



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2022/2023
BACHELOR'S DEGREE (BSC)	ENERGY ENGINEERING AND RENEWABLE ENERGIES
SUBJECT	PHYSICS II
TYPE OF EDUCATIONAL ACTIVITY	A
AMBIT	50293-Fisica e chimica
CODE	07870
SCIENTIFIC SECTOR(S)	FIS/01
HEAD PROFESSOR(S)	BURLON RICCARDO Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	BURLON RICCARDO Monday 10:00 12:00 Edificio 6 - 2° piano Wednesday 10:00 12:00 Edificio 6 - 2° piano

PREREQUISITES	A good knowledge of the topics learned in Physics I and Mathematical analysis courses is required.
LEARNING OUTCOMES	Knowledge and understanding Theoretical understanding: have a good understanding of the principles of classical electromagnetism(logical and mathematical structure, experimental support, and described physical phenomena) and their applications to engineering. Mathematical skills: be able to understand and master the use of the most commonly used mathematical methods. This will be verified during the written and oral test. Applying knowledge and understanding Problem solving skills: be able to evaluate clearly the orders of magnitude in situations which are physically different, but show analogies, thus allowing the use of known solutions in new problems. Be able to solve electricity and magnetism problems using first principles and Maxwell equations both in differential and integral form. Modelling: be able to identify the essentials of a process / situation and to set up a working model of the same; be able to perform the required approximations. This will be verified during the written and oral test. Making judgements Be able to identify the more effective way to the solution of electromagnetism problems using either the Maxwell equations and/or a conservation laws approach. Acquire an understanding of how electromagnetism laws are applicable to many fields, namely engineering. This will be verified during the oral test. Communications skills Be able to describe, analyse and solve electromagnetism problems using appropriate technical language and be able of written and oral communication on related subjects. Be able to describe the logical flowchart of problem solving. Be able to improve the group working skills. This will be verified during the oral test. Learning skills Students will learn the basic laws of electromagnetism and the typical methodology of the physical sciences, to be applied to engineering problems , critically and in a autonomous way. He will also improve the ability of autonomous learning. This will be verified during the oral test.
ASSESSMENT METHODS	The exam consists of two tests, oral and written ones . Both tests are evaluated on a 30 points scale . The final mark will include both written and oral tests. Purpose of the tests: test the knowledge of the principles of classical electromagnetism and Maxwell's equations and their application to solve electrostatic, magnetostatics and time dependent fields problems. Check the ability of modelling and identifying the essential elements of a problem. Type of tests: written test (problems and excises with symbolic or numerical answer, open or closed ended); passing the written test (at least 18/30 points) gives access to the oral exam (discussion of the written test and questions on general topics and / or exercises with reference to the recommended texts). The oral examination must be undertaken in the same exam session ("appello") of the written test. Duration of the written exam: no more than three hours. During the written test students can not use books of any kind neither notes written down during the course, but it is possible for them to use a calculator and a list of formulas. EVALUATION CRITERIA MARK 28 to 30 - 30 with distinction LEARNING OUTCOMES ACHIEVEMENT Learning outcomes have been achieved to a very good/excellent level. The student demonstrates most or all of the following characteristics. KNOWLEDGE AND UNDERSTANDING Full/excellent knowledge, understanding and integration of principles, concepts, methods and techniques of the discipline APPLYING KNOWLEDGE AND UNDERSTANDING Extensive/excellent evidence of relevant and perceptive application of theoretical and technical knowledge for tackling and solving problems, with very good/excellent level of autonomy, effectiveness and originality.

	MAKING JUDGMENTS, COMMUNICATION SKILLS, LEARNING SKILLS Comprehensive/excellent evidence of logical, analytical and critical abilities for reaching appropriate judgments and decisions, even based on incomplete or complex information and data. Full/excellent ability to communicate knowledge, analyses and conclusions, with a very good/excellent level of clearness, fluency and correct use of language. Very good/excellent abilities of concepts reinterpretation and interdisciplinary connection, showing full evidence for autonomously undertaking further studies or professional activity. MARK 24 to 27 LEARNING OUTCOMES ACHIEVEMENT Learning outcomes have been achieved to a good level. The student demonstrates most or all of the following characteristics KNOWLEDGE AND UNDERSTANDING Good knowledge, understanding and integration of principles, concepts, methods and techniques of the discipline, with minor inaccuracies or errors APPLYING KNOWLEDGE AND UNDERSTANDING Good evidence of application of theoretical and technical knowledge for tackling and solving problems, with fine/adequate level of autonomy and effectiveness. MAKING JUDGMENTS, COMMUNICATION SKILLS, LEARNING SKILLS Good/adequate evidence of logical, analytical and critical abilities for reaching appropriate judgments and decisions, based on available information and data. Good ability to communicate knowledge, analyses and conclusions, with a good level of clearness, fluency and correct use of language. Good/adequate abilities of concepts reinterpretation and interdisciplinary connection, showing evidence for autonomously undertaking further studies or professional activity. MARK 18 to 23 LEARNING OUTCOMES ACHIEVEMENT Learning outcomes have been achieved to an acceptable/basic level. The student demonstrates most or all of the following characteristics KNOWLEDGE AND UNDERSTANDING Acceptable/basic knowledge and understanding of principles, concepts, methods and techniques of the discipline, even if with some inaccuracies, errors or omissions APPLYING KNOWLEDGE AND UNDERSTANDING Evidence of adequate/basic application of theoretical and technical knowledge for tackling and solving problems, even if with limited level of autonomy and effectiveness. MAKING JUDGMENTS, COMMUNICATION SKILLS, LEARNING SKILLS Evidence of some logical, analytical and critical abilities for coherent judgments and decisions attempts. Basic ability to communicate knowledge, analyses and conclusions, with an acceptable level of clearness, fluency and use of language. Sufficient abilities, although with some limitations, of concepts reinterpretation and connection in disciplinary contexts, showing some evidence for autonomously undertaking further studies or professional activity. MARK below 18 LEARNING OUTCOMES ACHIEVEMENT Learning outcomes have not been met. The student demonstrates most or all of the following characteristics KNOWLEDGE AND UNDERSTANDING Insufficient knowledge and understanding of principles, concepts, methods and techniques of the discipline, with several and significant errors or omissions APPLYING KNOWLEDGE AND UNDERSTANDING Inadequate application of theoretical and technical knowledge for tackling and solving problems. Poor or no evidence of autonomy and effectiveness in facing the issues.
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	MAKING JUDGMENTS, COMMUNICATION SKILLS, LEARNING SKILLS Poor or no evidence of logical, analytical and critical abilities for coherent judgments and decisions attempts. Insufficient ability to communicate knowledge, analyses and conclusions, with an acceptable level of clearness, fluency and use of language. Poor abilities of concepts reinterpretation and interdisciplinary connection, showing no evidence for autonomously undertaking further studies or professional activity.
EDUCATIONAL OBJECTIVES	Have a good understanding of the principles of electromagnetism. Be able to solve simple problems of electrostatics, magnetostatics and electromagnetics, using first principles and Maxwell's equations
TEACHING METHODS	Lectures. Instructor-assisted problem solving. Classwork, for single students or groups. Teaching tools:blackboard, chalk and sticks, computer and video-projector.
SUGGESTED BIBLIOGRAPHY	P. Mazzoldi, M. Nigro, C. Voci, "Elementi di Fisica, Elettromagnetismo e onde" III/2022, EdiSES, ISBN:883623027X P. Mazzoldi, M. Nigro, C. Voci, "Fisica, Meccanica e Termodinamica", II/2021, EdiSES, ISBN : 9798836230365. S. Focardi, I. Massa, A. Uguzzoni, M. Villa, "Fisica Generale, Elettromagnetismo", II/2003, CEA, ISBN: 8808320154 D.J. Griffiths, "Introduction to Electrodynamics", Fourth Edition, Cambridge University Press,ISBN: 9781108420419 R.A. Serway, J.W. Jewett, "Fisica per Scienze ed Ingegneria, Volume 2", VI/2015.ISBN:9788879598248 M.Nigro, C. Voci, "Problemi di fisica generale. Elettromagnetismo -. Ottica", 1995 Libreria Cortina.ISBN: 9788877840455 F.Porto, G.Lanzalone, I.Lombardo, "Problemi di Fisica Generale, Elettromagnetismo e Ottica, 2017 EdiSES,ISBN:9788879598378

SYLLABUS

Hrs	Frontal teaching
4	Simple harmonic motion. Damped oscillations. Driven oscillations and resonance. Fourier analysis.
4	ELECTROSTATIC. Electric charges. Insulators and conductors. Electrical structure of matter. Coulomb's law. Electrostatic field. Electrostatic field produced by a continuous distribution of charges. Electrostatic field lines. Motion of a charge in an electrostatic field. Flow of the electrostatic field. Gauss's law. The divergence of the electrostatic field.
4	ELECTROSTATIC POTENTIAL. Electric potential and voltage. Electrostatic potential energy. The field as gradient of potential. equipotential surfaces. The electrostatic field of the rotor. The electric dipole. The strength on an electric dipole.
4	CONDUCTORS AND DIELECTRICS. Conductors in equilibrium.Cable conductor. Electrostatic shield. Capacitors. Connection of capacitors.The electrostatic field energy. Dielectrics. The dielectric constant. Polarization of dielectrics
4	ELECTRIC CURRENT. Electrical conduction. Electric current. Stationary electric current. Ohm's law. Resistors in series and parallel. Kirchoff's laws. Charge and discharge of a capacitor through a resistor.
2	MAGNETIC FIELD. Magnetic interaction. Magnetic field. Magnetic force on a moving charge. Magnetic force on a current-carrying conductor. Torque on plans circuits. Hall Effect. Motion of a charged particle in a uniform magnetic field.
2	MAGNETIC FIELD SOURCES. Magnetic field produced by a current. Electrodynamical actions between current-carrying wires. Ampere's law. Gauss' law for magnetism
4	ELECTRIC AND MAGNETIC FIELD TIME DEPENDENT. Faraday's law. induced electric field. Self-inductance, RL circuits. magnetic energy. Mutual induction.
2	MAXWELL EQUATIONS. Displacement current. Ampere-Maxwell law. Maxwell's equations. Maxwell's equations in differential form. A brief introduction to electromagnetics waves.
Hrs	Practice
5	ELECTROSTATIC
4	ELECTROSTATIC POTENTIAL
4	ELECTRIC CURRENT
3	MAGNETIC FIELD
2	MAGNETIC FIELDSOURCES.
4	ELECTRIC AND MAGNETIC FIELD TIME DEPENDENT
2	MAXWELL EQUATIONS