

Plasma Turbulence

Academic Year: (2021 / 2022)

Review date: 24-05-2021

Department assigned to the subject: Physics Department

Coordinating teacher: SANCHEZ FERNANDEZ, LUIS RAUL

Type: Electives ECTS Credits : 3.0

Year : 2 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Plasma Physics, Magnetohydrodynamics, Electrodynamics, Fluid Dynamics

OBJECTIVES

- Basic understanding of the physics of turbulence
- Recognition of differences between fluid and (magnetized) plasma turbulence
- Basic knowledge of turbulence numerical simulation
- Basic knowledge of experimental techniques to measure turbulence and turbulent fields

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to turbulence
2. The Navier-Stokes equation
3. Turbulence Basics in fluids
4. Two-dimensional turbulence
5. Experimental techniques to measure turbulence in fluids
6. Magnetohydrodynamic turbulence
7. Physics of magnetohydrodynamic dynamos
8. Numerical simulation of turbulence in fusion plasmas
9. Physics of turbulence-generated zonal flows in fusion plasmas
10. Drift wave turbulence
11. Experimental techniques to measure turbulence in fusion plasmas

LEARNING ACTIVITIES AND METHODOLOGY

- Topics are discussed in class with the help of slides that are provided to students.
- Selected research articles from the area of turbulence are handed to the students that, in small groups, must work through them, extract the main ideas, and present them in class at the end of the course.

ASSESSMENT SYSTEM

Final exam: multiple choice test and/or problems (50% of final grade)

Oral presentation of student projects (50% of final grade)

% end-of-term-examination:	50
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% of continuous assessment (assignments, laboratory, practicals...):	50
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BASIC BIBLIOGRAPHY

- P. A. Davidson Turbulence, Oxford University Press, 2004
- P.A. Davidson An introduction to Magnetohydrodynamics, Cambridge University Press, 2002
- W. D. McComb The Physics of Turbulence, Oxford Science Publications, 1990