KUVEMPU UNIVERSITY

CHOICE BASED CREDIT SYSTEM (CBCS)

&

CONTINUOUS ASSESSMENT AND GRADING PATTERN

Based

B. Sc., ENVIRONMENTAL SCIENCE SYLLABUS

(Case 1: 3 Majors with a General Degree)

for

2024-25

Board of Studies in Environmental Science
Department of P.G. Studies and Research in Environmental Science
Kuvempu University
Jnanasahyadri, Shankaraghatta-577451
Shivamogga, Karnataka, INDIA.

Undergraduate Environmental Science Syllabus

(Case 1: 3 Majors with a General Degree) for 2024-25

Proposed Semester(I&II)-wise distribution of the course structure

Paper code	Paper type	Title of the paper	Credits Assigned	Instructional hours per week
SEMESTER – I				
UGES-T-I	**Theory-I**	**Fundamentals of Environment**	**3**	**3**
UGES-P-I	**Practical-I**	**Fundamentals of Environment**	**2**	**4**
SEMESTER – II				
UGES-T-II	**Theory-II**	**Ecology and Environment**	**3**	**3**
UGES-P-II	**Practical-II**	**Ecology and Environment**	**2**	**4**

Curriculum Structure for Undergraduate Programme for 2024-25

(Course Structure, Scheme of Teaching and Evaluation - 2024-25)

Curriculum Framework for UG Programmes as suggested by KSHEC, Govt. of Karnataka

(As per G.O. No.: ED 166 UNE 2023, Bengaluru, dated: 08-05-2024)

Sl. No.	Subject Category	No. of Credits
1	Major Courses	90
2	Languages	24
3	Compulsory	12
4	Electives/Optional	04
	Total	130

Continuous Assessment Programme/Internal Assessment/Formative Assessment

Sl. No.	Continuous Assessment Programme/Internal Assessment	Maximum Marks
01	Two Session Tests with a proper record for assessment (5+5 = 10)	10
02	Assessment of Skill Development activities/Seminars/Group Discussion/ Assignment etc., with proper record	05
03	Attendance with proper record*	05
TOTAL MARKS		20

*** Attendance Marks-breakup**

<75% -00 Marks
75-80% - 01 Mark
80-85% - 02 Marks
85-90% - 03 Marks
90-95% - 04 Marks
>95% - 05 Marks

SEMESTER-I

UGES-T-I: PAPER-I: FUNDAMENTALS OF ENVIRONMENT

Course learning Objectives:

a. This course aims to provide students with a comprehensive understanding of the fundamental principles of environmental science, including the different types and segments of the environment, the dynamics of weather and climate, the causes and impacts of global climate change, and the key international policies and frameworks addressing climate change, emphasizing the role of individuals in promoting sustainability.
b. **Introduction of Environmental science-** is to introduce students to environmental science, covering its definition, scope, and the theoretical and applied aspects, while examining the key components and processes of the natural and artificial environments, including the atmosphere, hydrosphere, and lithosphere.
c. **Weather and Climate -** is to provide an understanding of weather and climate, including key meteorological parameters, solar energy dynamics, Earth's heat budget, major weather phenomena, and forecasting techniques.
d. **Greenhouse effect and global warming-**aims to educate students on the greenhouse effect and global warming, including definitions, impacts of major greenhouse gases, urban heat islands, global dimming, and carbon footprints. It also covers the extensive effects of climate change.
e. **Climate change and policy frame works**- focuses on global climate change policy frameworks and concepts of carbon credits, trading, and the Green Climate Fund, highlighting individual roles in advancing Sustainable Development Goals.

Course Outcome:

a. Students will gain insight into Earth's atmosphere, meteorology, pollution, gas emissions, airborne contaminants, and the dynamics of the atmosphere.
b. Understanding climate and its changes is crucial as it impacts people globally.
c. Analyzing atmospheric circulation and temperature can aid in modelling and predicting future conditions.
d. Climate change preparedness, or adaptation, involves minimizing the risks posed by climate change impacts on people, locations, and resources.

Unit-1: **12 Hours**

Introduction to Environmental Science: Definition and Scope. Theoretical and applied aspects of Environmental Science. Types of Environment - Natural and Artificial Environment.

Environmental segments: Atmosphere: Nature, origin and evolution of atmosphere. Atmospheric structure and composition. Hydrosphere- definition, Types and forms of precipitation, Bergeron process – Cloud formation and classification. Forms of condensation. Cloud seeding for artificial rain. Lithosphere: Definition. Internal structure of the earth.

Unit-2: **12 Hours**

Weather and Climate: Definition, scope and importance. Meteorological parameters - temperature, pressure, light, precipitation, humidity, wind speed & direction.

Nature of solar energy radiations, Insolation-Factors affecting the insolation, transfer of insolation – absorption, scattering. Reflectance, diffusion and transmission. Terrestrial radiation and heat budget of

the earth atmosphere. Monsoon Climates – Definition, Tropical cyclone-formation, structure, movement and path and its effects. Anticyclones -characteristics and origin. Thunder storms and tornadoes. Weather forecasting and modification, El Nino and La Nina effect. Indian monsoon climate.

Unit-3: **12 Hours**

Greenhouse effect and global warming: Definition, impacts, major greenhouse gases, sources and sinks of greenhouse gases; Urban Heat Islands; global dimming. Carbon foot print.

Impacts of global climate change-Increased surface mean temperature, vector borne/zoonotic diseases, forest fire, influence on agriculture, increase in floods and drought, loss of biodiversity and extinction of species, sea level rise. Climate change and food security. Vulnerable populations – The Kiribati story.

Unit-4: **12 Hours**

Climate change and policy frame works: Kyoto protocol 1997; United Nation Framework Convention on climate change (UNFCCC), The United Nations Conference on Environment and Development, Intergovernmental Panel on Climate Change (IPCC), Ministry of Environment, Forests & Climate Change (MoEF&CC), National Action Plan on Climate Change (NAPCC), Agenda 21, The Kyoto protocol, Paris agreement. Overview of Conference of Parties (CoP). Evolution of climate change negotiations. Copenhagen; Convention on climate change; carbon credit and carbon trading; Earth summit. Green Climate Fund. Role of individuals in achieving Sustainable Development Goals.

References:

1. Donn, W. L. (1971). The Earth: Our Physical Environment. John Wiley & Sons.
2. Turk, J., & Turk, A. (1984). Environmental Science. Saunders.
3. Eugen, E. D. (1983). Environmental Science. W.C. Brown Co.
4. Barry, R. G. (2003). Atmosphere, Weather and Climate. Routledge Press.
5. Mitra, S., Sharma, S., Bhattacharya, S., Garg, A., Devotta, S., & SenK. (2004). Climate Change and India. Universities Press.
6. Critchfield, H. J. (2004). General Climatology (4th ed.). Prentice-Hall India.
7. Siddhartha. (2005). Atmosphere, Weather and Climate. Kisalaya Publications Pvt. Ltd.
8. Lutgens, F. K., Tarbuck, E. J., & Taassa, D. (2012). The Atmosphere and Introduction to Meteorology (11th ed.). Prentice-Hall India.
9. Oppenheimer, M., O'Neill, B. C., Webster, M., & Agrawala, S. (Eds.). (2007). Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.
10. Philander, S. G. (2012). Encyclopaedia of Global Warming and Climate Change (2nd ed.). Sage Publications.
11. IPCC. (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

UGES-P: PRACTICAL-I

List of Practical:

1. Determination of pH in Rainwater Samples
2. Measurement of Humidity using Dry & Wet Bulb Thermometers
3. Measurement of Atmospheric Pressure using an Aneroid Barometer
4. Measurement of Wind Direction and Speed using a Wind Vane and Anemometer
5. Construction of a Wind Rose Diagram
6. Demonstration and Use of a Rain Gauge
7. Calculation of Mean Rainfall over a Drainage Basin using Thiessen's Polygon and Isohyetal Methods
8. Demonstration and Use of an Altimeter
9. Study and Analysis of Evaporation and Transpiration
10. Measurement of Solar Radiation
11. Measurement of Noise Levels in Different Localities
12. Visit to a Regional Meteorological Centre.
13. Weather Observation and Data Collection
14. Weather Forecasting Techniques.
15. Carbon Footprint Calculation.
16. Microclimate studies.

SEMESTER-II

UGES-T-II: PAPER-II: ECOLOGY AND ENVIRONMENT

Course Learning Objectives:

a. This course aims to provide a comprehensive understanding of ecology, covering fundamentals such as ecosystem types and structures, energy flow, food chains and webs, ecological pyramids, and productivity. It also explores major terrestrial and aquatic ecosystems, abiotic factors, ecological succession, biogeochemical cycles, population ecology parameters, and the concept of ecological niches, enhancing knowledge of ecosystem dynamics and environmental interactions.

b. **Fundamentals of Ecology** covers fundamental aspects of ecology, including ecosystem types and their structure, energy flow based on Thermodynamics laws, food chains, food webs, ecological pyramids and productivity. It also explores major terrestrial and aquatic ecosystems alongside crop land ecosystems.

c. **Abiotic factors and succession**-to explore how organisms respond to abiotic factors, including essential elements and limiting factors, and to understand the concept of ecological succession and the different types of ecological niches.

d. **Biogeochemical cycles-** to understand the biogeochemical cycles, including their types

e. **Population Ecology** seeks to grasp fundamental population parameters and dynamics, exploring the mechanisms that influence and regulate population sizes.

Course Outcome:

Upon completing this course, students will:

a. Gain a comprehensive understanding of ecology, covering ecosystem types, energy flow, food chains, webs, pyramids, and productivity, emphasizing terrestrial, aquatic, and crop land ecosystems.

b. Explore organism responses to abiotic factors, essential elements, and limiting factors. Understand ecological succession and different types of ecological niches.

c. Learn about biogeochemical cycles and their various types.

d. Develop a thorough understanding of population parameters, dynamics, and the mechanisms that regulate population sizes.

Unit-1: **12 Hours**

Fundamentals of Ecology: Definition, types of ecosystems. Structure and function of an ecosystem – abiotic and biotic components of an ecosystem. Energy flow – Laws of Thermodynamics in relation to energy flow. Food chain – Grazing, parasitic and detritus. Food web. Ecological pyramids - Pyramid of number, biomass and energy. Productivity - Primary secondary and net productivity. Bio-accumulation and Bio-magnification.
Major Ecosystem: Types and characteristics of Terrestrial ecosystem - Forest ecosystem, Mangrove, grassland, arid land, wetland, aquatic ecosystem-ponds, rivers, estuaries and Marine ecosystem. Crop land ecosystem.

Unit-2: **12 Hours**

Abiotic factors: Nature of response of organisms to abiotic factors. Essential elements and limiting factors; Liebig-Black Man Laws of limiting factors and Shelford's Law of Tolerance. Classification of organisms according to temperature tolerance and regulation. Thermal adaptation of plants and animals. Effect of light on plants and animals.
Ecological succession – Primary and Secondary succession – Natural and man-influenced succession, – Hydrarch and Xerarch. Ecotone and Edge effect; Ecotypes and Ecophenes; Ecological indicators. Ecological Niche: Concept and Types of niches

Unit-3: **12 Hours**

Biogeochemical cycles: Definition, types, organic and biotic phases of geochemical cycles; types of biogeochemical cycles, water cycle, gaseous cycle-the carbon cycle, the nitrogen cycle, oxygen cycle; sedimentary cycles - sulphur cycle and phosphorous cycle.

Unit-4: **12 Hours**

Population Ecology: Population definition, density, natality, mortality, life table, age distribution; age pyramids, sex ratio, biotic potential and environmental resistance; population growth rate, dispersion-emigration, immigration, migration and regulation of population size.

References:

1. Colinvaux, P. A. (1973). *Introduction to Ecology*. John Wiley.
2. Rolan, R. G. (1973). *Laboratory and Field Investigations in General Ecology*. Macmillan Co.
3. Michael, P. (1986). *Ecological Methods for Field and Laboratory Investigations*. Tata McGraw-Hill Publishing Co. Ltd.

4. Odum, E. P. (1983). *Basic Ecology*. Saunders.
5. Trivedi, P. K., & Goel, P. K. (1984). *Chemical and Biological Methods of Water Pollution Studies*. Environmental Publications.
6. Trivedi, R. K., & others. (1987). *Practical Methods in Ecology and Environmental Science*. Publisher.
7. Chapman, J. L., & Reiss, M. J. (2010). *Ecology: Principles and Applications* (2nd ed.). Cambridge University Press.
8. American Public Health Association (APHA), Water Environment Federation (WEF), & American Water Works Association (AWWA). (2017). *Standard Methods for the Examination of Water and Wastewater*. APHA– WEF.

UGES-P-II: PRACTICAL-II:

List of Practical:

1. Demonstration of Microscope
2. Observation and identification of Microscopic Flora and Fauna
3. Observation and Identification of Macroscopic Flora and Fauna
4. Study of Ecological Adaptations, Morphology, and Anatomy of Leaf and Stem of Hydrophytes
5. Study of Ecological Adaptations, Morphology, and Anatomy of Leaf and Stem of Xerophytes
6. Study of Ecological Adaptations, Morphology, and Anatomy of Leaf and Stem of Epiphytes
7. Study of Plant Community Using Quadrat Method to Calculate Frequency Percentage of Different Plant Species
8. Study of an Artificial Ecosystem
9. Estimation of Carbon Capture and Storage by Trees
10. Estimation of Primary Productivity of a Pond Using the Light and Dark Bottle Method
11. Estimation of Primary Productivity of Terrestrial Vegetation Using the Chlorophyll Method
12. Estimation of Primary Productivity of Grasses Using the Harvest Method
13. Determination of Water Turbidity Using a Sacchi Disc
14. Study of Physical Parameters of Pond and Lake Water (Color, Odor, Temperature, and Turbidity)
15. Visit to Social Forestry Areas/Urban Forestry.
16. Visit to Wildlife Sanctuaries or Forest Ecosystems.

THEORY EXAMINATION QUESTION PAPER PATTERN
(Semesters I –II)

B.Sc. Semester-I Degree Examination; 2024-25
(Semester Scheme; New Syllabus: 2024-25)

SUBJECT: Environmental Science

Paper –_____: _____
Paper Code: _____

Time: 3 Hours **Max. Marks: 80**

Instructions to candidates:

1) All sections are compulsory
2) Draw neat and labelled diagrams wherever necessary.

SECTION-A

1. Answer **all** the following questions: **(2×10=20)**

a)
b)
c)
d)
e)
f)
g)
h)
i)
j)

SECTION-B

Answer any **SIX** of the following: **(5×6=30)**

1.
2.
3.
4.
5.
6.
7.
8.
9.

SECTION -C

Answer **Any Three** of the following: **(10×3=30)**

10. From Unit-I
11. From Unit-II
12. From Unit-III
13. From Unit-IV

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QUESTION PAPER PATTERN FOR PRACTICAL EXAMINATION

Duration: 3 hours **Max. Marks: 40**

1. **Demonstrate or perform the Major experiment-A giving principle and procedure. Record the result. 15 Marks**

2. **Perform / demonstrate the Minor experiment-B giving principle and procedure. Record the result. 07 Marks**

3. **Write critical notes on C, D, E and F.**
   4x2=08 Marks

5. **Viva-voce 05 Marks**
6. **Record 05 Marks**

Chairman

(Prof. Yogendra K)
BOS in Environmental Science (UG)