

# Energy conversions and alternative power sources - opis przedmiotu

| Informacje ogólne   |                                                                   |
|---------------------|-------------------------------------------------------------------|
| Nazwa przedmiotu    | Energy conversions and alternative power sources                  |
| Kod przedmiotu      | 06.2-WE-ELEKTD-ECandAES-Er                                        |
| Wydział             | <a href="#">Wydział Informatyki, Elektrotechniki i Automatyki</a> |
| Kierunek            | WIEiA - oferta ERASMUS / Elektrotechnika                          |
| Profil              | -                                                                 |
| Rodzaj studiów      | Program Erasmus drugiego stopnia                                  |
| Semestr rozpoczęcia | semestr zimowy 2018/2019                                          |

| Informacje o przedmiocie        |                                                                                     |
|---------------------------------|-------------------------------------------------------------------------------------|
| Semestr                         | 3                                                                                   |
| Liczba punktów ECTS do zdobycia | 4                                                                                   |
| Typ przedmiotu                  | obieralny                                                                           |
| Język nauczania                 | angielski                                                                           |
| Sylabus opracował               | <ul style="list-style-type: none"><li>prof. dr hab. inż. Grzegorz Benysek</li></ul> |

| Formy zajęć  |                                         |                                        |                                            |                                           |                     |
|--------------|-----------------------------------------|----------------------------------------|--------------------------------------------|-------------------------------------------|---------------------|
| Forma zajęć  | Liczba godzin w semestrze (stacjonarne) | Liczba godzin w tygodniu (stacjonarne) | Liczba godzin w semestrze (niestacjonarne) | Liczba godzin w tygodniu (niestacjonarne) | Forma zaliczenia    |
| Wykład       | 30                                      | 2                                      | -                                          | -                                         | Zaliczenie na ocenę |
| Laboratorium | 30                                      | 2                                      | -                                          | -                                         | Zaliczenie na ocenę |

## Cel przedmiotu

To provide fundamental knowledge in subject of energy conversions and renewable energy sources.

## Wymagania wstępne

Circuit theory, Fundamentals of electrical power engineering.

## Zakres tematyczny

Energy resources and energy demands. Conversion of the thermal energy into mechanical and electrical. Conversion of the wind and water energy. Conversion of the nuclear energy into thermal and electrical energy. Energy conversions and influence onto environment.

Nuclear energy. Nuclear reactor – principle of operation. Advantages and disadvantages of the nuclear power stations.

Wind energy. Wind conditions In Poland and Europe. Wind conversion system. Ecological, scenery and environmental results of the wind installations utilization.

Solar energy. Insolation in Poland. Types and construction of the solar systems. Principle of operation.

Examples of the industrial installations with photovoltaic.

Water energy. Turbine construction. Influence of the large water power stations onto environmental changes. Principles of constructions as well as cooperation of the small water power stations with the energy network.

Geothermal energy. Methods and examples of utilization of the geothermal energy. Geothermal energy resources in Poland. Principle of operation of the heat pumps, heat sources utilized In heat pumps.

Biogas, biomass and waste heat. Fermentation as source of the biogas. Straw and brushwood utilization.

Electrical arrangements In alternative energy sources. Methods of solar energy conversion into electrical energy. Arrangements to cooperation with AC networks.

Novel sources of the alternative energies. Electrolysis and hydrogen utilization.

Thermonuclear fusion. Financial aspects of the alternative energy installations.

## Metody kształcenia

Lecture, laboratory exercises.

## Efekty uczenia się i metody weryfikacji osiągnięcia efektów uczenia się

| Opis efektu                                                                | Symbole efektów | Metody weryfikacji                                        | Forma zajęć                                            |
|----------------------------------------------------------------------------|-----------------|-----------------------------------------------------------|--------------------------------------------------------|
| Knows properties of renewable energy sources and electric energy deposits. |                 | <ul style="list-style-type: none"><li>kolokwium</li></ul> | <ul style="list-style-type: none"><li>Wykład</li></ul> |
| Knows about energy conversion.                                             |                 | <ul style="list-style-type: none"><li>kolokwium</li></ul> | <ul style="list-style-type: none"><li>Wykład</li></ul> |
| Characterizes the sources of renewable energy and energy storage.          |                 | <ul style="list-style-type: none"><li>kolokwium</li></ul> | <ul style="list-style-type: none"><li>Wykład</li></ul> |

| Opis efektu                                                                                                        | Symbole efektów | Metody weryfikacji                                                                     | Forma zajęć                                                    |
|--------------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Can select installation elements, estimate design cost and investment payback time for alternative energy sources. |                 | <ul style="list-style-type: none"> <li>wykonanie sprawozdań laboratoryjnych</li> </ul> | <ul style="list-style-type: none"> <li>Laboratorium</li> </ul> |

## Warunki zaliczenia

Lecture – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.

Laboratory – the main condition to get a pass is acquiring sufficient marks for all laboratory exercises as scheduled.

## Literatura podstawowa

1. Klugmann E., Klugmann-Radziemska E.: Alternative energy sources. Photovoltaics power systems, Wydawnictwo Ekonomia i Środowisko, Białystok, 1999. (in Polish)
2. Heier S., Waddington R.: Grid integration of wind energy conversion systems, John Wiley & Sons, 2006.
3. Luque A.: Handbook of photovoltaic science and engineering, John Wiley & Sons, 2003.
4. Lewandowski W.: Ecological friendly renewable energy sources, WNT, Warszawa, 2001. (in Polish)
5. Marecki J.: Basic of energy transformations, WNT, Warszawa, 1995. (in Polish).

## Literatura uzupełniająca

1. O'Hayre R.: Fuel cell fundamentals, John Wiley & Sons, 2006.
2. Mielczarski W., Electrical energy market – selected technical and economical aspects, ARE & EP-C, Warszawa, 2000 (in Polish)

## Uwagi

Zmodyfikowane przez prof. dr hab. inż. Grzegorz Benysek (ostatnia modyfikacja: 20-03-2018 11:42)

Wygenerowano automatycznie z systemu SylabUZ