DESCRIPTION OF THE COURSES

- Course code: ARR 2512
- Course title: Electric Energy Generation
- Language of the lecturer: polish

Course form	***Lecture***	***Classes***	***Laboratory***	***Project***	***Seminar***
*Number of hours/week**	*2*	*1*			
*Number of hours/semester**	*30*	*15*			
Form of the course completion	examination ;	attestation			
ECTS credits	*2*	*1*			
Total Student's Workload	*60*	*30*			

- Level of the course (basic/advanced): advanced
- Prerequisites: Thermodynamics
- Name, first name and degree of the lecturer/supervisor: Henryk Wojciechowski, dr inż.
- Names, first names and degrees of the team's members: Mieczysław Kozak, dr inż.
- Year 1 / II Semester 2
- Type of the course (obligatory/optional): optional
- Aims of the course (effects of the course):]
  The technical effectivity and economic the technological arrangements of production of electric energy
- Form of the teaching (traditional/e-learning): traditional
- Course description: Power and heat-power plants theoretical cycles: steam, gas, gas-steam, low and high pressure internal combustion engines, organic Rankine cycles. Technological configurations of power and heat-power plants. Principle of operation and construction of main devices in power plants and CHP. Auxiliary devices: pumps, fans, mills, compressors. Hydro-power plants: kinds, hydro-turbines. Basic hydro energetic calculations. Nuclear power plants: fission and fusion nuclear reactions. Principle of operation of nuclear reactor. Reactor types. Fuel cycle. Wind and solar power plants: principle of operation, basic energetic and economical calculations. Fuel cells: principle of operation, energy balance, hybrid plants. Energetic characteristics of power plants and CHP, technical and economical indices. Primary and secondary power control.

- Lecture:

Particular lectures contents	*Number of hours*
1. Primary energy mediums, energy processes.	2
2. Condensing power plant cycles: simple, with regenerative feed water heating and steam interstage reheating.	2
3. CHP plant cycles: with backpressure and extraction-condensing	

turbines	2
4. Power plant basic devices: boilers – principle of operation, construction, energy balance.	2
5. Power plant basic devices: steam turbines - principle of operation, construction, energy balance.	2
6. Calculation of active and reactive stage of the turbine. Energy balance of steam turbine.	2
7. Energetic characteristics of power plants and CHP, technical and economical indices. Primary and secondary power control.	2
8. Thermodynamic cycles of power plants and CHP: gas, gas-steam, piston internal combustion engines. Gas turbines with steam and water injection into the combustion chamber.	2
9. Hydropower plants – principle of operation, construction, kinds, basic energetic calculation.	2
10. Hydro power plants – flow-plants, reservoir-plants, peak-pump-plants. Hydro-power reservoir calculation.	2
11. Wind and solar power plants: principle of operation, basic energetic and economical calculations.	2
12. Nuclear power plants: fission and fusion nuclear reactions. Principle of nuclear reaction calculation. Neutron cycle.	2
13. Reactor types. Fuel cycle. Reactor power calculation. Schemas of nuclear power plants.	2
14. Fuel cells: principle of operation, energy balance, hybrid plants.	2
15. MHD generators, principle of operation, construction, energy balance, electromagnets	2

- Classes – the contents:

Piston engines cycles – general calculations. Low pressure (Otto), high pressure (Diesel and Sabathe), gas turbine (Joule-Bryton). Stirling engine. Organic Rankine cycle.

Steam-water cycles of condensing power plants (Rankine cycle – simple, with regenerative feed water heating and steam interstage reheating.

Steam-water cycles of heat-power plants – back pressure, extraction-condensing , extraction – back pressure.

Steam and water boilers – thermodynamic calculations of the cycle and combustion process. Energy balance and characteristics.

Steam turbines. Active and reactive stage calculation, velocities and losses.

Gas, gas-steam turbines – flow calculation. Energy balance of turbine and compressor. Configurations with regenerative heating.

Hydro stations – hydro turbines calculations, calculation of water reservoir in hydro power plant.

Wind power plants. Preliminary calculation. Economical effectiveness of wind power plant.

Fuel cells. Energy balance of fuel cells with basic and phosphorus electrolyte

Energetic characteristics of condensing power plants and extraction-condensing CHP

- Seminars – the contents:
- Laboratory – the contents:
- Project – the contents:
- Basic literature:

1. Laudyn D., Pawlik M., Strzelczyk F., Elektrownie. WNT, Warszawa 1997.

2. Chmielniak J., Rusin A., Czwiertnia K., Turbiny gazowe. Ossolineum, Wrocław 2001.
3. Chmielniak J., Technologie energetyczne. Wydawnictwo Politechniki Śląskiej. Gliwice 2004
4. Szargut J., Ziębik A., Podstawy energetyki cieplnej. PWN, Warszawa 2000
5. Marecki J., Podstawy przemian energetycznych. WNT, Warszawa 1995
6. Paska J., Wytwarzanie energii elektrycznej. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005
7. Gnutek Z., Kordylewski W., Maszynoznawstwo energetyczne. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2003
8. Goliński J., Jesionek K., Siłownie binarne. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2006
9. Lubośny Z., Elektrownie wiatrowe w systemie elektroenergetycznym. WNT, Warszawa 2006
10. Majewski R., Szafran R., Zbiór zadań z procesów energetycznych w wytwarzaniu energii elektrycznej. Skrypt Politechniki Wrocławskiej, Wrocław 1992.

- Additional literature:
1. Michałowski S., Plutecki J., Energetyka wodna, WNT, Warszawa, 1975.
2. Internet
3. Periodical : Energetyka, Gospodarka Paliwami i Energią.
- Conditions of the course acceptance/credition:
  Lectures: examination; exercises: attestation.

***** - depending on a system of studies