



FACULTY: ENVIRONMENTAL ENGINEERING AND ENERGY

COURSE TITLE: Engineering of Nuclear Power Systems

Number of contact hours: 60

Duration: 1 semester (fall / spring)

ECTS credits: 6

Programme description: Role and importance of nuclear energy; Nuclear cross-sections. Reaction rates; Nuclear fission and chain reaction; Criticality conditions; Neutron slowing-down; Conversion and breeding, Reactor components and their characteristics; Classification and design features of research, production, and power reactors; Introduction to fast reactor systems; Different types of fuel cycles; Uranium enrichment; Fabrication of fuel; Reprocessing of irradiated fuel; Process waste disposal; Reactor fuel requirements; Thermodynamical analysis of nuclear power plant; Layout of nuclear power plants; Containment buildings; Primary containment vessels; Structure of reactor core; and mechanical stress in various structures. Description and analysis of power plant systems and components including steam generator, steam dryer and separator, pressurizer, reheater, heat exchanger, condenser, demineralizer, pumps, turbine, generator, cooling tower; Auxiliary cooling systems. Fuel handling mechanisms; Control and mechanisms; Components of nuclear power cost; Economic comparison of nuclear and fossil fueled plants; Future trends in nuclear power.

Course type: lectures (30), computer simulations (30)

Literature:

1. Yastrebenetsky M., Kharchenko V., *Nuclear Power Plant Instrumentation and Control Systems for Safety and Security*, 2014.
2. Rust J.H., *Nuclear Power Plant Engineering*, Haralson, 1979.
3. El-Wakil M.M., *Nuclear Energy Conversion*. McGraw-Hill, 1982
4. Pedersen E.S. *Nuclear Power*. Ann Arbor Science, 1978.
5. El-Wakil M.M. *Power Plant Technology*. McGraw-Hill, 1984.
6. Lish, K.C. *Nuclear Power Plant Systems & Equipment*. Industrial Press Inc., 1972.

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Assessment method: report from computer simulation

Lecturer: Tomasz Sobota

Contact person: Tomasz Sobota (e-mail: tomasz.sobota@pk.edu.pl)