REM master basic syllabus

Title:
NE6013: Sustainable Energy

Credit value:
5ECTS

Mandatory/Optional:
Mandatory

Semester:
1

Lecturer/s:
Dr. Hannah Daly

University:
University College Cork

Department:
Energy Engineering

Rationale:
This module introduces students to the concept of sustainable energy, quantifying impacts of the energy system on human development, climate change, air pollution, energy security and energy poverty. It also introduces energy policy and long-term scenarios for the global energy system.

Objectives:
1. To introduce the concept of sustainable energy and the interaction between cost competitiveness, security of supply and environmental responsibility.
2. To make students aware of the link between energy and the environment, with a particular focus on climate change, air pollution and energy access.
3. To provide students with the basic tools to assess energy trends and their policy implications.
4. To introduce the topics of energy policy and economics.
5. To introduce energy efficiency and renewable energy sources and technologies.

Skills: *(according to the list of skills provided)*

Subject skills	REM Master Skills						
	L2.1	**L2.2**	**L2.3**	**L2.4**	**L2.5**	**L2.6**	**L2.7**
L3.1. Analyse energy supply and consumption trends.	X					X	X
L3.2. Discuss the impact of policy decisions on energy trends.	X	X			X	X	X
L3.3. Quantify energy related environmental impacts, focussing on climate change.	X		X		X	X	X
L3.4. Apply knowledge of energy to quantify impacts on energy trends.	X				X	X	X
L3.5 Compare renewable energy environmental impacts with fossil fuels.	X	X			X	X	X
L3.6. Explain different facets of security of energy supply.	X	X	X			X	X

Teaching and learning methods:

The teaching method is based on a series of lectures where the lecturer explains the main concepts through interactive power point presentations and worked out examples on the board. The students are also presented with a variety of issues of practical nature during the lectures. To support the learning process part of the modules covers tutorial-like sessions where the students are put to the challenge of working together and addressing problems of slight higher technical complexity.

Allocation of student time:

	Attendance (classroom, lab,…)	**Non attendance (lecture preparation, self study…)**
Lectures	24	8
Tutorials	12	0
Assignment + private study	0	64

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Assessment:

Formal written examination (70%). Continuous Assessment (30%) – mixture of coursework assignments and tutorial problem sets.

Assessment Matrix:

Subject skills	**Assessment method**					
	Exam	**Coursework**				
All	70%	30%				

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Programme:

Each "lesson" covers one week of material – broadly 2h lectures, 1h tutorial/assignment work.

Lesson 1	***Historical energy transitions; definition of sustainable energy; Introduction to energy systems;***
Lesson 2	***The outlook for global energy demand under existing policies; energy balances***
Lesson 3	***Climate change – science, impact and mitigation; sources of GHG emissions; global and per-capita carbon budgets***
Lesson 4	***Sustainable Development Goals and the role of energy; energy access, poverty and affordability***
Lesson 5	***Air pollution and energy links***
Lesson 6	***Energy security***
Lesson 7	***IEA Sustainable Development Scenario – Systems analysis of sustainability – sustainability indicators*** ***Understanding sustainability with Kaya identity***
Lesson 8	***Market development and prospects for renewable electricity, nuclear electricity and hydrogen***
Lesson 9	***Energy Efficiency – market and behavioural barriers to change – energy innovation***
Lesson 10	***Policy instruments – carbon tax, mandates and standards. Global agreements and targets***
Lesson 11	***EU policies and targets. Irish policy context – Climate Action Plan***

Resources:

A classroom, equipped with a blackboard and audio-visual resources, for the lectures. A room with flexible desk space for tutorials.

Bibliography:

Tester, Drake, Driscoll et. Al., 2005. Sustainable Energy, Choosing Among Options. MIT Press.

IEA, 2019. World Energy Outlook. Paris, France.

OECD, 2019. World Energy Balances, Paris, France.

Boyle, Everett, Ramage. Energy Systems and Sustainability. The Open University.

Further comments: