

# WIND ENGINEERING

(Specialization Environmental engineering, 4<sup>nd</sup> Year of study, 2<sup>st</sup> Semester)

**Credits (ECTS): 2**

**Course category: mandatory**

**Course holder: Assist. Prof. Georgiana-Diana GABUR, PhD**

## Objectives of the discipline:

The subject aims to acquire basic knowledge of the operating principles of the main wind and solar energy technologies.

Specific objectives:

- Forming the knowledge base necessary to understand and operate with specific wind engineering concepts.
- Identifying and assessing the potential of renewable sources.
- Assimilation of theoretical and practical knowledge on the establishment, design, sizing and verification of the main alternative energy systems.
- Analyze and evaluate the functional parameters and performance indicators of equipment and installation systems under given operating conditions.
- To train the ability to identify, formulate and explain the problems specific to the field of the discipline with the possibility of detecting technical non-conformities and functional and energy rehabilitation/modernization needs.

## Contents (syllabus)

Course (chapters/subchapters)
1. Introduction. What is renewable energy? Basic concepts: standard energy = electricity, renewable energy, industrial revolution, CO <sub>2</sub>
2. Wind energy: categories of wind, wind turbines, stages of installing a wind farm, energy production and efficiency, wind farms
3. Basic components of wind turbines.
4. Conversion of wind energy into mechanical and electrical energy. Estimates and limitation.
5. Impact of wind energy production on environmental factors.
6. Wind energy utilization in the EU and Romania: current situation, perspectives and challenges.
7. The sun - the main source of energy for mankind: physical characteristics of the sun, electromagnetic waves, solar constant, solar spectrum
8. Solar energy capture: photovoltaic cell: applications of photovoltaic cells
9. Solar thermal converters for individual use: structure, components, types of collectors. Concentrator solar thermal converters: overview, realizations.
10. Water energy. Basic concepts: hydro, wave, marine current energy. Geothermal energy. Basic concepts: methods of geothermal energy extraction, utilization of geothermal energy.
11. Biomass: biodiesel, bioethanol, biogas
12. Energy - reserves, consumption, alternatives
Practical activity
Presentation of the content of the project, rules, project presentation and drafting

Chap.1. Introduction Chap.2. Renewable energy sources Chap.3. Natural energy production
Chap.4. Wind turbine design 4.1. Location and access to turbines 4.2. Wind turbine structure
4.2.1. Rotor hub 4.2.2. Blades 4.2.3. Nacelle 4.2.4. Pylon 4.2.5. Main (low speed) shaft; 4.2.6. Gear-wheel speed multiplier; 4.2.7. Braking device; 4.2.8. High-speed shaft; 4.2.9. Electric generator; 4.2.10. Electric generator cooling system; 4.2.11. Pivoting system; 4.2.12. Girth wheel; 4.2.13. Anemometer; 4.2.14. Controller.
Chap.5. Environmental impact in the design and use phase Chap.6. Conclusions
Project submission, final evaluation

## Bibliography

1. Baican R., 2010 – *Energii regenerabile*, Ed. Grinta, Cluj-Napoca.
2. Bălan M.C., 2007 - *Energii regenerabile*. Editura U.T. PRESS Cluj-Napoca.
3. Burlacu G., 2010 - *Studii de ecologie și de protecția mediului*, Ed. Paideia, București.
4. Drăgan V., Burchiu V., 2012 - *Energiile regenerabile și utilizarea acestora*, Ed. Ceres, București.
5. Horst C., 2011 - *Tehnica utilizării energiei eoliene*, Ed. Mast, București.
6. Rojanschi V., Diaconu G., 1997 - *Protecția și ingineria mediului*, Ed. Economică, București.
7. Vasiliu D., 2007 - *Monitorizarea mediului*, Editura tehnică, București.

## Evaluation

Evaluation form	Evaluation Methods	Percentage of the final grade
Final exam	Written examination	60%
Evaluation of the activity during the semester	Project Presentation	40%

## Contact

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