Department	FAST School of Computing (FSC)	**Semester**	Spring 2025
Course Title	Environmental Studies	**Course Code**	NS 2002
Program	BS (CS), BS (DS), and BS(SE)	**Credit Hrs.**	3
Instructor	Prof. Dr. Saman Shahid	**Email**	saman.shahid@lhr.nu.edu.pk
Course Objectives:	Computer and data scientists have been actively playing role in various environmental monitoring related to oceans, forests, farms, rivers and other natural sources through computational modeling techniques. Therefore, an interdisciplinary course "Environmental Studies" is designed for undergraduate computer science students, which covers physical, chemical, biological aspects of the environment. The basic objective of this is to familiarize the students with environmental changes, developments, natural sources, pollution, global warming, environmental hazards, alternative energy sources, environment's health impacts, etc. The students should be able to identify factors influencing our environment for monitoring, sustaining resources and developing mitigate management.		

Text Book(s)	**Title**	Environmental Science-Earth as Living Planet (9th Edition)
	Author(s)	*Daniel B. Botkin & Edward A. Keller*
	Publisher	© 2014 by John Wiley & Sons Inc.
Ref. Book(s)	**Title**	Environmental Science: Toward a Sustainable Future (13th Edition)
	Author(s)	*Richard T. Wright & Dorothy F. Boorse*
	Publisher	© 2014 Pearson
	Title	Environmental Science-Foundations and Applications
	Author(s)	*Andrews Friedland, Rick Relyea, David Courard-Hauri*
	Publisher	© 2012 W.H. Freeman and Company USA
	Title	Principles of Environmental Engineering & Science (3rd Edition)
	Author(s)	*Mackenzie L Davis & Susan J Masten*
	Publisher	© 2013 McGraw-Hill

A. Course Learning Objectives (CLOs):

CLO #	Course Learning Objectives (CLOs):
1	To learn issues of environment (population, sustainability, urbanization, material/waste management etc.) to identify the health impacts from pollution, environmentally transmitted infections, and toxics chemicals.
2	To learn the implementation and utilization of alternative (e.g. nuclear energy) & renewable energy (wind/solar/biofuels/ocean technologies etc.) sources to minimize the harmful impacts of non-renewable & pollution emission sources (coal & oil).
3	To describe the water pollution sources (acid mine, degraded surface/ underground water), and waster water treatments with land applications and to learn sources of indoor/outdoor air pollution, their emissions, & their control/mitigation, ozone depletion, acid rain, & atmospheric inversions etc.
4	To explain the causes and proxy records of climate change, global warming, greenhouse effect, atmospheric processes (e.g., Hadley cells, Milankovitch cycles), and feedback loops.

B. Program Learning Outcomes

For each attribute below, indicate whether this attribute is covered in this course or not. Leave the cell blank if the enablement is little or non-existent.

1. Academic Education:	To prepare graduates as computing professionals	✔
2. Knowledge for Solving Computing Problems:	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.	✔
3. Problem Analysis:	Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.	✔
4. Design/ Development of Solutions:	Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.	

5. Modern Tool Usage:	Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.	
6. Individual and Team Work:	Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings.	✔
7.Communication:	Communicate effectively with the computing community and with society at large about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.	✔
8. Computing Professionalism and Society:	Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.	
9. Ethics:	Understand and commit to professional ethics, responsibilities, and norms of professional computing practice.	✔
10. Life-long Learning:	Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.	✔

C. Relation between CLOs and PLOs

(CLO: Course Learning Outcome, PLOs: Program Learning Outcomes)

		PLOs									
		1	**2**	**3**	4	5	**6**	**7**	8	**9**	**10**
CLOs	1	✔	✔	✔			✔	✔			✔
	2	✔	✔	✔			✔	✔			✔
	3	✔	✔	✔			✔	✔			✔
	4	✔	✔	✔			✔	✔			✔

Week	**Course Contents**	**CLO#**	**Assessment Tool Plan** (tentative)
1	**Chapter 1:** Key themes in environmental science. Human population growth, sustainability and carrying capacity, global perspectives, an urban world, people and nature, UN 17 sustainability goals	1	Project/Presentation, Assignment 1
2	**Chapter 8:** Environmental Health, Pollution and Toxicology Environmental health, categories of pollutants and toxins, infectious agents, toxic heavy metals, organic compounds, HAAs, nuclear radiation, thermal pollution, particulates, asbestos, electromagnetic fields, noise pollution, & effects of pollutants	1	Quiz 1
3	**Chapter 14:** Energy-Some Basics Outlook for energy, energy efficiency, energy sources and consumption, fossil fuels and alternative energy sources, energy conservation, increased efficiency and cogeneration, building design, industrial energy, sustainable-energy policy, & integrated sustainable energy Management	2	Quiz 2, Assignment 1
4	**Chapter 16:** Alternative energy and the environment Solar energy, passive solar energy, active solar energy, solar thermal generators, solar energy and the environment, electricity from renewable energy into a fuel for vehicles	2	Sessional I
5	**Chapter 16:** Alternative energy and the environment Water Power, Hydropower Systems, Ocean Energy Technology, Wind Power and the Environment, Biofuels, & Geothermal Energy,	2	Sessional I
Sessional Exam - I			
6	**Chapter 17:** Nuclear energy and the environment Role of nuclear power plants in energy production, conventional nuclear reactors, nuclear energy and the environment, effects of radioisotopes on human health, radiation doses & health, nuclear power plant accidents, radioactive waste management, future of nuclear energy	2	Quiz 3, Sessional I
7	**Chapter 19:** Water pollution and treatment Biochemical oxygen demand (BOD), eutrophication, waterborne diseases, oil, sediment, acid mine drainage, surface water pollution, & groundwater pollution	3	Quiz 4, Final Exam
8	**Chapter 19:** Water Pollution and Treatment	3	Quiz 4, Final Exam

	Wastewater treatment (Primary, Secondary and Advanced), Chlorine Treatment, Land Application of Wastewater, & Water Reuse		
9	**Chapter 20:** The atmosphere and climate change Origin of global warming, 20th century methods to reconstruct past temperatures, discovery of continental glaciations and ice ages, sediments, tree rings, ice cores, corals, carbon 14, structure of the atmosphere, atmospheric processes: temperature, pressure and global zones of high/low pressure, energy and the atmosphere, Hadley cells, Milankovitch & solar cycles	4	Sessional II, Assignment 2, Final Exam
10	**Chapter 20:** The atmosphere and climate change Oceans and land impacts on climate, albedo effects, greenhouse effect and gases (co2, methane, chlorofluorocarbons, nitrous oxide), greenhouse gases and climate, oceans and climate change, climate change and feedback loops, & climate, & ocean conveyor belt	4	Sessional II, Assignment 2, Final Exam
Sessional Exam - II			
11	**Chapter 21:** Air pollution General effects of air pollution, air pollutants, criteria pollutants (sulfur dioxide, nitrogen oxides, carbon monoxide), acid rain, ozone and other phytochemical oxidants, high altitude (stratospheric) ozone depletion, particulate matter and ultrafine particles, lead, air toxics (hydrogen sulfide, hydrogen fluoride, mercury, volatile organic compounds, methyl isocyanate, benzene, & acrolein	3	Quiz 5, Final Exam
12	**Chapter 21:** Air pollution Urban air pollution-chemical & atmospheric processes, future trends for urban air pollution, controlling common pollutants of the lower atmosphere, air quality standards, indoor air pollution and sources, chimney effect, heating, ventilation, and air-conditioning systems, heating, ventilation, environmental tobacco smoke, radon gas, bick building syndrome, and controlling indoor air pollution	3	Assignment 3, Final Exam
13	**Chapter 23:** Materials management Mineral resources & reserves, impacts of mineral development, integrated waste management, reduce, reuse, recycle, municipal solid-waste management, onsite disposal composting, & incineration, Open dumps, sanitary landfills, hazardous waste, land disposal, alternatives to land disposal of hazardous waste, & ocean dumping	1	Project/presentations
14	Revision, presentations and self-assessment tests.		
Final Exam			

Teaching Methodology:
Lecturing, Presentations, Assignments, Demonstrations, and Report Writing.
Important Instruction:
Plagiarism is not tolerable in any of its form. According to HEC, the similarity index should be less than 19%.
Evaluation Criteria:

Assessment Tools	Weightage
Assignments/Project+ Presentation	10%
Quizzes	15%
Midterms (I+II)	15+15= 30%
Final Exam	45%

Grading Criteria: Relative Grading Scheme may be used to mark the final grades.