYSIS OF VARIANCE:

Concept of analysis of variance, Example on One way and Two way analysis of variance.

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Paper No. CEMS309 Bio-Statistics and Its Applications-2

(PRACTICALS)

THE PRACTICALS IS DERIVED FROM THE ABOVE SYLLABUS

References:

1. Bhat BR, Modern Probability theory, 1985, Wiley Eastern Ltd.
2. Rohatgi VK and Md.Ehsanes saleh AK, An Introduction to Probability & Statistics, 2009, Wiley India..
3. Rao CR. Linear Statistical Inference and its Applications, 1973, John Wiley, NY.
5. Johnson NL and Kotz 4. Dutta, N. K. (2004). Fundamentals of Biostatistics, Kanishka Publishers.
4. Gurumani N. (2005) . An Introduction to Biostatistics, MJP Publishers.
5. Daniel, W. W. (2007). Biostatistics- A Foundation for Analysis in the Health Sciences,Wiley.
6. Rao, K. V. (2007). Biostatistics - A Manual of Statistical Methods for use in Health Nutrition and Anthropology.
7. Pagano, M.& Gauvreau, K. (2007). Principles of Biostatistics.
8. Sundaram, K.R.(2010) Medical Statistics-Principles & Methods, BI Publications,New Delhi

The Structure of the Question Paper for the University exam

Semester III (Environment Science) Paper no : CEES 309

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

Question No.	Sub Question	Question Type	Mark
Question 1	A	Short question (No internal Option)	05
Unit I	B	Descriptive Questions with Internal Option	10
Question 2	A	Short question (No internal Option)	05

Unit II	B	Descriptive Questions with Internal Option	10
Question 3	A	Short question (No internal Option)	05
Unit III	B	Descriptive Questions with Internal Option	10
Question 4	A	Short question (No internal Option)	05
Unit IV	B	Descriptive Questions with Internal Option	10

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**KSKV Kachchh University, Bhuj - Kachchh
Environment Science Syllabus as CBCS System
Semester III**

**CORE ELECTIVE-IV (CEMS-310) Environmental development,
challenges and effects.**

Total Marks : 60

Unit-1 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.

Unit-2 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.

Unit-3 Bio remediation

Need, Merits and Scope of Bioremediation, Approaches to bioremediation, ecotechnology of bioremediation, phytoremediation, phytomining, current status of bioremediation.

Unit-4 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.

KSKV Kachchh University, Bhuj - Kachchh
Paper No. CEMS310 Environmental development,
challenges and effects.

(PRACTICALS)

1. Prepare study report 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.

References:

1. Environmental pollution by Katyal Anmol Publication.
2. Environmental biology by Trivedi Anmol Publication.
3. Man and environment by Trivedi Akashdeet Pub.
4. Environmental pollution B.D.Sharma Anmol Pub.
5. Management of pollution control by Trivedi Akashdeet Pub.
6. Ecology and Environment by P.D.Sharma Rastogi Publication.

**The Structure of the Question Paper for the
University exam**

Semester III (Environment Science) Paper no : CEES 310

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

Question No.	Sub Question	Question Type	Mark
Question 1	A	Short question (No internal Option)	05
Unit I	B	Descriptive Questions with Internal Option	10
Question 2	A	Short question (No internal Option)	05
	B	Descriptive Questions with Internal	10

Unit II		Option	
Question 3	A	Short question (No internal Option)	05
Unit III	B	Descriptive Questions with Internal Option	10
Question 4	A	Short question (No internal Option)	05
Unit IV	B	Descriptive Questions with Internal Option	10

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KRANTIGURU SHYAMJI KRISHNA VERMA KACHCHH UNIVERSITY, KACHCHH

Syllabus

Effective from June 2016

B.Sc. SEMESTER IV

SUBJECT: ENVIRONMENT SCIENCE

Paper no.	Name
CEES-411	Cell Biology and Biochemistry
CEES-412	Nature of India's Environment-2
CEES-413	Environmental Zoology
CEES-414	Biological Environment

B.Sc. SEMESTER III & IV - ENVIRONMENT SCIENCE

SYLLABUS FOR ENVIRONMENT SCIENCE SEMESTER - IV

TYPE OF SUBJECT	SUBJECT CODE/ PAPER NO.	SUBJECT/ PAPER NAME	ASSESSMENT TYPE	CREDIT	BRIEF INTRODUCTION OF SUBJECT
CORE ELECTIVE-1	CEES-411	Cell Biology and Biochemistry	Theory	04	Students will learn about basic concepts of Cell Biology and Biochemistry.
			Practical	03	Practical related to Cell Biology and Biochemistry.
CORE ELECTIVE-2	CEES-412	Nature of India's Environment-2	Theory	04	Students will learn about environmental condition and resources of India.
			Practical	03	Practical related to theory syllabus.
CORE	CEES-413	Environmental	Theory	04	Student will learn about

ELECTIVE-3		Zoology			basic concepts of environment and zoology.
			Practical	03	Practical related to theory syllabus.
CORE ELECTIVE-4	CEES-414	Biological Environment	Theory	04	Students will learn about basic
			Practical	03	
CORE COMPULSORY	USCCEN 001	COMPULSORY ENGLISH	Theory	03	English literature and Grammar.
Foundation Course	USFC001	RTI and Consumer Act	Theory	01*	—

**KSKV Kachchh University, Bhuj - Kachchh
Environment Science Syllabus as CBCS System
Semester IV
CORE ELECTIVE-I (CEES-411) Cell Biology and Biochemistry
Total Marks : 60**

UNIT-1 Cell Biology

Cell: Definition, Types of cells- Akaryotic, Prokaryotic and Eukaryotic ; General structure of typical plant cell and animal cell; function of cell; Cell theory

Cellular organelles: Structure and function of Cell wall, plasma membrane, Endoplasmic reticulum, Golgi body, Mitochondria, Chloroplast, Ribosomes, Lysosomes, Nucleus.

UNIT-2 Cell Biology

Cell division: Definition, Importance of cell division

Cell cycle: Definition, Basic introduction.

Types of cell division: Mitosis and Meiosis.

UNIT-3 Biochemistry

Biochemistry: Basic introduction.

Bio-molecules: Carbohydrate- Basic structure, Mono-, Di-, Poly- saccharides, Properties.

Protein: Basic introduction, structure of protein molecule, Protein structure- Primary, Secondary, tertiary and quaternary structure; classification of protein on the basis of their Shape (globules and fibrous) and function, properties, biological importance.

Lipids: introduction, fatty acids- saturated and unsaturated, simple lipids, compound lipids, biological function/ importance of lipids.

UNIT-4 Biochemistry

Enzymes: Basic introduction, chemical nature and general characterization, structure- active site, mode of action- lock and key theory, Classification and Nomenclature of Enzymes, Co-factors, Co-enzymes.

Vitamins: Basic introduction, types (water soluble and fat soluble), source, biological importance of vitamins, deficiency/ disorders of vitamins.

KSKV Kachchh University, Bhuj - Kachchh

Paper No. CEES 411 Cell Biology and Biochemistry

(PRACTICALS)

1. To study typical plant cell and animal cell through photographs/ charts/ specimens.
2. To study the structure and function of following through photographs/ charts/ specimens.
Plasma membrane, Mitochondria, Chloroplast, Nucleus
3. To demonstrate phases of mitosis through photographs/ Charts.
4. To determine carbohydrate from given sample through bio chemical test. (any two tests)
5. To determine protein from given sample through bio chemical test. (any one tests)
6. To determine Lipid from given sample through bio chemical test. (any one tests)

References:

1. Cell Biology by C.B.Power.
2. College Botany-1 by Das, Dutta and Ganguli; mew central book dep.
3. Cell Biology,Genetics,Molecular Biology, Evolution and ...by P S Verma S.Chand Pub.
4. CELL BIOLOGY (CYTOLOGY, BIOMOLECULES AND MOLECULAR BIOLOGY) by Agrawal and Verma S. Chand Publishing

**The Structure of the Question Paper for the
University exam**

Semester IV (Environment Science) Paper no : CEES 411

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

Questi on No.	Sub Questio	Question Type	Mark
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Question 1	A	Short question (No internal Option)	05
Unit I	B	Descriptive Questions with Internal Option	10
Question 2	A	Short question (No internal Option)	05
Unit II	B	Descriptive Questions with Internal Option	10
Question 3	A	Short question (No internal Option)	05
Unit III	B	Descriptive Questions with Internal Option	10
Question 4	A	Short question (No internal Option)	05
Unit IV	B	Descriptive Questions with Internal Option	10

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**KSKV Kachchh University, Bhuj - Kachchh
Marine Science Syllabus as CBCS System
Semester IV**

CORE ELECTIVE-II (CEES-412) Nature of India's environment-2

Total Marks : 60

UNIT 1 Economic Resources:

Energy resources : Renewable and non-renewable

Mineral resources: Metallic, non-metallic & nuclear minerals

Marine resources – food, mineral & energy

UNIT 2 Habitat & People:

Urban habitat – urban demography; housing and slums

Urban water supply and sanitation

Urban transport

Rural water supply and sanitation

UNIT 3 Health: Health and poverty; common diseases:

Impact of environment on life of marine fisher folk and tribes

Government & environment: Environmental policies

UNIT 4 Epidemiological Study for Environmental Health:

Principal of epidemiology and epidemiologic method.

Aims of Epidemiology, Epidemiological approach, rates and ratios.

Epidemiologic methods Observational study, Experimental studies and Intervention studies, Descriptive.

Analytical epidemiology, Experimental epidemiology, Association and causation, use of epidemiology, Infectious epidemiology, Disease transmission.

KSKV Kachchh University, Bhuj - Kachchh

Paper No. CEES 412 Nature of India's Environment-2

(PRACTICALS)

2. Prepare study report 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.

References:

1. Basic of environment science by Srivastava Anmol Pub.
2. Basic of Ecology by Pradhan Anmol Pub.
3. Men and Environment by P.R.Trivedi Anmol Pub.
4. Handbook of methods in environmental studies by S.k, Malti Oxford Pub.
5. Environmental Science by S.C. Santra New central Book.
6. Ecology and Environment by P.D.Sharma Rastogi Publication

Semester IV (Environment Science) Paper no : CEES 412

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

Question No.	Sub Question	Question Type	Mark
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	n		
Question 1	A	Short question (No internal Option)	05
Unit I	B	Descriptive Questions with Internal Option	10
Question 2	A	Short question (No internal Option)	05
Unit II	B	Descriptive Questions with Internal Option	10
Question 3	A	Short question (No internal Option)	05
Unit III	B	Descriptive Questions with Internal Option	10
Question 4	A	Short question (No internal Option)	05
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**KSKV Kachchh University, Bhuj - Kachchh
Environment Science Syllabus as CBCS System
Semester IV
CORE ELECTIVE-III (CEES-413) Environmental Zoology**

Total Marks : 60

UNIT-1 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,

UNIT-2 Habitat Ecology

Aquatic habitat: Estuary, Marine, Fresh water habitat their climate, distribution in India, Flora and fauna.

Terrestrial Habitat: Tropical rain forest, Mangrove forest, desert their climate, distribution in India, flora and fauna.

UNIT-3 Conservation of 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.

UNIT-4 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.

KSKV Kachchh University, Bhuj - Kachchh

Paper No. CEES 413 Environmental Zoology

(PRACTICALS)

1. Study of zoogeographical regions of world through Map.
2. Study of zoogeographical regions of India through Map.

3. Study of National parks of India and Gujarat through Map.(For India any 10 national parks)
4. Study of Sanctuaries of India and Gujarat through Map. (Any 10 sanctuaries (India) and any 5 sanctuaries (Gujarat).
5. Study of Biosphere reserve of India through Map. (any 5 biosphere reserves of India).
6. Identification, classification of zooplanktons through photographs/ charts/ specimens.
7. Write down morphological/ physiological/ anatomical adaptation of terrestrial life.
8. Write down morphological/ physiological/ anatomical adaptation of aquatic life.
9. Write down morphological/ physiological/ anatomical adaptation of aerial life.

References:

1. Chordate Zoology by E.L. JORDAN & P.S. VERMA
2. Manual of Zoology Vol. I. Part. I.(Invertebrata), M. Ekambaranatha Ayyar and T.N. Ananthakrishnan, Reprint 2003.
3. Manual of Zoology Vol. I. Part. II.(Invertebrata), M. Ekambaranatha Ayyar and T.N. Ananthakrishnan, Reprint 2003.
4. Manual of Zoology Vol. II. Chordata M. Ekambaranatha Ayyar and T.N. Ananthakrishnan, Reprint 2003. S. Viswanathan (Printers andPublishers) Pvt. Ltd. 38, Mcnichols Rd, Chetput, Chennai - 600031.
5. Chordate Zoology E. L. Jordan and P. S. Verma. Reprint 2003. S. Chand .and Company Ltd, Ram nagar, New Delhi - 110 055.
6. A Text book of Zoology R. D. Vidyarthi and P. N. Pandey S. Chand and Company Ltd, Ram nagar, New Delhi - 110 055.
7. Ecology and Environment by P.D.Sharma Rastogi Publication

Semester IV (Environment Science) Paper no : CEES 413

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

Questi	Sub	Question Type	Mark
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on No.	Question		
Question 1 Unit I	A	Short question (No internal Option)	05
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Question 2 Unit II	A	Short question (No internal Option)	05
	B	Descriptive Questions with Internal Option	10
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Environment Science Syllabus as CBCS System
Semester IV
CORE ELECTIVE-IV (CEES-414) Biological Environment**

Total Marks : 60

UNIT-1 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.

UNIT-2 Biome Ecology

Biome: Definition

Major biomes of world: Forest biome (Tropical rain forest, deciduous forest), Grassland biomes, Desert 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)

UNIT -3 Ecological Microbiology

Microbiology: Definition, Classification of Micro organisms (Bacteria, Virus, Protozoa and Fungi)

General characteristics of Microorganisms: Bacteria, Virus, Protozoa and Fungi

Microorganisms and Nutrient cycle: Role of microorganisms in Nitrogen, Sulphur, Phosphorus and Carbon cycle.

UNIT-4 Conservation Biology

Biological diversity: Definition, Types- Genetic diversity, species diversity, community diversity.

Measuring Biodiversity: Alpha, Beta and Gamma diversity

Bio-ethics and conservation, causes of species extinction, IUCN red data book.

Jhum Cultivation: Definition, Jhum cultivation in India.

KSKV Kachchh University, Bhuj - Kachchh

Paper No. CEES 414 Biological Environment

(PRACTICALS)

1. To determine relative density of the given plant community by using random sampling unit method (Quadrat method).
2. To determine relative frequency of the given plant community by using random sampling unit method (Quadrat method).
3. To study forest biomes (Tropical rain forest and deciduous forest) of the world using Map.
4. To study Desert biomes of the world using Map.
5. To study Tundra biomes of the world using Map.
6. To study forest biomes (Tropical rain forest and deciduous forest) of India using Map.
7. To study Desert biomes of India using Map.
8. To study types of bacteria using photographs/ Charts/ Slides. (different shapes of Bacteria).
9. To study types of Virus using photographs/ Charts/ Slides. (TMV, Bacteriophage)
10. To study types of fungi by using photographs/ Charts/ Slides. (Any one fungi from each of Phycomycetes, Ascomycetes, Basidiomycetes)
11. To study types of Protozoa by using photographs/ Charts/ Slides. (Amoeba, Paramecium, Plasmodium).

Reference:

- 1.** Concepts of Ecology (Environmental Biology) by N.Arumugam
- 2.** Environmental Studies (Based on UGC Syllabus) by N. Arumugam, V.Kumaresan
- 3.** Plant Ecology & Phytogeography by V. Kumaresan, N. Arumugam
- 4.** Ecology, Toxicology and Evolution by N. Arumugam

Semester IV (Environment Science) Paper no : CEES 414

Total Mark: 60 (Total 4 units each carries 15 Marks)

Total Number of Question: 04

Question No.	Sub Question	Question Type	Mark
Question 1 Unit I	A	Short question (No internal Option)	05
	B	Descriptive Questions with Internal Option	10
Question 2 Unit II	A	Short question (No internal Option)	05
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Question 3 Unit III	A	Short question (No internal Option)	05
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Question 4 Unit IV	A	Short question (No internal Option)	05
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