

EMS717U/EMS717P

Renewable energy sources

Aims of the course:

appreciation of the global energy scene and the impacts of energy production and consumption on the environment.

understanding of the origin and nature of various renewable/sustainable energy sources, to enable the assessment of their ability to meet our future energy demands.

Learning Objectives:

On completing the course students will

- (1) be aware of the origins and nature of renewable energy sources.
- (2) understand in detail the technological processes involved in exploitation for use of renewable energy sources including process cost and efficiency.
- (3) be able to evaluate both positive and negative environmental impacts as a result of use of renewable energy sources.
- (4) be aware of the relative merits and limitations of renewable energy sources so as to address their role in meeting energy demands both on a local and a global scale.

Syllabus

1. *Introduction*. Global energy scene past and present.
2. *Origins of renewable energy sources*.
3. *Thermodynamics*. Energy conversion, efficiency.
4. *Building energy efficiency*.
5. *Wind power*. Wind characteristics, wind turbines, wind power.
6. *Solar energy conversion*.
7. Hydro and wave energies
8. *Non solar renewables*. Geothermal and tidal energies.
9. *Alternative energy conversion*. Fuel cell technologies.
10. *Sustainability of resources*. Renewable energy global demands, forecasting future energy requirements, balancing economic and environmental considerations, future policies and integrated energy solutions.

Recommended books

Renewable Energy, B Sorensen, Academic Press.

Introduction to Environmental Engineering and Science, G M Masters, Prentice Hall.

Renewable Energy, G Boyle, Oxford University Press.

Energy Systems and Sustainability, G Boyle, B Everett, J Ramage, Oxford University Press

Sustainable Energy – without the hot air, David JC Mackay, UIT Cambridge, free available online

Contents

Global energy scene past, present and future

Climate change and global warming

Global energy demand and supply

Ways to tackle the challenges

Renewable energy sources

Developments of energy conversion technologies

Environmental, economic, social impacts

Policies and regulations

Schedule

Week1: Introduction: Global energy scene past, present and future

Week2: Thermodynamics of energy conversion

Week3: Geothermal energy

Week4: Building energy efficiency 1

Week5: Building energy efficiency 2

Week6: Solar energy/solar radiation flux

Week8: Solar thermal systems/ solar energy as biomass

Week9: Wind energy

Week10: Hydro, tidal and wave energies

Week11: Solar photovoltaic technology

Week12: Fuel cell technology

Assessment

Coursework: 50% of module

Exam: 50% of module, in January examination period