

General information	
Academic subject	Physics 2
Degree course	<i>Scienze ambientali</i>
Academic Year	2021-2022
European Credit Transfer and Accumulation System (ECTS)	6
Language	<i>Italian</i>
Academic calendar (starting and ending date)	1/03/2021 - 1/06/2021
Attendance	<i>attendance is highly suggested</i>

Professor/ Lecturer	
Name and Surname	Antonio Suma
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Department and address	<i>Physics Department (Campus)</i>
Virtual headquarters	
Tutoring (time and day)	Wednesday, from 16:00 to 18:00 by appointment via e-mail

Syllabus	
Learning Objectives	<i>Knowledge of the fundamental aspects of electromagnetism, solving and discussing problems related to electromagnetism correctly and autonomously.</i>
Course prerequisites	<i>The achievement of the learning objectives requires from the student the knowledge acquired i) in the first year courses (essentially Mathematics and Physics 1) and ii) generic skills in scientific subjects.</i>
Contents	<p>Electrostatics <i>Concept of charge, conductors and insulators, Coulomb's law, quantization of charge, charge conservation.</i> <i>Concept of field, electric field, field due to a point charge, electric field of a dipole, field of a continuous charge distribution, dipole in an electric field.</i> <i>Gauss' law, applications of Gauss' law.</i> <i>Electric potential, equipotential surfaces, potential calculation, potential generated by a point charge, a dipole and a continuous charge distribution, calculating the field from the potential, potential of a charged conductor.</i> <i>Capacitor, capacitance, calculating the capacitance, capacitors in parallel and in series, potential energy and energy density, capacitor with a dielectric, dielectric and Gauss' law.</i> <i>Electric current, current density, resistance in a conductor, Ohm's law, power.</i> <i>Electromotive force, circuits analysis, Kirchhoff's voltage and current laws, simple circuits, resistances in parallel and in series, RC circuits.</i></p> <p>Magnetostatics <i>Magnetic phenomena, magnetic force, magnetic field, Hall's effect, circular motion of a charge in a magnetic field, magnetic force on a current-carrying wire, torque on a current loop.</i> <i>Biot-Savart law, magnetic field for an current arch, force between two parallel currents, Amperè's law, fields of solenoids and toroids, magnetic dipole field.</i></p> <p>Time-dependent electromagnetic phenomena <i>Magnetic flux, Faraday's law, Lenz's law, electromotive force and induced electric field, inductors, autoinduction, RL circuits</i></p>



	<p>Electromagnetic Waves Maxwell's equations, concept of wave, generation and propagation. of a planar electromagnetic wave, characteristics and spectrum of electromagnetic waves, source of electromagnetic radiation.</p> <p>Mention to electric and magnetic properties of matter and to optics</p>
Books and bibliography	<p>Slides from the lecturer</p> <p>"Fondamenti di Fisica: Elettromagnetismo, Ottica" Settima edizione, Halliday, Resnick, Walker, Settima edizione, Casa Editrice Ambrosiana</p>
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
150	36	30	84
ECTS			
6	4	2	
Teaching strategy		<i>Frontal teaching</i>	
Expected learning outcomes			
Knowledge and understanding on:		<ul style="list-style-type: none"> ○ Knowledge of basic aspects of electromagnetism, electromagnetic waves and optics, the physical meaning of Maxwell's equations, their implications and practical applications, knowledge of basic elements of optics 	
Applying knowledge and understanding on:		<ul style="list-style-type: none"> ○ Use knowledge of electromagnetism to solve problems related to electrostatics, currents, particles moving in an electromagnetic field, magnetostatics and induced electromagnetic phenomena. ○ Ability to recognize autonomously the main characteristics of an electromagnetic phenomenon and describe it using relations between physics quantities. 	
Soft skills		<ul style="list-style-type: none"> • <i>Making informed judgments and choices</i> <ul style="list-style-type: none"> ○ Acquisition of the ability to identify the methodologically adequate paths to describe, interpret and discuss the salient aspects of electromagnetic and optical phenomena. ○ Ability to evaluate the conceptual appropriateness of models and relationships between physical quantities. • <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ Ability to discuss the fundamental concepts of the study topics in a clear and exhaustive way, using an appropriate scientific language ○ Skills in the presentation of laws, models and relationships between quantities and related demonstrations. • <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ Ability to deepen specific topics of electromagnetism and optics autonomously starting from the knowledge and methods acquired during the course. ○ Personal skills in logical reasoning and critical approach to problems. 	

Assessment and feedback	
Methods of assessment	<p><i>The student's assessment includes a written test consisting of problems addressed in class. If the score is insufficient, it is possible to do an oral examination which consists in the discussion of the written test and in some questions related to topics of the course.</i></p>



	<p><i>During the course there are two partial tests, one on the electrostatic part in middle April, and one at the end of the course on the remaining part of the program.</i></p>
Evaluation criteria	<ul style="list-style-type: none">• <i>Knowledge and understanding</i><ul style="list-style-type: none">○ The student must demonstrate to master the principles underlying electrostatics and magnetostatics, optics, and to know the general laws governing electromagnetic phenomena and the laws of optics• <i>Applying knowledge and understanding</i><ul style="list-style-type: none">○ The student is asked to apply the theoretical aspects acquired in the course to the solution of problems and to the understanding of physical processes connected to the topics covered in the course.• <i>Autonomy of judgment</i><ul style="list-style-type: none">○ The student can autonomously identify a logical path between causes and effects in the processes of electromagnetism and optics.○ The student demonstrates that he can choose the methodological approaches suitable for describing / solving processes / problems related to the topics covered during the course○ The student can evaluate the correctness of the relationships between electromagnetic and optical physical quantities, and the conceptual correctness of models and relationships between electromagnetic and optical physical quantities.• <i>Communication skills</i><ul style="list-style-type: none">○ The student must have acquired the ability to fully communicate the concepts learned and to use correct scientific language.• <i>Capacities to continue learning</i><ul style="list-style-type: none">○ The student must demonstrate that he has acquired the tools to enrich his knowledge also through the in-depth studies proposed during the course.
Criteria for assessment and attribution of the final mark	<p><i>The score of the exam is attributed by means of a mark expressed out of thirty.</i></p>
Additional information	

Bari, 30/08/2021

Firma

Antonio Suma