

## MODULE INFORMATION SHEET

<b>Name of Module Unit</b>	<b>Alternative energy sources</b>
Name in polish language	Alternatywne źródła energii
Module type	compulsory / elective
Form of studying	full-time day courses
Level of study	graduate course (M.Sc. level)
Type of study ( for extra-mural courses)	-
Programme	Environmental Engineering
Speciality	Environment Protection Engineering
Responsible department	Chair of Environmental Protection and Management
Responsible person	Prof. dr hab. inż. Lech Łobocki

Semester	Lectures(E)	Tutorials	Laboratory	Computer Exercises	Projects	ECTS
4	15				30	3

### Learning outcomes (knowledge, skills, competences)

Students will gain general knowledge on the current status and perspective of alternative energy production and use, and familiarize with selected technologies. They will master skills in estimation of power production potential in selected technologies (such as wind power potential, insolation, etc.), siting procedures, and familiarize with certain aspects of design and management.

### Prerequisites

Environmental Physics; Meteorology

### Rules for integrated grade setting

Final exam 60%, assignments 40%

### Recommended readings

Due to rapid development in this field, lists of recommended reading for individual topics is provided through the course website and updated for each course.

## Contents of lectures (syllabus)

	Topics	Time (hrs.)	Scope (S / Ex)
1	Introduction: needs for alternative energy sources, classification of alternative energy sources, current and projected energy demands, development scenarios	1	S
2	Wind power: advantages and shortcomings of wind power, wind climatology, wind turbines and their characteristics. Environmental and economic aspects of wind energy production. Principles of estimating the wind power potential for siting purposes.	2	S
3	Solar power: solar energy resources and its availability. Solar & terrestrial radiation basics. Conversion methods. Solar collectors, concentration solar plants, photovoltaic cells – characteristics of individual technologies, technological, economic and environmental aspects. Principles of estimating energy production.	2	S
4	Energy storage. Electrochemical batteries, capacitors, mechanical devices. Hydrogen as energy storage mediums, hydrogen production and storage, fuel cells. Technological, economic and environmental aspects of energy storage.	2	S
5	Nuclear power: resources, technological potential, current status of nuclear power production. Basic concepts, nuclear fission and radioactive decay, fuels and reactions, reactor types. Economic cost, environmental issues and nuclear safety concerns.	2	S
6	Geothermal power: resources, exploitation methods, technologies. Limitations, economic and environmental aspects.	2	S
7	Energy form solid waste. Incineration of solid waste and fuel from solid waste. Landfill gas extraction and utilization. Biogas from digestion of organic waste.	4	Ex
<b>Total</b>		<b>15</b>	<b>hours</b>

S – topics listed in the legal study programme standards from 12.07.2007

Ex – extended topics

### Lecturers

Prof. Lech Łobocki, dr inż. Piotr Manczarski

### Assessment method

Examination

## Contents of guided projects

	Topics	Time (hrs.)	Scope (S / Ex)
1	Estimating the wind power potential for turbine siting using routine meteorological data	10	S
2	Estimation of the energy production of a solar installation (collector, photovoltaic cell battery)	12	S
3	Estimation of the energy potential of biogas extracted from landfill site	8	Ex
<b>Total</b>		<b>30</b>	<b>hours</b>

S – topics listed in the legal study programme standards from 12.07.2007

Ex – extended topics

**Persons responsible for guided projects**

Dr inż. Małgorzata Zdunek, dr inż. Piotr Manczarski

**Assessment method for guided projects**

Assignment report grades, current progress, timely completion of assignments