MEC8102: Impact of Energy Generation on Environment

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	0	45	100	60	40	3

Course Description:

This course provides students with exposure to a wide range of current energy and energy-related environmental policies that foster the deployment of sustainable energy technologies fuels, and practices. The primary focus will be on environmental disasters due to energy consumption, and the conventions and protocols related to energy and environment.

Course Objective:

- To introduce the student to the global energy situation and the interactions between the human activities in the energy field and the environment.
- To describe the available management systems and tools as well as technical mitigation methods relevant to the energy field and applicable within the existing legal framework.

Course Learning Outcomes:

Upon successfully completing this course the student should be able to:

- Describe from an overall perspective the major energy conversion processes,
- Draw distinctions between applications in industrialized nations and developing countries.
- Present a first-order environmental impact statement and life cycle analysis for an energy-intensive industrial system.
- Perform a basic scenario analysis with an energy forecasting tool
- Conduct major environmental studies embodying the concepts and tools and including the assimilation of relevant technical, financial, and social aspects.

Course Outline:

Earth Energy Systems (6 Hours)

- Origin of the earth; Earth's temperature and atmosphere; Sun as the source of energy;
- Biological processes; photosynthesis; food chains; Energy sources:
- Classification of energy sources, quality and concentration of energy sources; Overview of world energy scenario;
- Fossil fuel reserves-estimates, duration, overview of Uganda's energy scenario, energy and development linkage.

Ecological Principles **(4 Hours)**

- Ecological principles of nature; Concept of ecosystems;
- Different types of ecosystems; ecosystem theories;
- Energy flow in the ecosystems; biodiversity

Energy Systems and Environment **(7 Hours)**

- Environmental effects of energy extraction, conversion and use;
- Sources of pollution; primary and secondary pollutants;
- Consequence of pollution growth; Air, water, soil, thermal, noise pollution
- Cause and effect; Causes of global, regional and local climate change;
- Pollution control methods; Environmental laws on pollution control.

Air Pollution **(3 Hours)**

- Sources and Effect - Acid Rain - Air Sampling and Measurement –
- Analysis of Air Pollutants
- Air Pollution Control Methods and Equipment
- Issues in Air Pollution control.

Solid Waste Management **(6Hours)**

- Sources and Classification; Characteristics of solid waste-Potential methods of solid
- waste Disposal; Process and Equipments for Energy Recovery from Municipal Solid Waste and Industrial Solid Waste.

Water Pollution **(4 Hours)**

- Sources and Classification of Water Pollutants
- Characteristics - Waste Water Sampling Analysis
- Waste Water Treatment and Monitoring compliance with Standards
- Treatment, Utilization and Disposal of Sludge.

Other Types of Pollution **(4 Hours)**

- Noise Pollution and its impact - Oil Pollution
- Pesticides - Radioactivity Pollution Prevention and Control

Pollution from Thermal Power Plants and Control Methods **(3 Hours)**

- Instrumentation for pollution control - Water Pollution from Tanneries and other Industries and their control

Sustainability **(3 Hours)**

- Global warming; Green House Gas emissions, impacts, mitigation; Sustainability;
- Externalities; Future Energy Systems; Clean energy technologies; United Nations Framework
- Convention on Climate Change (UNFCCC); Sustainable development; Kyoto Protocol; Conference of Parties (COP);; Prototype Carbon Fund (PCF).

Delivery Method

Include formal lectures (including those from Visiting Lecturers), case studies, tutorial exercises, practical demonstrations, directed learning and individual work

Practicals
Application of LEAP as a tool for energy and environment projection for theory and practical/tutorials **(10 Hours)**

Assessment

The method of assessment is by written examination and evaluation from case studies.

References

[1] Frank Kreith (1999), *Mechanical Engineering Handbook*, Environmental Engineering

[2] R E Hester, R M Harrison (1999) *Environmental Impact of Power Generation (Issues in Environmental Science and Technology)* Royal Society of Chemistry ISBN-13: 978-0854042500

[3] R. Giero and P. Stille (2004) *Energy, Waste and the Environment*: A Geochemical Perspective (Geological Society Special Publication) Geological Society of London ISBN-13: 978-1862391673

[4] Adrian Bejan , Peter Vadász , Detlev G. Kröger (1999) *Energy and the Environment (Environmental Science and Technology Library)* ISBN-13: 978-0792355960