



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Machinery and equipment for nuclear power plants [S2EJ1>MiUwEJ]

Course

Field of study

Nuclear Power Engineering

Year/Semester

2/3

Area of study (specialization)

–

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

30

Laboratory classes

0

Other

0

Tutorials

15

Projects/seminars

0

Number of credit points

3,00

Coordinators

dr inż. Radosław Jankowski

radoslaw.jankowski@put.poznan.pl

Lecturers

Prerequisites

1 Knowledge: The student entering the subject should have a basic knowledge of first degree courses in thermodynamics, fluid mechanics, gas dynamics and heat transfer, and should be familiar with the construction of basic energy machines and equipment and methods of evaluating their efficiency. 2 Skills: The student should have the ability to use analytical methods used in the description of thermal-fluid phenomena occurring in power machines and the ability to obtain and process information from publicly available databases. 3 Social competences: The student is ready to critically evaluate his/her knowledge and perceived content.

Course objective

To impart extended theoretical knowledge and practical skills in the use of basic machinery and equipment operating in nuclear power plants.

Course-related learning outcomes

none

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:

The knowledge acquired in the lecture is verified in a written examination consisting of 10 open questions graded from 0 to 2 points. Pass mark: >50% marks

Auditorium exercises:

Continuous assessment in each class of skills and competences by solving scientific tasks and special case analyses. Assessment of student knowledge and skills on the basis of a final written test consisting of solving 5 tasks. Pass mark: >50% of the points.

Programme content

Lecture:

Performance characteristics of steam turbines operating in nuclear power plant circuits. Operating parameters of steam turbines, influence of fresh steam parameters, interstage moisture separation, selection of turbine splitting pressure. Equations describing turbine operation. Types of steam turbines, methods of regulating power. Intensification of the heat transfer process, co-current and counter-current heat exchanger systems. Issues in the operation of heat exchangers, design solutions of exchangers, construction and principle of operation of steam generators and condensers used in nuclear power generation, methods of combination and use of generators. Construction of circulating and feed pumps, pump fields of operation, pump regulation and ways of regulating pumping systems, measurement of flow parameters, operational issues of pump use in power plants, construction and operation of basic components of high pressure networks (barrier fittings, pressure regulators, bleeder valves, safety valve).

Audit exercises:

Solving practical problems in the operation of machinery and equipment in nuclear power plants. Application of the 1st and 2nd principles of thermodynamics, analysis of operation of flow machines, heat transfer issues and fluid mechanics. Calculation of model thermal circuits.

Course topics

Topics in line with curriculum content

Teaching methods

Lecture: multimedia presentation illustrated by analytical examples solved on the blackboard.

Auditing exercises: solution of exemplary scientific and engineering problems connected with eksploatacja urządzenia i maszyn stosowane w elektrowniach.

Bibliography

Basic

1. Chmielniak T.: Technologie energetyczne, WNT, Warszawa 2008
2. Celiński Z., Strupczewski A.: Podstawy energetyki jądrowej, WNT, Warszawa 1984
3. Hobler T.: Ruch ciepła i wymienniki, WNT 1979
4. Wiśniewski St., Wiśniewski T.: Wymiana ciepła, WNT 1997
5. Jędral W., Pompy wirowe, WNT, Warszawa 2001
6. Perycz S., Turbiny parowe i gazowe; Wydawnictwo PG, Wydawnictwo IMP PAN 1992
7. M. Joachimiak, D. Joachimiak, and P. Krzyslak, "Analysis of heat flow in a tube bank of a condenser considering the influence of air," Archives of Thermodynamics, vol. 38, no. 3, 2017, doi: 10.1515/aoter-2017-0019.

Additional:

1. Jezierski G., Energia jądrowa wczoraj i dziś, WNT, Warszawa 2005
2. Szargut J., Ziębik A.: Podstawy energetyki cieplnej, PWN, Warszawa 1998
3. Ackermann G., Eksploatacja elektrowni jądrowych, WNT, Warszawa 1987
4. Walczak J., Inżynierska Mechanika Płynów, Wydawnictwo PP, 2006

Breakdown of average student's workload

	Hours	ECTS
Total workload		
Classes requiring direct contact with the teacher		
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)		