GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2018-2019

Plasma Diagnostics (E026140)

Course size (nominal values; actual values may depend on programme)

Credits	6.0	Study time	180 h	Contact hrs	84.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 2)	English	excursion	8.75 h
		lecture	30.0 h
		guided self-study	15.0 h
		practicum	16.25 h
		seminar: coached exercises	15.0 h

Lecturers in academic year 2018-2019

Jaspers, Roger	TW17	lecturer-in-charge

Offered in the following programmes in 2018-2019	crdts	offering
European Master of Science in Nuclear Fusion and Engineering Physics	6	A

Teaching languages

English

Keywords

Plasma, Waves, Spectroscopy, Fusion, Neutrons, Thomson Scattering, Interferometry, Microwaves, energetic particles, probes, magnetic coils, data analysis.

Position of the course

This course will treat on an advanced level the different measurement methods in plasma physics and more specifically in Nuclear Fusion Technology. The focus will not only be on the operation principle and the relevant theory, but hands-on instructions and experiments are part of the course as well.

Contents

- week 1: generic properties and possibilities for plasma diagnostics + magnetic coils
- week 2: Passive plasma spectroscopy
- week 3: probes in plasma
- week 4: theory of waves in plasma + interferometry
- week 5: Electron Cyclotron Emission and Absorption
- week 6: data analysis techniques
- week 7: laser diagnostics and active beam spectroscopy
- week 8: particle diagnostic
- week 9: experimental session 1: wave plasma experiment
- week 10: neutron and X-ray diagnostics
- week 11: experimental session 2: probes, spectroscopy, laser
- week 12: discussion session.

Initial competences

Basic plasma physics knowledge: the student is expected to be familiar with the content of course Plasma Phyiscs (E02622).

Final competences

1 Obtaining knowledge and understanding of the different active and passive techniques to diagnose the plasma conditions: optical spectroscopy, active beam spectroscopy, Thomson scattering, microwave diagnostics, neutron and X-ray diagnostics, magnetic diagnostics, probe diagnostics.
2 Being able to derive the main principles of propagation of electromagnetic waves in

in magnetized plasmas and discuss on this basis: resonances, cut- off effects and changes in the refractive index for different polarizations, and its application for diagnostic purposes.
3 Being able to interpret real experimental data from diagnostics in fusion experiments or other plasma devices.
4 Being able to apply the relevant data-analysis technique to obtain the required information from experimental data.
5 Ability to discuss the implication of the operation of these diagnostics in a relevant environment such as a burning plasma and nuclear environment.
6 Being able to give design considerations for plasma diagnostics.

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

Guided self-study, excursion, lecture, practicum, seminar: coached exercises

Extra information on the teaching methods

- Guided Self study: Stdents will receive exercises to train the material. Each week ther will be a possibility to ask questions on this.
- Excursion: There will be a trip to Eindhoven University of Technology execture some practical expriments related tot het material taught in class.
- Lecture: There will be a lecture each week in which one ite will be central and discussed in depth.
- Practical: the students will have to run different experiments and hand in a small report on these.
- Seminar: next to the lecture a seminar will be organized in whihc the sutdents can work in smaller groups on assignments. At the end of the session the assignement will be treated plenary. These will be treated plenary.

Learning materials and price

Lecture notes and links to references therein (free).

References

See lecture slides.

Course content-related study coaching

By lecturer.

Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination

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

Written examination

Examination methods in case of permanent evaluation

Report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Calculation of the examination mark

- 80% on written exam
- 20 % on report