MEC7232: Other Alternative Energy Resources

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
40	0	10	45	100	60	40	3

Brief Description

The course cover other forms of Renewable or alternative energy sources which are not the main focus of the other courses in this program. These are geothermal energy, Hydrogen, fuel cell, Oceanic and wave energy.

This course covers geothermal, wind, wave, tidal energy hydrogen and fuel cells. It addresses the potential for these resources towards contributing to energy mix within Uganda at the region at present and in future. The technologies for tapping the power and heat from the above resources and their respective applications will be clearly demonstrated. .

Course Objectives

- To equip students with advanced knowledge in all the other types of renewable energy other than solar energy and hydropower.
- To present the state-of-the-art technologies for tapping power and heat from these resources.
- To address the feasibility of harnessing power from any of the above resource types for Uganda and regional applications at present and future.

Learning Outcomes

- Students should be able to describe the mechanisms or processes used in obtaining the usable energy from wind, geothermal, tidal wave energy, fuel cells and ocean energy.
- Students should be able to estimate the power from wind and geothermal and other sources using basic techniques and tools.
- Students should have the skills on how to make integrated designs for harnessing energy from the above resources.

Course Content

Geothermal **(10 Hours)**

- Geothermal: Geophysics , Geochemical
- Regional Geothermal Potential;
- Dry Rock and Aquifer Analysis;
- Technology for Geothermal Resources;
- Applications: low and high temperature applications, power cycles
- Electricity generation

Wind Energy **(12 Hours)**

- Regional wind resources;
- energy from the wind; characteristics of wind;
- wind measurement and analysis (The Betz model and Raleigh wind distribution)
- Design of wind energy conversion systems
- Electricity generation; Water pumping,
- Environmental impact.

Wave Energy **(3 Hours)**

- Principle of wave energy
- Properties of deep water
- Wave characteristics
- Wave energy
- Economics and environment

Tide Power **(3 Hours)**

- The cause of tides
- Enhancement of tides
- Tidal flow power; tidal power range
- Tidal energy conversion systems
- Economic
- Environmental factors

Fuel Cell **(6 Hours)**

- Thermodynamics and electrochemical principles;
- Basic design, types, applications; Hydrogen;
- Electrochemistry of Fuel Cells; Fuel Cell Systems and Technologies;
- Hydrogen Production Technology; Hydrogen Storage;
- Fuel Cells in Transportation; Stationary and Mobile Fuel Cell Systems; Policies and Future Research and Development of Fuel Cell Technology;
- Power from waste

Ocean Energy **(3 Hours)**

- Ocean energy resources, ocean energy routes,
- Principles of ocean thermal energy conversion systems,
- ocean thermal power plants,
- Principles of ocean wave energy conversion

Wave Energy **(3 Hours)**

- Wane motion;
- wave energy and power; wave patterns;
- devises
- Economic and environmental factors.

Delivery Method

The teaching of students will be conducted through lectures, tutorials, short classroom exercises, case studies, group discussions among the students and projects aimed at solving real life problems.

Assessment Method

Assessment will be done through coursework which will include assignments, class room and test and written examination. Course work will carry a total of 40% and written examination carries 60%. Coursework marks will be divided into; Assignments 5%, Tests 10% and Practical Work 25%.

References

1. W.J. Minkowycz and E.M. Sparrow,(2001) Advances in numerical heat transfer, Taylor & Francis Books, 2001.
2. Leon Douglas Smoot & Philip J. Smith (1985), Coal Combustion and Gasification, Springer, 1985