COURSE OF STUDY *Physics (LM-17)*
ACADEMIC YEAR *2024-2025*
ACADEMIC SUBJECT *Laboratory of Plasma Physics*

General information	
Year of the course	2nd
Academic calendar (starting and ending date)	1st semester: September - December 2024
Credits (CFU/ECTS):	3
SSD	FIS/03
Language	English
Mode of attendance	Compulsory

Professor/ Lecturer	
Name and Surname	Giorgio Dilecce – Francesco Taccogna
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Telephone	080 5443671
Department and address	CNR IMIP c/o Dipartimento di Fisica
Virtual room	
Office Hours (and modalities: e.g., by appointment, on line, etc.)	Friday 11.00-13.00 (flexible on request)

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
75	16	15	44
CFU/ECTS			
3	2	1	

Learning Objectives	*Fundamentals of gas discharges physics and applications*
Course prerequisites	*Basic knowledge of gas kinetic theory, electromagnetism, atomic and molecular structure*

Teaching strategie	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 in terms of	
Knowledge and understanding on:	o 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:	o Estimate the different working conditions of gas discharges o Interpretation of diagnostic techniques
Soft skills	• **Making informed judgments and choices** o Ability of perform evaluations and propose various discharge-plasma configurations • **Communicating knowledge and understanding** o Communication skills in Italian/English

	○ Specific ability in the presentation and dissemination of knowledge with appropriate scientific language ● **Capacities to continue learning** ○ Ability to imagine a diagnostic experiment of a modelling application
Syllabus	
Content knowledge	1. *Elementary processes of charged species and of atoms and molecules in plasmas* 2. *Dynamics of charged particles* 3. *Plasma statistics and kinetics of charged species* 4. *Plasma electrostatics and electrodynamics* 5. *Electrical breakdown in gases* 6. *Glow and arc discharges* 7. *High pressure and high frequency discharges* 8. *Modelling techniques* 9. *Plasma diagnostics techniques* 10. *Basics on applications with a focus on CO_2 destruction* 11. *Experimental and modeling laboratory experiences*
Texts and readings	*Lecture notes* *A. Fridman, L.A. Kennedy: Plasma Physics and Engineering CRC Press* *Yu.P. Raizer Gas Discharge Physics Springer Verlag*
Notes, additional materials	*The two books are far oversized compared to the course program. They are recommended for further optional reading*
Repository	

Assessment	
Assessment methods	*Oral exam*
Assessment criteria	● **Knowledge and understanding** ○ Consistency of answers to formulated questions ● **Applying knowledge and understanding** ○ Setting up an explanation to a new problem ● **Autonomy of judgment** ○ Imagine a diagnostic/modelling setup ● **Communicating knowledge and understanding** ○ Communicate the interplay of different branches of physics in the gas discharges complex environment ● **Communication skills** ○ Clarity and precision of the presentation ● **Capacities to continue learning** ○ Understanding of the cross-disciplinary approach
Final exam and grading criteria	Evaluation of the degree of understanding and ability to approach the multi-disciplinary character of gas discharges physics and applications
Further information	
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