Integral University, Lucknow
Department of Environmental Science

Effective from Session: 2024-2025							
Course Code	**B150101T/ES125**	**Title of the Course**	**Basics of Environmental Science**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**I**	**3**	**1**	**0**	**4**
Pre-Requisite	10+2	**Co-requisite**					
Course Objectives	This course provides students with a working knowledge of concept of environment and the relation between human and its relation with the environment.						

Course Outcomes

CO1	Gain knowledge about origin of life and related theories.
CO2	Learn fundamental concept of environmental science.
CO3	Develop the understanding about environmental education and able to understand the relationship between human and environment.
CO4	Understand the concept of sustainable development and SDG and also able to understand the current scenario of environmental degradation.
CO5	Learn the significance and importance of environmental management and have the practical knowledge about the affected areas of environment.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Evolution**	Origin of life and speciation, Darwinism and modern synthetic theory of evolution, Natural Selection; Biochemical basis of origin of life; Hardy Weinberg Equilibrium; Genetic drift.	8	CO1
2	**Concept of Environment**	Definition, Principles and Scope of Environmental Science; Environment, its components and segments; Moral and Aesthetic Nature of Environmental Science; Objectives and Historic roots of the subject; for Public Awareness.	8	CO2
3	**Environmental Education**	Goals of environmental education; Environmental Literacy, Environmental Careers, Environmental Justice, Individual Organisms, Environmentalism, Environmental Education at Primary, Secondary level.	6	CO3
4	**Man, and Environment:**	Man-Environment relationships; Impacts of human activity on environment (Agriculture, transportation, mining, urbanization, industrialization); Environmental Degradation and Conservation Issues, Modern concept of environmental conservation	8	CO3
5	**Sustainable Development**	Concept and Significance of sustainable development, Core elements of sustainable development, Over-view of SDG (Sustainable Development Goals).	6	CO4
6	**Current Environmental Issues**	Ill effects of fireworks and environmental degradation, Climate change and its effects on human health, Deforestation and its impacts on human communities and flora and fauna of the Environment.	8	CO4
7	**Environmental Management**	Significance of Environment Management, Resettlement and rehabilitation of project affected areas, Environmental ethics: Role of Indian's religions and cultures in environmental conservation, Communication and public awareness programs for environment management.	8	CO5
8	**Field Survey**	Assessment of impacts of anthropogenic activities in the surrounding environment; Evaluation of the consequences rising from agricultural and commercial logging practices to preserve environment, case study, Reclamation and monitoring of the affected area by developmental activities: case study.	8	CO5

Reference Books:

1. Environmental Science by William P. Cunningham and Mary Ann Cunningham; McGraw-Hill Publications.
2. Environmental Science: Earth as a Living Planet by Botkin and Keller; JOHN WILEY & SONS, INC
3. A text Book of Environment Studies, Asthana, D. K. and Asthana, M. 2006, S. Chand & Co.
4. Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. Atmosphere, Weather and Climate, Barry, R. G. 2003, Routledge Press, UK.
6. Environmental Science: S. C. Santra, New Central Book Agency.

e-Learning Source:

1. Environmental Science, Dr. Y. K. Singh, https://www.hzu.edu.in/bed/E%20V%20S.pdf
2. Textbook for Environmental Studies, Erach Bharucha, https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
3. Fundamentals of Environmental Studies, https://www.jkcprl.ac.in/download/11567250727.pdf

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-
CO5	2	1	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Department of Environmental Science

Effective from Session: 2024-2025							
Course Code	**B150102P/ES126**	**Title of the Course**	**Practical on Environment**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**I**	**0**	**0**	**4**	**2**
Pre-Requisite	10+2	**Co-requisite**					
Course Objectives	This course provides students with a working knowledge of Lab practices, environment and its relation with the human being, Meteorological parameters.						

Course Outcomes	
CO1	Students will be able to understand the good Laboratory Practices including Dos & DON'Ts in the laboratory.
CO2	Students will be able to learn interaction of human with environment.
CO3	Students develop understanding about local environmental problems and able to find remedy.
CO4	Gain knowledge about different meteorological parameters.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Good Lab Practices (GLP).**	i. Instructions ,ii. DOs and DON'Ts in the Laboratory iii. General Information,iv. Introduction	15	CO1
2	**Environmental Issues and Impacts**	Study the effects of environmental problem and its impact on human population.	15	CO2
3	**Plants/ Trees and Its Importance**	Choose five common species of Trees / plants from your near areas and list their common names. Describe each plant in terms of its height and leaves	15	CO3
4	**Weather Parameters measuring Devices**	To record the following parameters of weather monitoring station: a. Atmospheric Pressure, b. Rainfall, c. Outdoor, indoor temperature d.Wind speed and Direction e..Humidity & draw point	15	CO4

Reference Books:

1. Environmental Science: Earth as a Living Planet by Botkin and Keller; JOHN WILEY & SONS, INC.
2. A text Book of Environment Studies, Asthana, D. K. and Asthana, M. 2006, S. Chand & Co.
3. Atmosphere, Weather and Climate, Barry, R. G. 2003, Routledge Press, UK.
4. Environmental Science: S. C. Santra, New Central Book Agency.

e-Learning Source:

1. Good Lab Practices, https://youtu.be/YXl6MLvcGic; https://youtu.be/TADfGsai3Ro.
2. Indian Meteorological Department, Weather, https://mausam.imd.gov.in/imd_latest/weather_video/video.php.
3. Atmospheric Pressure, https://youtu.be/r7ZfzJ-yP3U; https://youtu.be/JQp63iUYSgU.
4. Anemometer, https://youtu.be/cWzGDEDVEgY; https://youtu.be/J5Eh6EU18Us;https://youtu.be/n5deIWQigrk.
5. Rain gauge, https://youtu.be/y6tyAy_MRv0; https://youtu.be/IU9CsbAkRbc.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow
Department of Environmental Science

Effective from Session: 2024-2025							
Course Code	**B150103T/ES127**	**Title of the Course**	**Environmental Chemicals and Toxicants**	**L**	**T**	**P**	**C**
Year	1st	**Semester**	I	**3**	**1**	**0**	**4**
Pre-Requisite	10+2 with Science	**Co-requisite**	None				
Course Objectives	1. To comprehend the basics of environmental chemistry in a precise and compact way. 2. To provide understating of various aspects of chemicals and chemistry, which are particularly valuable to environmental scientific practice. 3. During this course you student will study the chemistry of air, water, and toxic organic compounds. 4. To lay a foundation for understanding in specialized areas of environment management and practices. 5. To provide student with an understanding of the fundamental chemical processes that are central to important environmental problems.						

Course Outcomes	
CO1	Identify and evaluate the relative importance of various reactions, physical processes and transport mechanisms affecting different chemicals in the environment.
CO2	Apply quantitative problem-solving skills to questions in environmental chemistry.
CO3	Compare/contrast the composition and temperature profile as well as predominant types of reactions in different regions of the atmosphere.
CO4	Creating models to predict consequences for the environment.
CO5	To use chemistry knowledge to find the most suitable measures, management methods and industrial solutions to ensure a sustainable use of the earth's resources and ecosystem service.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Fundamentals of Environmental Chemistry**	Fundamental Concept & Scope of environmental chemistry, stoichiometry, Gibb's energy, chemical potential, chemical equilibria, acid base reactions.	8	CO1
2	**General Principles of Environmental Chemistry**	Pollutant, Contaminant, Receptor, Sink, pathways of Pollutant, Speciation, Dissolved Oxygen, Chemical Oxygen Demand, Biological Oxygen Demand, Threshold Limit Value, Elementary Idea on carbohydrates, Proteins & lipids.	6	CO2
3	**Chemical Accidents**	Bhopal gas tragedy (India), Love Canal tragedy (USA) etc.	6	CO2
4	**Atmospheric Chemistry**	Composition of Atmosphere, Particles, Ions and Radicals in the atmosphere, Chemical Processes for Formation of Inorganic Particulate Matter, Chemical Processes for formation of Organic Particulate matter, Chemical & Photochemical Reactions in the atmosphere.	8	CO3
5	**Aquatic Chemistry**	Properties of water, chemistry of water, concept of DO, BOD, COD, sedimentation, coagulation, filtration.	8	CO4
6	**Soil Chemistry**	Composition of Lithosphere/soil, water and air in soil, Inorganic and organic components in soil, Micro and Macro nutrients, Nitrogen Pathways and NPK in Soil.	8	CO4
7	**Environmental Chemistry**	Toxic chemicals in the environment, Impact of Toxic chemicals on Enzymes, Biochemical effects of Arsenic, Biochemical effects of Cadmium, Biochemical effects of lead, Biochemical effects of Mercury, Biochemical effects of Carbon Monoxides, Biochemical effects of Pesticides.	8	CO5
8	**Green Chemistry for Sustainable Future**	Reagents, Media, Special Importance of Solvents, Water the Greenest Solvents, Synthetic and Processing Pathways, Role of Catalyst, Biological Alternatives, Biopolymers, Principles and Application of Green Chemistry, Zero waste technology.	8	CO5

Reference Books:

1. Baird and Colin "Environmental Chemistry"
2. Bailey, Clark , Ferris, Krause and Strong "Chemistry of Environment"
3. Manahan, Stanley E. Fundamentals of Environmental Chemistry Boca Raton: CRC Press LLC,200

e-Learning Source:

1- https://www.futurelearn.com/courses/atmospheric-chemistry-planets-and-life-beyond-earth

2- https://inside.mines.edu/~epoeter/_GW/17WaterChem1/WaterChem1pdf.pdf

3- https://www.studocu.com/row/document/university-of-eldoret/soil-chemistry/soil-chemistry-notes-2nd-part/2253260

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO6	PSO7
CO1	2	1	1	1		2							2	2	2			
CO2	2	1	1	1		2							2	2	2			
CO3	2	1	1	1		2							2	2	2			
CO4	2	1	1	1		2							2	2	2			
CO5	2	1	1	1		2							2	2	2			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow
Department of Environmental Science

Effective from Session: 2024-2025							
Course Code	**B150104P/ES128**	**Title of the Course**	**Toxicant Analysis Lab**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**I**	**0**	**0**	**4**	**2**
Pre-Requisite	10+2 with Science	**Co-requisite**	NIL				
Course Objectives	1. Familiarize with the qualatiative determination techniques 2. Gain knowledge on detection methods and impacts of adulteration in edible items viz vegetable oil and milk.. 3. Understand the basics of air pollutants						

Course Outcomes	
CO1	To know the determination procedure of toxic adulterants present in vegetable oils.
CO2	Studants will be able to learn how to detect adulterant in milk sample.
CO3	To understand about the basics of air quality monitoring and particulate matter.
CO4	Students will be able to understand and obsrve the effects of air pollutants on plants.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Adulterant test of vegetable oil**	Determination of Argemone oil in cooking Vegetable oil	12	CO1
2	**Adulterant test of milk**	Detection of acids Detection of Formalin Detection of Ammonium Sulphate	12	CO2
3	**Methylene blue Reductase Test**	Methylene blue Reductase Test of milk	12	CO3
4	**Determination of air pollutants**	PM2.5 and PM10	12	CO4
5	**Effects of pollutants on plants**	To observe the gaseous pollutants SO2 on plants	12	CO4

Reference Books:

1. AMRITA, OLABS, Study of pollutants in Air.
2. AMRITA, OLABS, Studies on Turbidity, pH and Microbial Presence in Water.
3. AMRITA, OLABS, Study of pollutants in Air.

e-Learning Source:

1. https://www.acs.org/greenchemistry/what-is-green-chemistry/examples.ht
2. https://www.ysi.com/parameters
3. PM - Particulate Matter, https://youtu.be/ZUsNCq8acYM.
4. Monitoring methods for Air – PM, https://youtu.be/-uZURNKE4z8.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO6	PSO7
CO1	2	1	1	1		2							2	2	2	2		
CO2	2	1	1	1		2							2	2	2	2		
CO3	2	1	1	1		2							2	2	2	2		
CO4	2	1	1	1		2							2	2	2	2		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow
Department of Environmental Science

Effective from Session:2024-2025							
Course Code	**I150107T/ES131**	**Title of the Course**	**Introduction to Natural Hazard and Disaster Management**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**I**	**2**	**1**	**0**	**3**
Pre-Requisite	Basic science	**Co-requisite**	NIL				
Course Objectives	1. To impart basic knowledge of concept of Hazard, risk and vulnerability. 2. To understand types of hazards, their causes and impact. 3. Assessment of risk and vulnerability. 4. Acquiring knowledge about mitigation and preparedness to combat disaster. 5. To aware about role of government bodies in disaster management.						

Course Outcomes

CO1	Gain basic knowledge of concept of Hazard, risk and vulnerability.
CO2	Acquired knowledge of hazards its impact.
CO3	Understand about Assessment of risk and vulnerability related to disaster.
CO4	Formulate, organize and assess disaster Risk reduction activities and practice Disaster Management

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Concept of Disaster and Vulnerability**	Hazard and disaster -Concept; risk and vulnerability; Types of hazards-Natural hazards: hydrological, atmospheric & geological hazards, Causes of Earthquake, floods, cyclone, tsunami, landslides and drought.	10	CO1
2	**Impact of Disaster**	Global and National Perspective. Disaster profile of India, Case studies from Disasters, Large Hydro projects and its risks-Uttarakhand Dsisaster-2013.	10	CO2 CO3
3	**Disaster Management**	Component of Disaster Management-Preparedness and Mitigation, Phases of Disaster Management. Compensation and Insurance.	10	CO4 CO5
4	**Intervention of technologies**	Application of geoinformatics in hazard, risk & vulnerability assessment. Early warning System; PTWS & IMD.	10	CO5
5	**Disaster Risk Reduction**	Approaches to Disaster risk Reduction (DRR)- Role of public, education and media in DRR. Community Based DRR, International/National Humanitarian aid.	10	CO4
6	**Disaster Act. And Policies**	National Acts and policies for mitigating Disasters (Disaster Management Act 2005, National Policy for Disaster Management-2009, Institutional Framework for disaster management (NDMA, SDMA, SDMA &NIDM).	10	CO4

Reference Books:

1-Coppola D. P. 2007. Introduction to International Disaster Management. Butterworth Heinemann.

2-Cutter, S.L. 2012. Hazards Vulnerability and Environmental Justice. EarthScan, Routledge Press.

3-Keller, E. A. 2012. Introduction to Environmental Geology. Prentice Hall, Upper Saddle River, New Jersey.

4-Pine, J.C. 2009. Natural Hazards Analysis: Reducing the Impact of Disasters. CRC Press, Taylor and Francis Group.

5-Schneid, T.D. & Collins, L. 2001. Disaster Management and Preparedness. Lewis Publishers, New York, NY.

6-Smith, K. 2001. Environmental Hazards: Assessing Risk and Reducing Disaster. Routledge Press.

7-Wallace, J.M. & Hobbs, P.V. 1977. Atmospheric Science: An Introductory Survey. Academic Press, New York.

e-Learning Source:

1. https://www.researchgate.net/publication/323794760_Natural_Hazards_and_Disaster_Management
2. https://link.springer.com/article/10.1007/s11069-019-03677-2
3. https://ndmindia.mha.gov.in/images/public-awareness/Primer%20for%20Parliamentarians.pdf
4. SWAYAM MOOC, e-Skill India, Coursera, Udemy,NPTEL

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						2	2		-	-	-	-	3	2	2	1	1	-
CO2			2			2			-	-	-	-	2	2	3	1	1	-
CO3			2			2			-	-	-	-	1	3	2	1	1	-
CO4		3				2			-	-	-	-	1	3	1	3	3	-
CO5		2	2			2	2		-	-	-	-	1	1	3	3	3	-

3- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow
Department of Environmental Science

Effective from Session: 2024-2025							
Course Code	**I150108T/ES132**	**Title of the Course**	**Water Monitoring and Conservation Techniques**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**I**	**2**	**1**	**0**	**3**
Pre-Requisite	10+2	**Co-requisite**	Basic knowledge of water				
Course Objectives	The objective of this course is to impart knowledge of hydrology that deals with the occurrence, distribution, movement, and properties of water on the earth. The students will also be aware of different water quality standards for the application of water in different sectors. It is expected to give an exposure to students of social and natural sciences and humanities for better understanding of water resources, water economics, water governance and policy.						

Course Outcomes

CO1	Describe the role water plays in the lithosphere, hydrosphere, cryosphere, atmosphere, and biosphere, with emphasis on interactions between these reservoirs.
CO2	Apply the scientific method to investigations of hydrologic processes, Earth systems, and interactions among the various physical and biological realms utilizing standard scientific field and laboratory methods.
CO3	Plan water quality surveillance for a given aquatic environment and to understand what a test result means in terms of the health of the ecosystem. water quality and water quality criteria and standards, and their relation to public health, environment, and urban water cycle
CO4	Use their knowledge environment, research skills to current issues pertaining to water resources, management, and remediation, with emphasis on related economic, social, and public policy dimensions.
CO5	Analyze, interpret, and report on laboratory and field findings using appropriate statistical techniques and computer applications.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Introduction to water**	Origin of water on earth, Unique properties of water (Polarity, Cohesion, Density, Surface Tension, Viscosity, Heat capacity, Boiling and freezing points, Temperature, Taste, Odour, Colour). Importance of water in human civilization (Mesopotamian and Indus), Water catastrophes: Historical perspective and consequences, Water infrastructure and tools (Ancient, Medieval and modern).	9	CO1 &2
2	**Hydrology and hydrological cycle**	Concept and scope of hydrology, Hydrological cycle: Evaporation: Process, Factors effecting evaporation, Measurement of evaporation, Transpiration: process, Factors affecting transpiration, Condensation: Process and measurement, Precipitation: Process, Types and forms, Measurement and distribution,	9	CO, 2& CO5
3	**Water conservation Practices**	Rainwater harvesting methods, classes, benefits, approach, water saving technologies, rainwater harvesting and drought mitigation, crop productivity and water security. Concept and definition of watershed, importance of watershed management and its role in conservation of natural resources. Methods of irrigation - surface, subsurface, sprinkler, drip and pitcher. Reducing water losses, water resource in India, water budget in India, planning and optimum use of water resources.	11	CO2, 3 &5
4	**Water resources and sustainable development**	Water as a resource, Dublin-Rio Principles on Water and Sustainable Development, Brief account of concept of water stress, scarcity, water footprint and virtual water trade, Right to Water (SDG-6);Entitlements and criteria, Concept and overview of Water, Sanitation and Hygiene (WASH), Swach Bharat Mission and National Water Mission,	9	CO 2,3,4 &5
5	**Water Resource: Governance and Policy**	Water Governance: Elements and dimensions of water governance; Effective water governance schemes; Indicators of good governance. Water Governance in India: Salient features of National water policy 2012 and Jammu and Kashmir Water Resource (Regulation and Management) act 2010, Conflicts in Water Pricing: Conflicts on subsidy verses sustainability, overview of global water conflicts and interstate water conflicts in India.	11	CO4 & CO5
6	**Water Economics**	Valuing of water: The use and non-use values of water, Introduction to water valuation methods: Non- revenue waters (NRW) and unaccounted for water (UFW); Metering water uses; Water management through economic instruments. Water Pricing - Approach and Models: Significance of water pricing Water pricing models - flat rate and uniform rate, Brief account of water pricing practices in India and abroad.	11	CO5

Reference Books:

1. Standard methods for the examination of water and wastewater published by APHA 15th ed.
2. Keith, L.H. [Ed.] 1988 Principles of Environmental Sampling. American Chemical Society
3. Mays, L.W. 2006. Water Resources Sustainability. The McGraw-Hill Publications.
4. Schward and Zhang, 2003. Fundamentals of Groundwater. John Willey and Sons.
5. Souvorov, A.V. 1999. Marine Ecologonomics: The Ecology and Economics of Marine Natural Resource Management. Elsevier Publications. Vickers, A. 2001.
6. Handbook of Water Use and Conservation. Water Plow Press.
7. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment &Security. Stockholm Env. Institute, Oxford Univ. Press.

e-Learning Source:

SWAYAM, MOOC, e-Skill India, Coursera, Udemy, National Digital Library of India

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO4	PSO5	PSO6	PSO7
CO1		2			2		3				3		2
CO2	3		2					2	3	2		2	
CO3	2				2			2					2

CO4			3			2		2			2	3	
CO5	3				3	2					3		3

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Effective from Session: 2024-2025							
Course Code	**Z010101T/BE105**	**Title of the Course**	**Food, Nutrition and Hygiene**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**First**	**2**	**0**	**0**	**2**
Pre-Requisite	-	**Co-requisite**	-				
Course Objectives	To learn the basic concept of food, nutrition, hygiene, common diseases prevalent in society along with 1000 days nutrition concept.						

Course Outcomes	
CO1	To learn the basic concept of the Food and Nutrition, and meal planning.
CO2	To learn about macro and micronutrients and its RDA, sources, functions, deficiency, and excess.
CO3	To learn 1000 days Nutrition Concept and study the nutritive requirement during special conditions like pregnancy and lactation.
CO4	To study common health issues in the society and to learn the special requirement of food during common illness.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Concept of Food and Nutrition**	(a) Definition of Food, Nutrients, Nutrition, Health, balanced Diet (b) Types of Nutrition- Optimum Nutrition, under Nutrition, Over Nutrition (c) Meal planning- Concept and factors affecting Meal Planning (d) Food groups and functions of food	8	1
2	**Nutrients: Macro and Micro RDA, Sources, Functions, Deficiency and excess of**	(a) Carbohydrate (b) Fats (c) Protein (d) Minerals Major: Calcium, Phosphorus, Sodium, Potassium Trace: Iron, Iodine, Fluorine, Zinc (e) Vitamins Water soluble vitamins: Vitamin B, C Fat soluble vitamins: Vitamin A, D, E, K (f) Water (g) Dietary Fiber	7	2
3	**1000 days Nutrition**	(a) Concept, Requirement, Factors affecting growth of child. (b) Prenatal Nutrition (0 - 280 days): Additional Nutrients' Requirementand risk factors during pregnancy (c) Breast / Formula Feeding (Birth – 6 months of age) Complementary and Early Diet (6 months – 2 years of age)	8	3
4	**Community Health Concept**	(a) Causes of common diseases prevalent in the society and Nutrition requirement in the following: Diabetes Hypertension (High Blood Pressure) Obesity Constipation Diarrhea Typhoid (b) National and International Program and Policies for improving Dietary Nutrition. (c) Immunity Boosting Food	7	4

Reference Books:

1. Singh, Anita, "Food and Nutrition", Star Publication, Agra, India, 2018.
2. Sheel Sharma,Nutrition and Diet Therapy,Peepee Publishers Delhi,2014,First Edition.
3. 1000Days-Nutrition_Brief_Brain-Think_Babies_FINAL.pdf
4. https://pediatrics.aappublications.org/content/141/2/e20173716
5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5750909/

e-Learning Source:

1. https://www.udemy.com/course/internationally-accredited-diploma-certificate-in-nutrition

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)											
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	-	2	2	3	2	3	3	2	2	-
CO2	-	-	-	3	2	3	2	3	3	2	2	-
CO3	-	-	-	3	3	2	3	3	-	-	2	-
CO4	-	-	3	3	3	3	3	3	3	2	3	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Effective from Session: 2024-25							
Course Code	**A050101T/ HM101**	**Title of the Course**	**RASHTRA GAURAV**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**II**	**2**	**0**	**0**	**2**
Pre-Requisite	10+2	**Co-requisite**	None				
Course Objectives	The objective of the course on "Rashtra Gaurav" is to explore and critically analyze the multifaceted dimensions of national pride and glory, as depicted in the paper. Participants will delve into the historical, cultural, social, and political aspects that contribute to the concept of "Rashtra Gaurav" (National Pride) in the context of the specific themes and perspectives presented in the paper. Through in-depth discussions, readings, and interactive sessions, participants will gain a comprehensive understanding of the factors that shape and define a nation's sense of pride, and how these factors influence individual and collective identities. The course aims to foster a nuanced appreciation for the significance of "Rashtra Gaurav" in contemporary society, encouraging participants to critically evaluate its implications and applications within diverse global contexts.						

Course Outcomes	
CO1	To understand the basics of Indian Society and culture.
CO2	To analyze the fundamental issues in India.
CO3	To understand Indian Heritage.
CO4	To examine the philosophical and spiritual developments in India.
CO5	To evaluate the contributions of Major National Characters and Personalities.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Indian society & culture**	• Unity in Diversity • Art forms, Literature, Culture from Ancient to Modern time. • National and International Awards & Awardees	05	01
2	**Issues In India**	• Issues of Gender Equality and role of Women Organisations • Issues of Poverty and Development • Social Empowerment through Social Movements in India	05	02
3	**Indian Heritage**	• Cultural Heritage in India: Buddhist Monuments at Sanchi, Ajanta & Ellora Caves, Khajuraho, Taj Mahal • Tourist Places in India: Red Fort, Ambar Palace, Kaziranga National Park, Ram Mandir (Ayodhya)	04	03
4	**Philosophical and spiritual developments**	• Sufism & Bhakti Movement: Bulleh Shah, Data Ganj Baksh, Khwaja Moinuddin Chishti, and Nizamuddin Auliya.Tulsidas, Surdas, Meera, Nank & Kabir • Jainism: Mahavir's biography and education • Buddhism: The life of Buddha, Contributions of Buddhism to India's Culture	05	04
5	**Major national characters and personalities**	• Ashoka the Great and His Dhamma • Raja Ram Mohan Roy & Brahmo Samaj • Savitribai Phule: A Social Reformer and contribution in Women Education • Swami Vivekanand and his philosophies • Mahatma Gandhi: Role of Gandhi in Indian National Movement • Dr. Bhimrao Ambedkar: A Chief architect of the Indian Constitution	06	05

Reference Books:

1. Jawaharlal Nehru - "The Discovery of India"
2. B.R. Ambedkar - "Annihilation of Caste"
3. Ramachandra Guha - "India After Gandhi: The History of the World's Largest Democracy"
   Mahatma Gandhi – "My Experiment with Truth"
4. S C Dubey- "Indian Society"
5. Nadeem Hasnain – "Indian Society and Culture" G Shah- "Social Movements in India"

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)									
PO-PSO CO	PO1	PO2	PO3	PO4	P05	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	3	3	2	2	3	2	1	2
CO2	3	2	2	3	1	2	3	1	2	1
CO3	1	2	2	2	2	3	2	3	3	2
CO4	1	3	2	3	2	3	2	3	1	3
CO5	2	3	1	2	2	3	1	3	2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign and seal of HoD**

Integral University, Lucknow
Department of Environmental Science

Effective from Session: 2024-2025							
Course Code	**B150201T/ES133**	**Title of the Course**	**Environmental Biology**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**II**	**4**	**0**	**0**	**4**
Pre-Requisite	10+2 with Physics, Chemistry & (Maths/ Biology)	**Co-requisite**					
Course Objectives	This course introduces the basic principles of Environmental biology, ecology, and the relationship between humans and natural world. This major course is designed to provide students with a foundation in population, whole organism, evolutionary biology and environmental science as well as in chemistry and mathematic						

Course Outcomes

CO1	The student will be to understand the basic elements of ecology and environmental factors and ecosystem dynamics.
CO2	The course will lead the students understand the different functions played by ecosystem and its various positive and negative interactions with organisms.
CO3	Develop understanding about Evolutionary Theories, Ecological Succession and Taxonomy.
CO4	Ability to realize the usefulness of flora and fauna for pollution control mechanism.
CO5	Students will study about the growth of different types of microorganisms based on various environmental factors

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Ecology**	Introduction of Ecology (Definition, History, Branches and Scope). Basic principles of Environment and Ecology; Environmental factors (Abiotic and biotic) their importance and role.	8	CO1
2	**Ecosystem**	Components, Structure, and function of Ecosystem; Major ecosystems (terrestrial, aquatic, and marine); Trophic Levels, food chain and food webs; Energy flow in Ecological systems; Ecological Pyramids, Productivity.	8	CO2
3	**Autecology**	Population Characteristics- Dispersion, Density, Natality, Mortality, Age Structure, Population Growth; Human population & growth; Ecological niche and habitat; Positive and Negative Interactions of Populations.	6	CO2
4	**Synecology**	Community Structure, Growth Forms; Methods of Plant Community Analysis; Concept of Keystone Species, Ecotone, Ecotypes, Ecophene, ecological indicators; Ecological Succession.	8	CO3
5	**Biogeochemical Cycles**	Hydrological, Gaseous and Sedimentary Cycle- Carbon, Oxygen, Nitrogen, Phosphorus and Sulphur Cycles; Major biome of the world.	6	CO4
6	**Limiting factors of Environment**	Concept of limiting factors, laws of limiting factors – laws of minimum and tolerance, combined concept of limiting factors, Earth's carrying capacity	8	CO5
7	**Taxonomy**	Definition of taxonomy, Systematics, and classification; morphological and taxonomical studies of flora and fauna.	8	CO3
8	**Microbiology**	Basic concept on structures and functions of bacteria and viruses	8	CO5

1. Ecology and Environment: P.D. Sharma., Rastogi Publication.
2. Fundamental of Ecology: E. P. Odum,W. B. Sauders Company, USA
3. Ecology, 2nd Edition by Paul Colinvaux, Wiley.
4. Ecology: From Individuals to Ecosystems by Michael Begon & Colin R. Townsend & John L. Harper;Blackwell publishing.
5. Ecology: Theories and Applications (4th Edition) by Peter Stiling; Prentice Hall.
6. Textbook of Environmental Studies, Erach Bharucha, Orient longman Pvt. Ltd., Ernakulam.

e-Learning Source:

1. https://www.docsity.com/en/environmental-science-environmental-biology-lecture-notes/233205/
2. https://www.bdu.ac.in/cde/SLM/SLM_SAMPLE/BSc-Zoology.pdf
3. https://www.youtube.com/watch?v=I3WLJFXSbhw

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2											3	2				
CO2	3	3											3	2				
CO3	2	2											2	2				
CO4	3	3											3	2				
CO5	2	2											2	2				

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow
Department of Environmental Science

Effective from Session: 2024-2025							
Course Code	**B150202P/134**	**Title of the Course**	**Practical on Environmental Biology**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	II	**0**	**0**	**4**	**2**
Pre-Requisite	10+2 with Science	**Co-requisite**					
Course Objectives	This course provides an introduction to the basic laboratory principles. Furthermore, students will have hands on experience and perform laboratory work in identifying and analyzing different environmental problems related with air, water pollution, and environmental degradation.						

Course Outcomes	
CO1	The student will be to understand about Good Laboratory Practice (GLP).
CO2	Student will develop practical knowledge on Measurement of different soil parameters.
CO3	Be able to Illustrate abiotic/biotic interactions and symbiotic relationships
CO4	Develop knowledge on Preparation of Herbarium and its Documentation

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Good Laboratory Practices**	All Laboratory Rules and Regulations, Safety Precautions, Introduction to Laboratory Instruments, etc	15	CO1
2	**Soil Analysis**	To Study the NPK of soil samples using soil analysis Kit.	15	CO2
3	**Ecosystem**	Study of a simple ecosystem (Suggested habitats: pond, river, estuarine, grassland, forest and desert) and description of the biotic and abiotic components of the ecosystem	15	CO3
4	**Survey of Flora and Fauna**	1.Survey of vegetation in an area. 2.Survey of birds, insects and other animals in an area. 3.Preparation of Herbarium	15	CO4

Reference Books:

1.Muller-Dombols, D. and Ellenberg, H. (1974). Aims and Methods of Vegetation Ecology, Wiley, New York.

2. Odum, E.P. (1983), Basic Ecology, Sanders, Philadelphia.

3. Robert Ricklefs (2001). The Ecology of Nature. Fifth Edition. W.H. Freeman and Company.

4. Singh K.P. and J.S. Singh (1992). Tropical Ecosystems: Ecology and Management. Wiley Eastern Limited, Lucknow, India.

5. Singh, J.S. (ed.) 1993. Restoration of Degraded Land: Concepts and Strategies. Rastogi Publications, Meerut.

6. Smith, R.L. (1996). Ecology and Field Biology, Harper Collins, New York.

7. Botkin, D.B. and Keller, E.A. 2000. Environment Science: Earth as a living planet. ThirdEdition. John Wiley and Sons Inc.

e-Learning Source:

1. https://www.docsity.com/en/environmental-science-environmental-biology-lecture-notes/233205/
2. https://www.bdu.ac.in/cde/SLM/SLM_SAMPLE/BSc-Zoology.pdf
3. https://www.youtube.com/watch?v=I3WLJFXSbhw

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	1	2	3	1	1	-	-	-	-	-	1	3	1	3	1	-
CO2	3	1	1	1	1	1	1	-	-	-	-	-	1	3	1	3	1	-
CO3	1	1	1	1	3	2	1	-	-	-	-	-	2	1	1	2	2	-
CO4	2	1	1	1	2	3	1	-	-	-	-	-	1	2	3	1	1	-
CO5	3	1	1	2	3	1	1	-	-	-	-	-	3	3	3	3	3	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow
Department of Environmental Science

Effective from Session: 2024-2025							
Course Code	**B150203T/ES135**	**Title of the Course**	**Eco-Restoration and Invaded Ecosystems**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**II**	**4**	**0**	**0**	**4**
Pre-Requisite	10+2	**Co-requisite**	NONE				
Course Objectives	The aim of the course is to define the principles of ecological restoration and ecotourism and investigate the complex and dynamic interactions between humans and their environment. This advanced ecosystem management course will begin with an overview of the ecological basis for plant invasions in managed forests and terrestrial ecosystems, and then focus on methods for restoration of invaded and formerly invaded systems. Management tools and techniques for prevention, control, and restoration will be discussed, and plant invasions						

Course Outcomes

CO1	Be able to interpret and critically assess theories related to restoration ecology, biotic interactions, and ecological succession
CO2	Predict the issues related to the environmental ecosystem degradation and Eco restoration
CO3	Understand how to use modern tools, methods, and traditional knowledge to prevent and control plant invasions and to restore formerly invaded ecosystems.
CO4	Predict the issues related to the environmental ecosystem degradation and Eco restoration
CO5	Develop skills and demonstrate how to integrate ecological concepts into management efforts

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Restoration Concept**	Concepts of restoration, single vs. multiple endpoints; ecosystem reconstructions; physical, chemical, biological, and biotechnological tools of restoration. Various approaches to Restoration Ecology of Disturbed Ecosystems: disturbance and its impact on the structure and functioning of terrestrial and aquatic ecosystems.	8	CO1
2	**Restoration of Ecosystems & Biodiversity**	Ecology of Disturbed Ecosystems: disturbance and its impact on the structure and functioning of terrestrial and aquatic ecosystems. Restoration of biological diversity: Acceleration of ecological succession, reintroduction of biota. Restoration of contaminated soils and soil fertility, mine spoil restoration. Restoration in the context of Sustainability, Globalization and Sustainability	8	CO2
3	**Role of Local people, Organization, and collaboration**	Community participation in eco-restoration traditional sacred land restoration, water restoration its techniques, practices regulation concept of traditional knowledge and transmission and maintenance of traditional knowledge on eco restoration over generations, ecosystem services and human wellbeing, NGO's, educational, research institutions and other agencies.	8	CO3
4	**Eco restoration Ethics**	Ethics in Eco-restoration: virtue, utilitarian and deontological theories; Religion and ethics; Political ecology; Ownership and intellectual property rights; Codes of conduct.	6	CO3
5	**Invasion theories and mechanism**	Introduction, Theories and Mechanisms for Invasion, Dispersal Mechanisms, Dispersal Mechanisms, Biotic interactions (competition, facilitation, mutualism)	6	CO4
6	**Ecological Impacts following Invasion and Ecosystem reclamation**	Impacts to ecological processes (nutrient cycles), Impacts to ecological processes (fire and water), Impacts to plant communities (biodiversity vs saturation), Eco remediation techniques, general principles, bioremediation, phytoremediation in eco-restoration	8	CO4
7	**Management and Restoration of Invaded Ecosystems**	Management and Restoration of Invaded Ecosystems, Techniques for control I- Integrating plant biology into control, Restoration of invaded ecosystem I- restoring plant communities, Restoration of invaded systems II- restoring ecosystem function, Restoration of invaded systems II- case studies and efficacy, Invasive species management and restoration in a changing environment	8	CO5
8	**Case Studies**	Ecological Restoration of Lantana-Invaded. Landscapes in Corbett Tiger Reserve, Restoration of Lake Kukkarahalli in Mysore, Mangrove restoration, Land reclamation and restoration of natural ecosystem: a case study from opencast mines of northeastern Coalfields of India.	8	CO5

Reference Books:

1. Agarwal, A. N (1980) Indian Agriculture, Vikas publishing House, New Delhi,
2. Weaver, D. B (2001) The Encyclopedia of Ecotourism, CABI, Publishing, U.K.
3. Byrne, P. 1999. The Philosophical and Theological Foundations of Ethics. 2d ed. Palgrave Macmillan, London, UK.
4. https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000014ER/P000282/M027568/ET/1519296718Paper12_EM_Module28_etext.pdf
5. Sinha, P. C (2003) Encyclopedia of Ecotourism, Vol – I, II & III, Anmol publications Pvt. Ltd, New Delhi.
6. Ecological Restoration, Second Edition: Principles, Values, and Structure of an Emerging Profession (Society for Ecological Restoration) Paperback – Import, 28 February 2013 by Andre F. Clewell (Author), James Aronson (Author)
7. Google book: International principles and standards for the practice of ecological restoration. Second edition George D. Gann ,Tein McDonald ,Bethanie Walder ,James Aronson ,Cara R.Nelson ,Justin Jonson ,James G. Hallett ,Cristina Eisenberg ,Manuel R. Guariguata ,Junguo Liu ,First published: 04 September 2019,https://doi.org/10.1111/rec.13035

e-Learning Source:

1. SWAYAM
2. Virtual Labs
3. MOOC

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	1	1	3	2						3	3	3	2	1	-
CO2	3	2	2	1	1	3	2						3	3	3	2	1	-
CO3	3	2	2	2	2	3	2						3	3	3	2	1	-
CO4	3	2	2	1	1	3	2						3	3	3	2	2	-
CO5	2	3	1	1	1	3	2						3	3	3	2	2	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow
Department of Environmental Science

Effective from Session: 2024-2025							
Course Code	**B150204P/ES136**	**Title of the Course**	**Ecosystem Dynamic Lab**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**II**	**0**	**0**	**4**	**2**
Pre-Requisite	10+2	**Co-requisite**	None				
Course Objectives	This course provides knowledge about the various type of invasive species its establishment, area extent, influence of biotic and abiotic factor etc. Further, student will explore the advance tool and techniques of eco restoration of terrestrial and aquatic ecosystem.						

Course Outcomes	
CO1	To identify the invasive plant species.
CO2	Student will explore the landscape ecology in term of degraded area extant, population and community ecological changes.
CO3	To study about the ecological succession steps.
CO4	Students will explore the advance techniques for environmental monitoring.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Field visit**	Explore the invasive species in the focused area	15	CO1
2	**Landscape Ecosystem**	Identification of degraded areas/landscape/ecosystems Study the population and community ecology changes in the area	15	CO2
3	**Ecological Succession**	Specific areas of focus include effects of abiotic and biotic disturbances on vegetation and animals.	15	CO3
4	**Ecosystem Disturbance**	Identify the disturbing factors in and ecosystem viz. natural disasters, climate change, invasion, anthropogenic activities. To study about the forest fire area extent using environmental monitoring techniques namely RS and GIS, ecological methods, surveys, and ground studies	15	CO4

Reference Books:

1. Gardner, R.H., Robert,V., O'Neill, T.irner,M.G. 2001. Landscape Ecology in Theory & Practice. Pattern and Process. Springer-Verlag, USA
2. Agarwal, A. N (1980) Indian Agriculture, Vikas publishing House, New Delhi,
3. Bharucha, E. 2003. Biodiversity of India. The. Mapin Publishing, India
4. Egan,D. and Howell, E.A. (eds.) 2001. The Historical Ecoogy Handbook : A Restorationist's Guide to Reference Ecosystems. Island Press, Washington DC USA

e-Learning Source:

1. SWAYAM
2. MOOC
3. https://www.youtube.com/watch?v=3GfoRRxpVVA

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	1	1	1	3	2						2	3	3	2	1
CO2	3	2	2	1	2	3	2						3	3	3	1	1
CO3	2	1	1	1	1	3	1						3	3	3	1	1
CO4	3	2	1	1	1	3	2						3	3	3	1	3

2- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2024-2025							
Course Code	**B190103T/CH135**	**Title of the Course**	**Water Treatment and Analysis**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**I**	**3**	**1**	**0**	**4**
Pre-Requisite	10+2	**Co-requisite**	-				
Course Objectives	This course aims to familiarize students with the field of water and wastewater treatment. The course will cover sludge disposal, primary, secondary, and tertiary treatment processes; water chemistry; characteristics of water and wastewater; and the design of water and wastewater treatment plants; cleaner water production; and most favorable treatment technologies.						

Course Outcomes	
CO1	Identify the parameters that define the constituents of potable water and wastewater; demonstrate the fundamentals of water and wastewater treatment.
CO2	Able to explain the function and procedural procedures of important water treatment processes, such as coagulation, precipitation, chlorination, etc., used to improve water quality.
CO3	Understand the typical physical, chemical, and biological unit activities used in treatment procedures, and investigate the biological characteristics of water. The operating procedures of treatment systems to handle trash from homes and businesses are examined.
CO4	Students become aware of the potentially dangerous effects of waste on the environment and human health. A sense of sustainable environmental measures is developed via the evaluation of various corrective actions to quantify waste amount and strength.
CO5	To get rid of hazardous trash, awareness will be raised regarding waste generation, its effects, and mitigation techniques. The use of environmental audits in industries would result from keeping in mind their key components.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Industrial pollution**	Types of industries and industrial pollution; Characteristics of industrial wastes; Population equivalent; Bioassay studies; effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health; Environmental legislations related to prevention and control of industrial effluents and hazardous wastes.	6	1
2	**Purification of Water for Drinking Purpose**	Clarification, coagulation, contact & electro chemical coagulation, sterilization & disinfections of water, precipitation, aeration, ozonisation and Chlorination.	8	1,2
3	**Determination of Hardness and Softening Methods for Water**	Determination of hardness of water: Titration methods - complexometric method using EDTA. Water softening methods: lime soda process, permutit or zeolite process, Ion exchange process or demineralization of water, Desalination of water: elecrodiaysis and Reverse osmosis.	8	2,3
4	**Water Analysis**	Water analysis: sampling of water for analysis - chemical substances affecting potability - colour, turbidity odour, taste, temperature, pH and electrical conductivity. Analysis of solids present in water: suspended solids, dissolved solids, total acidity, alkalinity, free CO2, and free chlorine.	6	2,3
5	**Analysis of Chemical Substances Affecting Health**	Analysis of chemical substances affecting health: Ammonia, Nitrate, Nitrite, cyanide, sulphate, sulphide, chloride, fluoride. Analysis of chemical substances indicative of pollution: Dissolved oxygen, Bio Chemical oxygen demand (BOD), Chemical oxygen demand (COD).	8	4
6	**Bacteriological Examination of Water**	Bacteriological examination of water: total count test; E.coli test, E.coli index, most probable number method, Biological examination of water.	8	1,5
7	**Cleaner Water Production**	Waste management Approach; Waste Audit; Volume and strength reduction; Material and process modifications Recycle, reuse and byproduct recovery; Applications.	8	4
8	**Treatment Technologies**	Equalisation; Neutralisation; Removal of suspended and dissolved organic solids; Chemical oxidation, Adsorption Removal of dissolved inorganics; Combined treatment of industrial and municipal wastes; Residue management; Dewatering; Disposal.	8	1,5

Reference Books:

1. Chemical Thermodynamics by R.P.Rastogi et al
2. Principles of physical chemistry by Puri Sharma and Pathan
3. Essentials of Physical Chemistry, Bahl & Tuli, S. Chand & Co. Ltd.

e-Learning Source:

1. https://condorchem.com/en/industrial-wastewater-treatment/
2. https://www.chemicalprocessing.com/articles/2018/understand-industrial-wastewater-treatment/
3. https://www.encyclopedia.com/environment/encyclopedias-almanacs-transcripts-and-maps/industrial-waste-treatment

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)											
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	-	-	-	-	-	3	1	1	2	3
CO2	3	2	-	-	-	-	-	2	1	1	2	3
CO3	2	2	-	-	-	-	-	2	1	1	2	2
CO4	3	3	-	-	-	-	-	3	1	1	2	3
CO5	2	3	-	-	-	-	-	3	1	1	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2024-2025							
Course Code	**B190104P/CH136**	**Title of the Course**	**Water Quality Analysis**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**I**	**3**	**1**	**0**	**4**
Pre-Requisite	10+2	**Co-requisite**	-				
Course Objectives	Students will possess the practical, technical, communicative, and conceptual knowledge necessary to solve both qualitative and quantitative problems as well as transferrable abilities like the capacity to work both individually and in teams. They will also be able to work efficiently and safely in a laboratory environment.						

Course Outcomes	
CO1	To work effectively in the various domains of chemistry, keep records of all experiments you perform in the manner required in the lab. You should also be aware of the fundamental analytical and technical abilities needed.
CO2	Understand the basic titration methods and technical skills to work in the different fields of chemistry.
CO3	Able to evaluate water quality parameters like DO, BOD, COD, TDS and alkalinity.
CO4	Students should be aware of how to measure the amount of alkali in antacid tablets.
CO5	Analyze the chloride content in the water sample and also the percent chlorine in the bleaching powder sample.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Standard and buffer solution**	Preparation of standard solution related to normality & molarity. Preparation of buffer solution, pH measurement.	15	1,2
2	**Water quality parameters**	Estimation of hardness of water by EDTA. Determination of Dissolved oxygen (DO) in the given water sample. Determination of chemical oxygen demand (COD). Determination of Biological oxygen demand (BOD).	15	1,2,3
3	**Total dissolved solid and total alkali content**	Determination of Total dissolved solid (TDS) in the given water sample. Determination of alkali content in antacid tablet using HCl.	15	1,2,3,4
4	**Chloride content**	Determination chloride content in the given water sample. Determination the percentage of available chlorine in the given bleaching powder sample.	15	1,2,5

Reference Books:

1. Advance Practical Chemistry: Jagdamba Singh, L.D.S Yadav, Jaya Singh, I.R. Siddiqui, PragatiEdition.
2. Practical Organic Chemistry, A.I.Vogel.
3. Practical Physical Chemistry: B. Viswanathan and P.S.Raghavan.
4. Experimental Inorganic Chemistry –W.G.Palmer.

e-Learning Source:

1. https://www.fandm.edu/uploads/files/79645701812579729-genchem-reference-for-web.pdf
2. http://file.akfarmahadhika.ac.id/E-BOOK/12-1213-akfarmahad-16-1-vogelqu-d.pdf
3. https://faculty.psau.edu.sa/filedownload/doc-6-pdf-f06110ef2e1e1ae119cbacf71dd17732-original.pdf
4. https://www.stem.org.uk/resources/collection/3959/practical-chemistry
5. https://www.stem.org.uk/resources/collection/3959/practical-chemistry

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)											
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	-	-	-	-	-	-	3	2	1	2
CO2	2	1	-	-	-	-	-	-	2	2	2	2
CO3	3	3	-	-	-	-	-	-	3	3	1	3
CO4	3	2	-	-	-	-	-	-	2	2	1	2
CO5	3	3	-	-	-	-	-	-	3	2	1	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow
Department of Environmental Science

Effective from Session:2024-2025

Course Code	B150205T/ES137	Title of the Course	Natural Resources and its Management	L	T	P	C
Year	1st	Semester	II	4	0	0	4
Pre-Requisite	Basic science	Co-requisite	NIL				
Course Objectives	To be aware about different types of resources and its distribution. To understand sustainable exploration, use and conservation of different types of resources. To approaches to natural resource management and to maintain ecological diversity						

Course Outcomes

CO1	Students will be able to introduced and aware from different types of resources and its distribution.
CO2	Students will be able to analyze soil resources and how soil quality get affected by different factors/events.
CO3	Understand sustainable exploration, use and conservation of different types of mineral resources.
CO4	Students will be able to know about importance of water resources, Remedial Measures in conserving water resources.
CO5	The knowledge can be apply to prevent overexploitation, long-term measures for productivity and conservation resources.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1.	**Introduction to Natural Resources**	Resources and Reserves, Classification, and types of natural resources- Renewable and Non-renewable resources, Major Resources of India.	6	CO1
2.	**Soil Resources**	Soil Formation and soil degradation - Soil erosion, Soil Fertility, Role of organic matter and its significance in soil quality – Diagnosis of soil nutrient deficiencies, Green manuring, Animal manures and Composting -Wasteland development strategies	8	CO2
3.	**Mineral Resources**	Origin, distribution and types of minerals -Exploration of mineral resources, Impact of mining activities on environment - Conservation of mineral resources	8	CO3
4.	**Water Resources**	Potential of Water resource, Causes and impact of water scarcity, Integrated water resource management -Watershed management, Introduction to Wetland and its conservation Ecological significance of mangroves	8	CO4 CO5
5.	**Forest Resources**	Forest resources: Distribution, economic and ecological importance of forests, Deforestation: Cause & impact. Forest management Strategies, Afforestation &Reforestation	8	CO5
6.	**Renewable energy**	Current status and future prospect of Renewable energy, Solar Energy-Solar, Thermal Systems, solar cells, Hydro-power development, potential, Wind Energy, Tidal Energy, Ocean Thermal Energy Conversion (OTEC), Geothermal Energy, Energy from Biomass, Bio-Diesel	8	CO1 CO5
7.	**Non-renewable energy**	Oil-exploration, extraction and processing, Natural Gas: exploration, liquified petroleum gas, Coal: reserves, classification, extraction, processing, Environmental impacts of nonrenewable energy consumption.	8	CO1 CO5
8.	**Resource Conservation**	Approaches of natural resource conservation: ecological approach, economic approach, ethnological approach, integrated resource management strategies	6	CO5

Reference Books:

1. Craig, J.R., Vaughan. D.J. & Skinner. B. J. 1996. Resources of the Earth: Origin, use and Environmental Impacts (2nd edition). Prentice Hall, New Jersey.
2. Freeman, A.M. 2001 . Measures of value mid Resources. Resources for the Future. Washington DC.
3. Ginley, D.S. & Calien, D. 20.11.Fundamentals of Materials for Energy and Environmental .
4. Klee, G.A. 1991 . Conservation of Natural Resources. Prentice Hall Publication.
5. Dutta A (2001) Biodiversity and ecosystem Conservation. Kalyani Publisher, Kolkata.

e-Learning Source:

1. Nalini KS (1993) Environmental Resources and Management, Anmol Publications (P) Ltd., New Delhi. Nautiyal S and Kaul AK (1999) Forest Biodiversity & its Conservation Practices in India.
2. http://web.worldbank.org/archive/website00675/WEB/PDF/ENVST-18.PDF
3. https://www.researchgate.net/publication/294369522_Integrated_Soil_and_Water_Resource_Management_for_Livelihood_and_Environmental_Security
4. https://www.isric.org/utilise/global-issues/water
5. https://www.mdpi.com/journal/resources/special_issues/Mineral_Resource_Assessment_Mining_Processing
6. SWAYAM MOOC, e-Skill India, Coursera, Udemy,NPTEL

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						2	2		-	-	-	-	3	2	2	1	1	-
CO2			2			2			-	-	-	-	2	2	3	1	1	-
CO3			2			2			-	-	-	-	1	3	2	1	1	-
CO4		3				2			-	-	-	-	1	3	1	3	3	-
CO5		2	2			2	2		-	-	-	-	1	1	3	3	3	-

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD

Integral University, Lucknow
Department of Environmental Science

Effective from Session: 2024-2025							
Course Code:	**B150206P/ES138**	**Title of the Course**	**Natural Resources Lab**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**II**	**0**	**0**	**4**	**2**
Pre-Requisite	10+2	**Co-requisite**	Nil				
Course Objectives	This course provides students the knowledge and understanding of lab related to Natural Resource To understand estimation of particle size distribution of the soil. To know how to determine the specific gravity and moisture content of the soil.						

Course Outcomes

CO1	Able to explain and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goal
CO2	Gain practical knowledge about productivity and usage of forest resource.
CO3	Gain knowledge on analysis and interpretation of different physical properties of soil.
CO4	Able to monitor impact of developmental activities on natural resources

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Field Visit**	Visit to different reservoir of Natural Resource (River, Forest, mines etc.) field report submission based on the survey of local sites.	15	CO1
2	**Study of Forest**	Estimation of Forest Canopy Cover, Forest produce, Deforestation pattern	15	CO2
3	**Soil &Mineral analysis**	To diagnose Soil nutrient deficiency, Soil Horizon Measurements To study pore space, water holding capacity and bulk density of soil.	15	CO3
4	**Environmental Monitoring**	Environmental Impact Assessment of Hydro project/Mining sites Prepare a working model on Solar light, Rainwater harvesting system, Soil Profile	15	CO4

Reference Books:

1. Anne E. Magurran, Brian J. McGill (2011) Biological Diversity: Frontiers in Measurement and Assessment. Oxford University Press. ISBN: 978-0199580675.
2. Loreau, M. & Inchausti, P. 2002. Biodiversity and Ecosystem functioning: Synthesis and Perspectives. Oxford University Press, Oxford, UK
3. Pandey, P.N. (2017). Biodiversity Environmental Science Forestry, Narendra Publication house.
4. Rao K.S, K.S. Rao (1993). Practical Ecology. Anmol Publication, 190 pages
5. Singh, J. S. & Singh, S. P. 1987. Forest vegetation of the Himalaya. The Botanical Review 53:80-192.
6. Dane, J.H. & Topp, G.C. (2004). (eds) Methods of Soil Analysis: Part 4, Physical Methods. SSSA
7. Kaushik, Anubha and Kaushik, C.P. (2018) Perspectives in Environmental Studies.

e-Learning Source:

1. Study of soil pH, https://youtu.be/ViWCoeFwH9M.
2. Preparation of herbarium sheets, https://youtu.be/CK4vepuWzrM
3. Herbarium - CSIR-NBRI, https://youtu.be/6tJdvDzPzR8.
4. Primary productivity, https://youtu.be/9LpMskfUgz0.
5. Light-Dark bottle method, https://youtu.be/i5Tit4BgfIE.
6. AMRITA, OLABS, Study of Physical Properties of Soil. http://amrita.olabs.edu.in/?sub=79&brch=18&sim=235&cnt=1

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	-	1	-	1	2	2						2	2	2	2	2
CO2	1	1	-	-	1	2	2						2	2	2	2	2
CO3	2	1	-	-	-	1	2						2	1	2	2	2
CO4	2	-	-	-	-	2	2						2	1	1	2	2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	A070101T/SS 108	**Title of the Course**	Society in India: Structure, Organization & Change	**L**	**T**	**P**	**C**
Year	I[ST]	**Semester**	II[nd]	**5**	**1**	**0**	**6**
Pre-Requisite	Intermediate	**Co-requisite**	None				
Course Objectives	This paper is designed in this manner, so that students are introduced to the concepts related to Indian Society. They are made familiar with the Indian Society, its linkages and continuity with past and present. It also gives insights to analyze contemporary Indian society. This paper provides comprehensive understanding of Indian society.						

Course Outcomes	
CO1	To develop the understanding about the Indian Society and its structure
CO2	To Understand Indian society through different perspectives
CO3	Enhance Knowledge regarding Culture and Ethnicity
CO4	Learn about Tribal communities
CO5	Learn about Basic Social institutions
CO6	To understand Social Classes of Indian Society
CO7	Extend knowledge regarding Demography and Population
CO8	To understand about transformation of Indian Society

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	The structure and composition of Indian society	Village, Town, City, Rural Urban linkages. Unity and diversity in Indian society	07	CO1
2	Perspective to study Indian Society.	Ideological, Historical, Structural and Functional Perspective to study Indian Society	07	CO2
3	Cultural and Ethnic diversity	Diversities in respect of language, caste, region and religious beliefs and practices	08	CO3
4	Tribal Communities in India	Geographical distribution, Problem of Assimilation, Integration and Assertion, Backwardness and Under development in Tribe.	08	CO4
5	Basic Institutions of Indian society	Caste, Marriage, Religion, Class and Joint Family.	06	CO5
6	Social Classes in India	Agrarian-Rural, Industrial-Urban: The Middle Class; Exclusion and Inclusion, Backward classes, Dalits, Women	08	CO6
7	Population	Structure and dynamics, Demographic analysis ,Population explosion, Demographic theories, Population growth and control.	08	CO7
8	Change and Transformation in Indian Society	Factors affecting National Integration: Casteism and Politics of caste in India, Communalism and Politics of communalism, Naxalism	08	CO8

Reference Books:

Bose, N.K.1967:Culture and Society in India

Dube, S.C., 1958: India's Changing Villages

Karve, Irawati, 1961: Hindu Society: An Interpretation

Srinivas, M.N., 1963Social Change in Modern India

e-Learning Source:

IGNOU & Other centrally/state operated Universities / MOOC platforms such as "SWAYAM" in India and Abroad

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	1	3	1	1	1	3	1	1	3	3	3
CO2	3	1	2	1	2	2	1	3	3	3	1	3	3	3
CO3	3	-	-	2	1	2	1	3	3	3	-	2	3	3
CO4	3	1	-	3	3	-	2	3	3	3	2	-	2	3
CO5	3	2	2	2	2	1	2	3	3	3	3	2	2	2
CO6	3	-	3	3	3	2	3	3	3	1	3	-	3	3
CO7	3	-	3	3	2	3	3	3	3	3	3	-	3	3
CO8	3	-	2	3	2	3	-	3	3	3	3	-	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow
Department of Environmental Science

Effective from Session: 2024-2025							
Course Code	**I150208T/ES140**	**Title of the Course**	**Ecotourism & Wildlife Management**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**II**	**4**	**2**	**0**	**6**
Pre-Requisite	10+2	**Co-requisite**	NIL				
Course Objectives	To provide basic knowledge of Eco-Tourism. To provide knowledge of methods and data used for Interesting Eco-tourism. To provide knowledge of Impact of Eco-tourism. To provide knowledge of the concept of bioassay. To develop knowledge of Wildlife management.						

Course Outcomes	
CO1	Have an enhanced knowledge of Eco-tourism.
CO2	Be able to make connection and interrelations between data used for Interesting Eco-tourism.
CO3	Be able to explain Impact of Eco-tourism and their environment.
CO4	Be able to explain Wildlife Conservation and related problems.
CO5	Be able to describe Wildlife Management.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Introduction to Eco- Tourism**	Ecotourism – study history of tourism; identify various forms of tourism and evolution of ecotourism. Dimensions of tourism and essential conditions for tourism to occur. Differences between tourism components. Mass tourism versus ecotourism. Consumptive and Non-Consumptive Tourism.	08	CO1
2	**Interesting Eco-tourism**	- Places of interests of Ecotourism in India. Ecotourism in practice in important PA's of India- case studies of Periyar Tiger Reserve Keoladeo National Park, Kanha National Park and Jim Corbet National Park. Important Biosphere Reserves as ecological centre.	08	CO2
3	**Ecosystems study**	Study of different Ecosystems – Rain forest Ecotourism – Mountain Ecotourism – Polar, Islands and Coasts Ecotourism – Wilderness - Marine Ecosystem.	06	CO2
4	**Impact of Eco-tourism**	Impact of Ecotourism, Types and Degree of Impacts from Ecotourism activities– Ecotourism related organization. Positive and negative impact of Ecotourism, Responsible ecotourism, Impact of eco-tourism on Economy.	08	CO3
5	**Wildlife Conservation**	Wildlife conservation - Protected Areas Network in India - Goals of management, Strategies for planning.	08	CO4
6	**Factors influencing wildlife management**	Factors influencing wildlife management such as habitats, population, behaviour, food- habits health etc. Tools for data collection and analysis.	06	CO4
7	**Wildlife Management**	Wildlife Management process, elements of wildlife management in India. Role of local communities in Wildlife management.	08	CO5
8	**Wildlife conflicts**	Man-wildlife conflicts – Poaching of wildlife – Wild life conservation laws – The Wildlife (Protection) Act, 1972 (2002 amendment).	08	CO5

Reference Books:

1. Dasma RF (1968) Environmental Conservation Joh Wiley a nd Sons New York.
2. Mukherje N (2008) Ecotourism and s ustainable Development. Cybetech Publications, New Delhi.
3. Prabha Chandra (2003) Global Ecotourism Kaniskha Publishers, New Delhi.
4. Weaver DB (2001) The Encyclopedia of Ecotourism, CABI Publishing, UK.

e-Learning Source:

1. https://www.slideshare.net/chandikeehelamalpe/ecotourism-64745161
2. https://www.slideshare.net/ravindraprasad5/eco-tourism-42047943
3. https://www.slideshare.net/AndrewMyrthong/ecotourism-57238509
4. https://slideplayer.com/slide/6063870/
5. https://www.slideshare.net/apoorvkumar9277/wildlife-conservation-37245301
6. https://www.google.com/search?client=firefox-b-d&q=Wildlife+Management+ppt

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	2	2	2	1	-	-	-	-	-	2	2	2	2	2	-
CO2	3	2	2	2	2	2	1	-	-	-	-	-	2	1	1	2	2	-
CO3	3	3	2	2	2	2	2	-	-	-	-	-	2	2	1	2	1	-
CO4	3	3	3	2	3	2	2	-	-	-	-	-	3	3	2	3	1	-
CO5	2	2		2	2	3	1	-	-	-	-	-	2	3	3	2	3	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2024-2025							
Course Code	**Z020201/NS110**	**Title of the Course**	**First Aid and Health**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**II**	2	0	0	2
Pre-Requisite	10+2	**Co-requisite**	-				
Course Objectives	This course aims to educate fundamental and essential understanding of first aid and sex education.						

Course Outcomes	
CO1	Learn the skill needed to assess the ill or injured person and learn the skills to provide CPR to infants, children and adults.
CO2	Learn the skills to handle emergency child birth and learn the Basic sex education help young people navigate thorny questions responsibly and with confidence.
CO3	Learn the Basic sex education help youth to understand Sex is normal. It's a deep, powerful instinct at the core of our survival as a species. Sexual desire is a healthy drive.
CO4	Help to understand natural changes of adolescence
CO5	Learn the skill to identify Mental Health status and Psychological First Aid

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Fundamentals of First Aid-I	A. Basic First Aid • Aims of first aid & First aid and the law. • Dealing with an emergency, Resuscitation (basic CPR). • Recovery position, Initial top to toe assessment. • Hand washing and Hygiene • Types and Content of a First aid Kit B. First AID Technique • Dressings and Bandages. • Fast evacuation techniques (single rescuer). • Transport techniques. C. First aid related with respiratory system • Basics of Respiration • No breathing or difficult breathing, Drowning, Choking, Strangulation and hanging, • Swelling within the throat, Suffocation by smoke or gases and Asthma. D. First aid related with Heart, Blood and Circulation • Basics of The heart and the blood circulation. • Chest discomfort, bleeding. E. First aid related with Wounds and Injuries • Type of wounds, Small cuts and abrasions • Head, Chest, Abdominal injuries • Amputation, Crush injuries, Shock F. First aid related with Bones, Joints Muscle related injuries • Basics of The skeleton, Joints and Muscles. • Fractures (injuries to bones).	8	1,2
2	Fundamentals of First Aid-II	G. First aid related with Nervous system and Unconsciousness • Basics of the nervous system. • Unconsciousness, Stroke, Fits – convulsions – seizures, Epilepsy. H. First aid related with Gastrointestinal Tract • Basics of The gastrointestinal system. • Diarrhea, Food poisoning. I. First aid related with Skin, Burns • Basics of The skin. • Burn wounds, Dry burns and scalds (burns from fire, heat and steam). • Electrical and Chemical burns, Sun burns, heat exhaustion and heatstroke. • Frost bites (cold burns), Prevention of burns, Fever and Hypothermia. J. First aid related with Poisoning • Poisoning by swallowing, Gases, Injection, Skin K. First aid related with Bites and Stings • Animal bites, Snake bites, Insect stings and bites L. First aid related with Sense organs • Basic of Sense organ. • Foreign objects in the eye, ear, nose or skin. • Swallowed foreign objects. M. Specific emergency satiation and disaster management • Emergencies at educational institutes and work • Road and traffic accidents. • Emergencies in rural areas. • Disasters and multiple casualty accidents. • Triage. • Emergency Child birth	8	2.3
3	Fundamentals of Sex Education-I	Basic Sex Education • Overview, ground rules, and a pre-test • Basics of Urinary system and Reproductive system. • Male puberty — physical and emotional changes • Female puberty — physical and emotional changes • Male-female similarities and differences	7	4

		• Sexual intercourse, pregnancy, and childbirth • Facts, attitudes, and myths about LGBTQ+ issues and identities • Birth control and abortion • Sex without love — harassment, sexual abuse, and rape • Prevention of sexually transmitted diseases.		
4	Fundamentals of Sex Education-II	• Mental Health and Psychological First Aid • What is Mental Health First Aid? • Mental Health Problems in the India • The Mental Health First Aid Action Plan • Understanding Depression and Anxiety Disorders • Crisis First Aid for Suicidal Behavior & Depressive symptoms • What is Non-Suicidal Self-Injury? • Non-crisis First Aid for Depression and Anxiety • Crisis First Aid for Panic Attacks, Traumatic events • Understanding Disorders in Which Psychosis may Occur • Crisis First Aid for Acute Psychosis	7	5

Reference Books:

1. Indian First Aid Mannual-https://www.indianredcross.org/publications/FA-manual.pdf
2. Red Cross First Aid/CPR/AED Instructor Manual
3. https://mhfa.com.au/courses/public/types/youthedition4
4. Finkelhor, D. (2009). The prevention of childhood sexual abuse. Durham, NH: Crimes Against Children Research Center.
5. Orenstein, P. (2016). Girls and sex: Navigating the complicated new landscape. New York, NY: Harper.

e-Learning Source:

1. https://www.redcross.org/take-a-class/first-aid/first-aid-training/first-aid-online
2. www.unh.edu/ccrc/pdf/CV192. pdf
3. https://www.firstaidforfree.com/
4. https://www.coursera.org/learn/psychological-first-aid
5. https://www.coursera.org/learn/mental-health

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	-	-	-	-	-	2	-	-	2	1
CO2	1	3	-	-	-	-	-	2	-	-	3	3
CO3	2	3	-	-	-	-	-	3	-	-	2	2
CO4	3	2	-	-	-	-	-	1	-	-	3	3
CO5	3	3	-	-	-	-	-	3	-	-	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow
Department of Environmental Science

Effective from Session: 2024-2025							
Course Code	**B150207T/ ES139**	**Title of the Course**	**AI for Earth and Environmental Sciences**	**L**	**T**	**P**	**C**
Year	**1st**	**Semester**	**II**	**4**	**0**	**0**	**0**
Pre-Requisite	10+2	**Co-requisite**	None				
Course Objectives	The curriculum aims to provide environmental sciences students with the knowledge and skills to leverage artificial intelligence for advanced research, monitoring, and sustainable management of environmental resources. It's designed to address the growing demand for individuals with an understanding of both our changing climate and artificial intelligence, together with the business acumen to deploy that understanding effectively.						

Course Outcomes

CO1	Able to define AI and machine learning
CO2	Describe and apply AI methods covered in the course, including the basic concepts and the key algorithms
CO3	Describe pressing societal and environmental challenges, where AI has been successfully deployed to tackle them
CO4	Model societal challenges as mathematical problems that AI techniques can be applied to and recognize which AI techniques fit the problems
CO5	Gain insight into different application areas for AI and their different challenges

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Introduction to Artificial Intelligence**	History and evolution of AI, comparison of human and computer skills, Component of AI, Scope and significance in different domains, Ethical considerations in AI development and deployment, Intelligent Agent, logical agent. Problem-solving through AI: Defining the problem as a state space search, analyzing the problem, solving the problem by searching, informed search, and Uninformed Search	6	CO1 &2
2	**Machine Learning Basics**	Neural networks and deep learning, Supervised and unsupervised learning, Feature selection and engineering, learning from observation, and knowledge in learning. Natural Language Processing: Brief history of NLP, Text processing, Sentiment analysis, language translation, Early NLP system, ELIZA system, LUNAR system, General NLP system.	6	CO2 & CO5
3	**Applications of AI & ML**	Healthcare, Transport, Banking and finance, Security, Education, Robotics, Agriculture, E-commerce, poverty, homelessness, and social media, Using AI 'guardians' to save trees, reduce the carbon footprint of steel and energy waste reduction, Tackle poaching, smart agriculture, plotting clouds using computers, environmental sustainability (biodiversity, climate, water, forests), disasters, and climate change.	16	CO2 & 3
4	**Models development with AI**	Developing models/determining important variables within models for the studies of climate, biology, geography, genetics, and many other fields relevant in the Earth and Environmental Sciences. Python tutorials and individual Python assignments using real datasets for hands-on practice of the concepts and algorithms. AI project in the context of a societal or environmental domain.	17	CO 2,3,4 &5

Reference Books:

1. Pattern Recognition and Machine Learning, Christopher Bishop, Springer; 2006
2. An Introduction to Statistical Learning with Applications in R, Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, Springer, 2013.
3. Deep Learning, Goodfellow, I., Bengio, Y. and Courville A., 2016.
4. Applied Mathematical Programming. Bradley, Hax, and Magnanti (Addison-Wesley, 1977).

e-Learning Source:

1. SWAYAM MOOC e-Skill India Coursera Udemy National Digital Library of India
2. http://faculty.marshall.usc.edu/garethjames/ ISL/ISLR%20Seventh%20Printing.pdf
3. http://web.mit.edu/15.053/www/AMP.htm

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO- PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO4	PSO5	PSO6	PSO7
CO1		2			2		3					3		2
CO2	3		2						2	3	2		2	
CO3	2				2				2					2
CO4			3			2			2			2	3	
CO5	3				3	2						3		3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**