



General information	
Academic subject	Laboratory of plasma physics
Degree course	Physics
Academic Year	2022/2023
European Credit Transfer and Accumulation System (ECTS)	3
Language	English
Academic calendar (starting and ending date)	05.10.2022 – 21.12.2022
Attendance	YES

Professor/ Lecturer	
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Department and address	CNR IMIP presso Dipartimento di Fisica
Virtual headquarters (Microsoft Teams code)	
Tutoring (time and day)	Friday 11.00-13.00 (flexible on request)

Syllabus	
Learning Objectives	<i>Fundamentals of gas discharges physics and applications</i>
Course prerequisites	<i>Basic knowledge of gas kinetic theory, electromagnetism, atomic and molecular structure</i>
Contents	<ol style="list-style-type: none"><i>1. Elementary processes of charged species and of atoms and molecules in plasmas</i><i>2. Dynamics of charged particles</i><i>3. Plasma statistics and kinetics of charged species</i><i>4. Plasma electrostatics and electrodynamics</i><i>5. Electrical breakdown in gases</i><i>6. Glow and arc discharges</i><i>7. High pressure and high frequency discharges</i><i>8. Modelling techniques</i><i>9. Plasma diagnostics techniques</i><i>10. Basics on applications with a focus on CO₂ destruction</i><i>11. Experimental and modeling laboratory experiences</i>
Books and bibliography	<i>Lecture notes</i> <i>A. Fridman, L.A. Kennedy: Plasma Physics and Engineering CRC Press</i> <i>Yu.P. Raizer Gas Discharge Physics Springer Verlag</i>
Additional materials	<i>The two books are far oversized compared to the course program. They are recommended for further optional reading</i>

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
31	16	15	44
ECTS			
3	2	1	

Teaching strategy	Lessons with slides support, visit to the virtual lab “low temperature plasmas”, experimental practice in the laboratory “Diagnostics of non-equilibrium plasmas”, both belonging to CNR-ISTP

Expected learning outcomes	
Knowledge and understanding on:	<ul style="list-style-type: none">○ Knowledge of the fundamentals of gas discharges physics, of the elementary processes relevant to charged and excited molecular and



	atomic species, and of the main methods for producing gas discharges
Applying knowledge and understanding on:	<ul style="list-style-type: none"> ○ Estimate the different working conditions of gas discharges ○ Interpretation of diagnostic techniques
Soft skills	<ul style="list-style-type: none"> ● Making informed judgments and choices <ul style="list-style-type: none"> ○ Ability of perform evaluations and propose various discharge-plasma configurations ● Communicating knowledge and understanding <ul style="list-style-type: none"> ○ Communication skills in Italian/English ○ Specific ability in the presentation and dissemination of knowledge with appropriate scientific language ● Capacities to continue learning <ul style="list-style-type: none"> ○ Ability to imagine a diagnostic experiment of a modelling application

Assessment and feedback	
Methods of assessment	
Evaluation criteria	<ul style="list-style-type: none"> ● Knowledge and understanding <ul style="list-style-type: none"> ○ Consistency of answers to formulated questions ● Applying knowledge and understanding <ul style="list-style-type: none"> ○ Setting up an explanation to a new problem ● Autonomy of judgment <ul style="list-style-type: none"> ○ Imagine a diagnostic/modelling setup ● Communicating knowledge and understanding <ul style="list-style-type: none"> ○ Communicate the interplay of different branches of physics in the gas discharges complex environment ● Communication skills <ul style="list-style-type: none"> ○ Clarity and precision of the presentation ● Capacities to continue learning <ul style="list-style-type: none"> ○ Understanding of the cross-disciplinary approach
Criteria for assessment and attribution of the final mark	Evaluation of the degree of understanding and ability to approach the multi-disciplinary character of gas discharges physics and applications
Additional information	