Lodz University of Technology

Thermal Power Plants II

Course description

Basic information

Study programme Power Engineering **Speciality/path** - **Organizational unit** Faculty of Mechanical Engineering **Study level** first-cycle programme (inżynier) **Study mode** full-time studies **Education profile** general academic	**Didactic cycle** 2025/26 **Course code** W1ENES.110.00163.25 **Language of instruction** polish **Obligatory** Obligatory **Block** Directional subjects **Course related to scientific research** No

Course coordinator	Janusz Buchta
Course instructor(s)	Janusz Buchta

Period	**Form of verification**	**Total ECTS points**
Semester 5	Graded assignment **Classes and hours** • Lecture: 30 • Tutorials: 15 • Project work: 30	5

Prerequisites

Basic competences in the field of technologies related to electrical power generation, power machinery construction and power transmission.

Learning outcomes

Code	Programme outcomes	Detailed outcomes indicators
1ENE1	Possesses necessary for engineering purposes advanced knowledge of generation, conversion and transmission methods for energy from both conventional and renewable sources.	1ENE1.1 Identifies flow, thermodynamic and electrical phenomena and processes enabling an understanding of key problems in the energy industry. 1ENE1.2 Describes methods of generation, conversion and transmission of energy from conventional sources.
1ENE3	Demonstrates detailled knowledge of electrotechnics and electronics, covering: structure, operation, design and performance of electric installations and devices used in power engineering.	1ENE3.3 Describes the construction, operation, and principles of selection, design, and operation, of typical power engineering plant, machinery, and equipment.
1ENE5	Is able at an advanced level to identify, formulate and solve basic engineering problems including elements of economic and safety assessment, taking advantage of the elements of detailled knowledge gained within general engineering and specialist courses.	1ENE5.3 Uses design documentation in the field of mechanical engineering and prepares technical documentation for selected machinery and equipment in the fields of energy and mechanical engineering and construction. 1ENE5.4 Uses design documentation in the fields of electrical engineering, electrical engineering and automation in the fields of electrical power engineering, electrical engineering and automatic control engineering.
1ENE7	Is able to apply mathematical models (analytical, empirical, numerical), perform calculations and numerical simulations of basic phenomena and processes present in heat and power engineering.	1ENE7.1 Applies physical and mathematical models to analyse flow, thermal and electrical phenomena and processes typical of the power engineering industry.

Course contents

Basic types of auxiliaries in various types of power plants. Adjusting the flow rate of power plant auxiliaries. Types of drives applied in auxiliaries: steam turbines and electric motors. Configuration of power supply in power plant auxiliaries. Calculations regarding the electric system of the power plant's auxiliaries.

Complementary information

Contents - detailed selection

No.	Contents - detailed selection	Class type
1.	LECTURE. Basic types of auxiliaries in thermal, nuclear and hydro power stations. Coal mills: construction and characteristic. Induced draught and forced draught fans: construction and classification. Feed water pumps, circulating pumps, cooling water pumps, extraction pumps. Other types of power plant auxiliaries. Adjusting of auxiliaries output. Types of drives applied in auxiliaries: steam and electrical. Engineering specifications of induction motors driving power plant auxiliaries. Power supply in auxiliaries: layout and specification. Start-up transformer. Stand-by power supply. Automatic systems for change-over of power supply in auxiliary electrical system. PROJECT. Calculation of capacities of basic power station auxiliaries. Selection of induction motors parameters. Choice of the method for adjusting auxiliaries output to minimize energy consumption. Layout of auxiliary electrical system. Specifications of start-up and stand-by transformers. Verification of an auxiliary electrical system and induction motors specifications during motors start-up and change over of supplies. Calculation of short-circuit currents in auxiliary electrical system. TUTORIALS. Tutorials are seminar-based and concern current issues in the national power generation sector, including energy transition, decarbonisation and nuclear energy. Students prepare presentations on assigned topics, then lead discussions and evaluate each other's work.	Project work, Tutorials, Lecture

Teaching methods and techniques, passing conditions

Class type	Teaching methods and techniques	Passing conditions
Lecture	Lecture	A test covering the scope of lecture material
Tutorials	Multimedia presentation, Discussion, Group work, Peer assessment, Mini lecture	Seminar presentation
Project work	Project execution, Group work	Project report

Examination methods, weighed grades

Class type	Examination methods and weighed grades
Lecture	Final test: 40%
Tutorials	Multimedia presentation: 20%
Project work	Design Project: 40%

Verification of learning outcomes

Detailed outcome indicators	Verification criteria	Assesment tool (class type)
1ENE1.1	In the final test, the student provides logical answers. In the seminar presentation, the student presents information with an understanding of the topic.	Multimedia presentation (Tutorials), Final test (Lecture)
1ENE1.2	In the final test, the student provides logical answers. In the seminar presentation, the student presents information with an understanding of the topic.	Multimedia presentation (Tutorials), Final test (Lecture)
1ENE3.3	In the final test, the student provides logical answers. In the seminar presentation, the student presents information with an understanding of the topic.	Multimedia presentation (Tutorials), Final test (Lecture)

Detailed outcome indicators	Verification criteria	Assesment tool (class type)
1ENE5.3	In completing the project task, the student correctly applies the principles of description of machinery.	Design Project (Project work)
1ENE5.4	In completing the project task, the student correctly applies the principles of description of machinery.	Design Project (Project work)
1ENE7.1	In completing the project task, the student correctly applies the principles of mathematical description of machinery.	Design Project (Project work)

Literature

Compulsory reading

1. Pawlik M., Strzelczyk F.: Elektrownie. Wydawnictwo Naukowe PWN, WNT, 2023
2. Pawlik M., Skierski J.: Układy i urządzenia potrzeb własnych elektrowni. WNT Warszawa 1986

Other reference materials

1. Paska J.: Wytwarzanie energii elektrycznej. Oficyna Wydawnicza Politechniki Warszawskiej, 2018
2. Chmielniak T.: Technologie energetyczne. Wydawnictwo Naukowe PWN, Warszawa 2023

Student workload

Activity type	Average number of hours* needed to complete an activity
Lecture	30
Tutorials	15
Project work	30
Participation in academic consultations	5
Preparation for test	20
Preparation of a multimedia presentation	20
Preparation of the project	30
Total student workload	**No. of hours** 150
Workload involving teacher	**No. of hours** 75
Total ECTS points	**ECTS** 5

* activity hour equals to 45 minutes

Directional learning outcomes

Code	Content
1ENE1.1	Identifies flow, thermodynamic and electrical phenomena and processes enabling an understanding of key problems in the energy industry.
1ENE1.2	Describes methods of generation, conversion and transmission of energy from conventional sources.
1ENE3.3	Describes the construction, operation, and principles of selection, design, and operation, of typical power engineering plant, machinery, and equipment.
1ENE5.3	Uses design documentation in the field of mechanical engineering and prepares technical documentation for selected machinery and equipment in the fields of energy and mechanical engineering and construction.
1ENE5.4	Uses design documentation in the fields of electrical engineering, electrical engineering and automation in the fields of electrical power engineering, electrical engineering and automatic control engineering.
1ENE7.1	Applies physical and mathematical models to analyse flow, thermal and electrical phenomena and processes typical of the power engineering industry.