

## **NUCLEAR SYNERGY WITH COAL AND CHEMICAL PROCESSING** (3 ECTS) *Elective*

Responsible person: dr hab. inż. Jerzy Cetnar, prof.

### ***Learning outcomes***

The aim of the course is to provide the students with the basics understanding of physics and techniques applied in nuclear reactors. Following the basic understanding students will learn of selected nuclear reactor types, their constructions, safety and functions as sources of power and heat thus will gain knowledge of the concept of nuclear cogeneration dedicated for heat application in chemical processing, coal processing and synthetic fuel production and means of systems integration.

On completing this course, you should be able to:

- understand the basic aspects of nuclear reactor function that might be required from chemical engineers for related R&D programs or future industrial application nuclear synergy systems;
- recognise possible primary interaction between nuclear and chemical components of the integrated system and identify safety issues a particular system integration involves;
- assess benefits from nuclear synergy introduction to chemical process in terms of CO<sub>2</sub> emission reduction and increased effectiveness of resources utilization;
- analyse various technological and economical aspects of selected cogeneration systems with major focus on clean coal systems;
- identify areas of technology developments required for realization of an effective nuclear synergy systems

### ***Course main content***

Part 1: Lectures to provide the required knowledge and guidance for self-studies, organised in three groups:

1. Nuclear specific issues
2. Chemical specific issues
3. Integration issues

Part 2: Seminars

Students will be given selected topics specific to nuclear cogeneration development based on completed and ongoing programs in order to enhanced acquired knowledge and for detailed discussion

### ***Admission***

Required bachelor degree on chemical processing  
Extended knowledge of physics  
Basic knowledge of economy

### ***Literature***

1. G. Bell, S. Glasstone "Nuclear Reactor Theory"
2. Nuclear heat applications: Design aspects and operating experience" IAEA-TECDOC-1056
3. Non-electric application of nuclear energy IAEA-TECDOC-923
4. Next Generation Nuclear Plant Project Technology INL/EXT -09-16598

### ***Assessment***

- 1) Test of knowledge in regard to the lectures
- 2) Evaluation of acquired knowledge basing on the seminar presentation