

PHYS – E0463: Fusion Energy Technology

Preface and course layout

Course objectives

- **Introduction** into thermonuclear fusion, principle, and concepts, and technology
- **Advanced courses have been / will be given as special lecture series, e.g.,**
 - Plasma stability
 - Transport
 - Scrape-off layer physics (2018)
 - Gyrokinetic theory (2017)
- **Introduction to plasma physics (PHYS-E0561) in fall and advanced plasma physics course (PHYS-E0566) held in winter/spring**

Course schedule 2021:

<https://mycourses.aalto.fi/course/view.php?id=29832>

- **Duration:** weeks 2 – 14 (Jan 11 – Apr 11, 2021),
 - Note, week 8 (Feb 22-26, 2021) is a midterm (evaluation week), no lectures nor exercise class
 - Note, Apr 5, 2021 is a public holiday (Easter Monday)
- **(Regular) lectures:** Monday 14:15-16:00 o'clock
 - Zoom: <https://aalto.zoom.us/j/68644286347>
- **(Regular) exercises:** Wednesday 10:15-12:00 o'clock
 - Zoom: <https://aalto.zoom.us/j/66233604247>
- **Staff:** Mathias Groth, Timo Kiviniemi, Henri Kumpulainen
 - e-mail addresses: `first.lastname@aalto.fi`

Course schedule 2021:

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- **Course material (e.g., lecture notes) on MyCourses:**

<https://mycourses.aalto.fi/course/view.php?id=29832>

- **Aalto Fusion and Plasma Physics group:**

<https://www.aalto.fi/en/departments-of-applied-physics/fusion-and-plasma-physics/>

Course schedule 2021:

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- **5 credits:**
 - No points for attending lectures
 - 75% for attending the exercise classes and completing the exercises
 - 25% for the (final) exams ⇒ **provisionally, oral exams during week 15 (April 12 – 16, 2021); pairs of two students, Q&A for 30 mins**

Course curriculum

- **Long-term role of fusion in meeting future energy needs**
- **Fusion principles and concepts**
- **Tokamaks, stellarators and laser facilities**
- **Heating systems and diagnostics**
- **Plasma-wall interaction and fusion materials**
- **Fuel cycle**
- **Future fusion reactors: ITER and DEMO**

Course material

- **Kikuchi, Lackner, Tran: “Fusion Physics” (2012)**
www-pub.iaea.org/MTCD/Publications/PDF/Pub1562_web.pdf
- **Wesson: “Tokamaks” (4th edition 2011)**
- **Dolan: “Magnetic Fusion Technology” (2014)**
- **Stacey: “Introduction to the Physics and Technology of Magnetic Confinement Fusion” (2010)**
- **Stangeby: “The Plasma Boundary in magnetic fusion devices” (2000)**
- **Duderstadt, Moses: “Inertial confinement fusion” (1982)**
- **Material from plasma physics summer schools**
- **Various review papers on fusion**