Subject Description Form

Subject Code	CSE1003
Subject Title	Introduction to Environmental Science and Engineering
Credit Value	3
Level	1
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide a basic understanding of the long-term impacts of engineering solutions on society and the environment and the causes of global environmental issues; 2. To teach students the basic skills needed to address environmental challenges and to design sustainable products and systems using advanced analysis methods; 3. To provide basic knowledge to enable students to turn community needs into practical engineering solutions.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) Define sustainability in relationship to development indexes; (b) Perform calculations involving conventional units utilized in engineering; (c) Solve basic equilibrium problems related to pH and solubility; (d) Prepare and solve mass balance equations to determine the impacts of pollutants on the environment; (e) Describe the impact of anthropogenic sources on water quality, air quality, and human health; (f) Describe the relationship between community sustainability, fossil fuel emissions, global climate change and environmental impacts; (g) Develop frameworks for conceptualizing complex and open system problems; (h) Describe the basic approach to material cycles when developing products and processes; (i) Cultivate creative and critical thinking, an ability to work independently, and the recognition of the need for and engagement in life-long learning; (j) Practice teamwork and take responsibility for shared activities

Subject Synopsis/ Indicative Syllabus	1. Sustainability, Engineering and Design (2 weeks) What is sustainable development; Definition of sustainability, Technical approach to quantify sustainability 2. Analyzing sustainability using engineering science (2 weeks) Natural biogeochemical cycles, Mass balance and system boundaries, Solubility, Henry's Law, Ideal gas law, Chemistry of natural systems, Equilibrium models, Environmental fate and partitioning of chemicals 3. Water quality impacts (2 weeks) Water crisis, Water quality parameters, Modeling the impact of water pollutants, Water treatment technologies 4. Impacts on air quality (2 weeks) Health effect of air pollutants, Estimating emission of air pollutants, Dispersion of air pollutants 5. The carbon cycle and energy balance (2 weeks) Climate change, The carbon cycle, Global energy balance, Greenhouse gases and effects, Carbon mitigation, capture and sequestration 6. Sustainable engineering (2 weeks) Footprint indicators of sustainability, waste management and materials life cycle, ecological design, biomimicry, stainability and green engineering 7. Introduction to life cycle analysis (1 week) Life cycle assessment framework, material flow analysis, embodied energy
Teaching/Learning Methodology	Lectures serve as a foundational teaching method to deliver theoretical knowledge and concepts related to sustainable practices in engineering and design. The lectures will be designed to engage students through a combination of multimedia presentations, case studies, and real-world examples, facilitating a deeper understanding of sustainability challenges and solutions. Tutorials will provide opportunities for students and lecturers to communicate and discuss any difficulties related to the course. In each tutorial, students will also be guided through problem-solving exercises, such as solving calculation questions and developing new mass balance equations. It will allow students to apply theoretical knowledge to real-world scenarios and retain new information. Assignments will require students to apply theoretical knowledge and practice some problem-solving exercises individually to develop essential skills as engineers. Independent study and associated reading allow students to engage in self-directed learning to deepen their understanding of the course materials.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed									
		a	b	c	d	e	f	g	h	i	j
1. Continuous Assessment	25%	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2. Examination	70%	✓	✓	✓	✓	✓	✓	✓	✓	✓	
3. Seminar Report	5%									✓	
Total	100%										

Students must pass the examination and achieve a passing overall score / grade to pass the subject.

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

1. Tutorials/assignments are designed to evaluate students' understanding and application of key concepts and strengthen the understanding of the application of basic physical sciences;
2. The mid-term and the final exams will provide a structured format to assess students' grasp of theoretical concepts and basic problem-solving skills individually.

Student Study Effort Expected

Class contact:	
▪ Lecturers / Tutorials	39 Hrs.
Other student study effort:	
▪ Reading and study	50 Hrs.
▪ Assignments	30 Hrs.
Total student study effort	119 Hrs.

Reading List and References

Textbook:

Bradley Striebig, Adebayo Ogundipe, Maria Papadakis, 1st Edition, *Engineering Applications in Sustainable Design and Development*, Cengage Learning, 2015.