

- Introduction and overview on fusion physics and technology
- Magnet technology
- Blanket technology
- Basics of plasma-wall interactions
- Radiation damage in structural materials for fusion reactors
- Materials modelling
- Plasma-facing-components (PFCs): materials under high heat loads
- Different types of fusion reactors: tokamak, stellarator, Wendelstein W7-X, ...
- Alternative confinement concepts
- Diagnostics, control and data analysis for fusion plasmas
- Plasma heating

Initial competences

Vector calculus, classical mechanics, electromagnetism

Final competences

- 1 Understand the working principles and engineering challenges of industrial plasma sources
- 2 Insight in technological applications of plasmas in different fields
- 3 Being able to process scientific literature and to make a synthesis/review on a certain subject
- 4 Being able to report and present scientific findings as a team
- 5 Knowledge of the physical basis of nuclear fusion
- 6 Knowledge of technological and engineering aspects of nuclear fusion regarding material requirements, plasma diagnostics and reactor development

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Group work, Seminar, Lecture, Independent work, Peer teaching

Extra information on the teaching methods

Part A: Plasma Technology

- Lecture
- Invited lectures by specialists in the field
- Lab visit
- Independent work and group work
- Student group work presentations and discussion

Part B: Fusion Technology

- Lectures
- Invited lectures by specialists in the field
- Problem solving

For the group work, each student team elaborates on a case study, prepares a joint report and presents it together with their team fellows to all students.

Questions are asked to test the insight in the subject.

Learning materials and price

Slides

References

- F.F. Chen: *Introduction to Plasma Physics and Controlled Fusion*
- J. Freidberg: *Plasma Physics and Fusion Energy*
- Y.P. Raizer, *Gas Discharge Physics*
- M. Kikuchi, K. Lackner, M.Q. Tran, *Fusion Physics*
- W. Lochte-Holtgreven: *Plasma diagnostics*

Course content-related study coaching

The instructor can be contacted after the lectures, or by appointment. Interactive support via the electronic learning platform

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment

Examination methods in case of periodic assessment during the second examination period

Oral assessment

Examination methods in case of permanent assessment

Oral assessment, Presentation, Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

- Part A: Plasma Technology:
 - Continuous assessment, presentation, oral examination, report
 - graded report of group work; graded oral presentation with questions.
Frequency: 1 case study + 1 oral presentation
- Part B: Fusion Technology:
 - Oral examination
 - Oral closed-book exam

Possibilities of retake permanent evaluation: group work report in adapted form – to be submitted before the start of the second examination period

Calculation of the examination mark

Special conditions: The weight of the non-permanent evaluation is in principle 50%. However, when a mark of less than 10/20 is obtained for the permanent or non-permanent evaluation, the weight of the lowest score is increased to 90%. The results of the first examination period for the permanent evaluation will be transferred to the second examination period.