PHYS-447

Reactor technology

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Cursus	Sem.	Type
Ing.-phys	MA1, MA3	Opt.
Nuclear engineering	MA1	Obl.
Physicien	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Oral
Workload	120h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

Reactor core cooling, power limits and technological consequences due to fuel, cladding and coolant properties, main principles of reactor and power plant design including auxiliary systems are explained. System technology of most important thermal and fast reactor types is introduced.

Content

- Fuel rod, LWR fuel elements
- Temperature field in fuel rod
- Reactor core, design
- Flux and heat source distribution, cooling channel
- Single-phase convective heat transfer, axial temperature profiles
- Boiling crisis and DNB ratio
- Pressurized water reactors, design
- Primary circuit design
- Steam generator heat transfer, steam generator types
- Boiling water reactors
- Reactor design
- LWR power plant technology, main and auxiliary systems
- Breeding and transmutation, purpose of generation IV systems
- Properties of different coolants and technological consequences
- Introduction into gas-cooled reactors, heavy water moderated reactors, sodium and led cooled fast reactors, molten salt reactors, accelerator driven systems

Learning Outcomes

By the end of the course, the student must be able to:

- Assess / Evaluate the performance of reactor types
- Systematize reactor system components
- Formulate safety requirements for reactor systems

Transversal skills

- Access and evaluate appropriate sources of information.
- Collect data.

Teaching methods

Lectures, numerical exercises

Assessment methods

oral exam