Course number	U-LAS12 20019 LE57		
Course title (and course title in English)	Introduction to Plasma Science-E2 Introduction to Plasma Science-E2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,Arseniy Aleksandrovich, Kuzmin
Group	Natural Sciences	Field(Classification)	Physics(Development)
Language of instruction	English	Old group	Group B
Number of credits	2		
Number of weekly time blocks	1	Class style	Lecture (Face-to-face course)
Year/semesters	2026 • Second semester		
Days and periods	Tue.3	Target year	Mainly 1st year students
Eligible students	For all majors		

[Overview and purpose of the course]

Plasma is diverse and very abundant. Almost 99% of the visible matter in the observable Universe is in the state of plasma. It is everywhere in Space and on Earth, naturally occurring and produced in laboratories or used in factories. Stars, nebulas, Auroras, sparks, arc welding, thermonuclear reactors - this is just a beginning of a big list of various plasmas.

In this course the so-called fourth state of matter - plasma, will be introduced. We will start with a brief overview of possible plasmas and will define it. Next, we'll go into some details about plasma description. There are various approaches to describe plasma, they depend on the plasma kind. We will mainly focus on a single particle approach. If you are not familiar with some mathematics or physics, I will introduce the necessary concepts in class. So any humanities students are welcome.

After we finish with a more formal descriptions, we will review some of the cosmic plasmas: our Sun, solar wind, and Auroras.

Then I will introduce some of technological plasma applications and will focus on explanation of a magnetic confinement of plasma for energy generation.

[Course objectives]

The goal of this course is to introduce listeners to the "forth state of matter" - plasma.
To understand what is plasma and what are its properties.
To learn the role of plasma in the cosmic phenomena.
To learn about scientific and technological applications of plasma.
To understand basic idea of the fusion energy research.

[Course schedule and contents)]

1. Kinds of plasma, definitions of plasma.
2. Gas discharges: we'll follow an electron and discover the fundamentals of ionization, excitation, and other phenomena important in gas discharges and more.
3. Laboratory plasma and how to make one: breakdown of gases.
4. Laboratory plasma: glow, arc and corona discharges.
5. Technological applications of plasma.
6. Cosmic plasma: star formation and start structure.
7. From Sun to Earth: solar corona, solar wind, and Aurora.

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Introduction to Plasma Science-E2(2)

8.The ultimate energy source on Earth: thermonuclear fusion.

14 lectures in total and one feedback class.
1-2 lessons will be held for each item.

[Course requirements]

At the beginning of the course, you do not need the knowledge of Mathematics and Physics. Some grasp of Mathematics and Physics is important, however, the essential knowledge for the course will be provided as needed in class.

[Evaluation methods and policy]

Evaluation will be based on:
10% attendance and participation
20% homework
20% quiz
50% final exam

[Textbooks]

Instructed during class

[References, etc.]

（References, etc.）

John Wesson 『Tokamaks』 （Clarendon Pres - Oxford）ISBN:0-198-50922-7
Syun-Ichi Akasofu 『Exploring the secrets of the aurora』 （Springer）ISBN: 0-387-45094-7
A. C. Phillips 『The physics of stars』 （John Wiley & Sons）ISBN:0-471-94057-5
Markus Aschwanden 『Physics of the solar corona』 （Springer）ISBN:3-540-30765-6
Francis F. Chen 『Introduction to Plasma Physics and Controlled Fuion』 （Springer）ISBN: 978-3-319-22308-7

[Study outside of class (preparation and review)]

Preparation for lectures will include revision of class materials and homework assignments. Detailed instructions will be given during the class.

[Other information (office hours, etc.)]

[Essential courses]