UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

dipartimento di
scienze della formazione, psicologia, comunicazione

COURSE OF STUDY *Primary Education Sciences*

ACADEMIC YEAR *2024-25*

ACADEMIC SUBJECT: *ELEMENTS OF PHYSICS TEACHING*

General information	
Year of the course	*IV*
Academic calendar (starting and ending date)	*II semester*
Credits (CFU/ETCS):	*8+1*
SSD	*FIS 08*
Language	*Italian*
Mode of attendance	*optional*

Professor/ Lecturer	
Name and Surname	*Michele Romita*
E-mail	michele.romita@gmail.com
Telephone	
Department and address	
Virtual room	
Office Hours (and modalities: e.g., by appointment, on line, etc.)	*Wednesday 15:30 (to review)*

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
70	*60*	*10*	*70*
CFU/ETCS			
9	*8*	*1*	

Learning Objectives	*Observing and identifying phenomena, being able to describe and represent them, and guiding others in observation and identification of phenomena.Having awareness of the various aspects of the experimental method, where the experiment is understood as a reasoned inquiry into natural phenomena, simple critical analyses of measurements, and the ability to build educational pathways by implementing the above towards the construction of simple models.Understanding and evaluating how scientific knowledge and skills strongly contribute to the construction of active and informed citizenship.*
Course prerequisites	*Knowledge related to any physics course from any secondary high school.The prerequisites cannot differ for attending and non-attending students.*

Teaching strategie	*Lecture, possible digital simulations or use of apps using smartphones or devices, telematic supports, in some cases performing exercises, group work with cooperative learning methodology or case studies.*
Expected learning outcomes in terms of	*The expected learning outcomes define "the set of knowledge, skills, and competencies (cultural, disciplinary, and methodological) defined during the design of the study program, which the student must possess at the end of the educational path."***

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Knowledge and understanding on:	Knowledge and understanding (what the student knows at the end of the course);** o - Elements of mechanics o - Elements of thermology and heat o - Elements of optics o - Elements of electricity and magnetism - Dublin Descriptor 3: - Dublin Descriptor 4: - Dublin Descriptor 5: o
Applying knowledge and understanding on:	: Applying knowledge and understanding (what the student can do at the end of the course, i.e., the skills they have acquired); o - Observing and identifying phenomena, being able to describe and represent them, and guiding others in the observation and identification of phenomena o - Having awareness of the various aspects of the experimental method, where the experiment is understood as a reasoned inquiry into natural phenomena, simple critical analyses of measurements, and the ability to build educational pathways by implementing the above towards the construction of simple models o - Understanding and evaluating how scientific knowledge and skills strongly contribute to the construction of active and informed citizenship o
Soft skills	Making judgements (activities contributing to the development of these skills must be indicated, e.g., lab tests, writing reports, etc.); Students must have the ability to collect and interpret data (typically in their field of study) deemed useful to make independent judgments, including reflections on social, scientific, or ethical issues related to them. o - Autonomy of judgment: At the end of the course, the student should be able to: o - Evaluate a primary school textbook in its scientific aspects o - Evaluate and develop experimental proposals for primary school Communication skills (specific activities must be designed to develop the student's ability to communicate/transmit what they have learned); students must be able to communicate information, ideas, problems, and solutions to both specialist and non-specialist audiences. o - Communication skills: At the end of the course, the student should be able to: o - Communicate physical content adequately but very simply o - Manage classroom communication to support the understanding of experiments and the content being addressed Learning skills (indicate the tools provided so that the student can continue studying independently after the course). Students must have developed the learning skills necessary to undertake further studies with a high degree of autonomy.

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	○ Ability to learn independently: At the end of the course, the student should be able to: ○ Design and implement educational experiences for primary school, equipping them with an adequate method of inquiry and formal representation.
Syllabus	*Fundamental principles of dynamics* *Fundamental principles of thermology* *Fundamental principles of light*
Content knowledge	**Outline of learning models within the physics learning process.** Overview of the main didactic approaches to studying physics, with a focus on laboratory methods and the use of new digital technologies. **Introduction to scalar physical quantities with an overview of vector quantities and their operational definitions and measurements:** Measurement as the first form of representing objects and natural phenomena. Laboratory experiences. **Introduction to kinematics and dynamics:** The fundamental laws of motion for point masses, and the law of universal gravitation. The historical/scientific development of ideas and reasoning leading to their identification, viewed as the first source of simplified analysis of the functional dependencies between physical quantities. Model representation: graphs, Cartesian graphs. Forces and moments, and an overview of rigid body mechanics. Laboratory experiences, including digital ones. **Introduction to conservation laws, with an overview of collision processes:** An analysis of the discovery of the first conservation laws, acknowledging the initial steps toward the first forms of particularly abstract mathematical modeling of nature. Laboratory experiences, including digital ones. **Introduction to the modeling of wave phenomena and light, with an overview of the discovery of its nature through interference and diffraction experiments:** An interesting historical journey and simple experimental observations, including everyday ones, that led to the development of ideas about wave phenomena and the behavior and nature of light. **Introduction to calorimetry and an overview of thermodynamics:** Temperature and heat, an overview of the first principles of thermodynamics. The physics of heat allows for qualitative home experiments useful for developing the ability to question reality by observing phenomenological dependencies of significant quantities. **Introduction to the fundamental forces of nature, including their formal and historical cultural aspects:** An overview of quantum mechanics, particularly the double-slit experiment, focusing on its qualitative aspects as an efficient mathematical model despite its high degree of counter-intuitiveness. **Introduction to the fundamental concept of the field, particularly the electric field and currents:** Significant small experiments with electrification phenomena, as well as the construction of circuits and the graphical representation of fields. **Introduction to the magnetic field and an overview of the relationship between currents and magnets:** Analysis of the content, form, and methodological approach proposed in primary school textbooks.
Texts and readings	*Indicazioni nazionali e nuovi scenari (https://www.miur.gov.it/documents/20182/0/Indicazioni+nazionali+e+nuovi+scenari/)* *"Fisica" vol.I e II , P.Mazzoldi, M. Nigro, C.Voci; Edises 2003* *"Guida all'insegnamento della Fisica" A. B. Arons, Zanichelli 2003* *"Fare Laboratorio" Guida alla didattica esperienziale progetto LS-OSA lab maggio 2021.*

	"Il metodo Montessori" E. Balconi P. Beretta, Xenia 2014 *"Didattica generale e Didattica Disciplinare" B. D'Amore, F. Frabboni B., Mondadori 2005* *"Elaborazione di un approccio ontosemiotico alla didattica della Meccanica quantistica" Tesi di dottorato FIS/08; Università degli studi di Bari, Michele Romita.* *"Introduzione storica al concetto di energia"; A. Baracca, U.Besson; Le Monier 1981* *MLTV Making Learning and Thinking Visible; a cura di E. Mughini e S. Panzavolta, INDIRE, Carocci editore 2020*
Notes, additional materials	*The texts mentioned above are the minimum cultural references upon which the program will be based*
Repository	*The teaching materials will be provided by the teacher in the form of ebooks or handouts*

Assessment	
Assessment methods	*The final exam will be oral and will focus on assessing the knowledge of the minimum content regarding the elements of physics, teaching approaches, and the application of the scientific method in discussing them, as well as the ability to organize everything into a small simulation of a teaching intervention.*
Assessment criteria	• *Knowledge and understanding:* *- Knows and understands the studied elements of physics.* • *Applied knowledge and understanding:* *- Applies qualitatively the scientific inquiry method even in cases of simple physical phenomena, including new ones.* • *Autonomy of judgment:* *- Is able to comment on and critique arguments from a primary school textbook.* *Communicative skills:* *- Communicates the studied contents with appropriate language.* *- Manages classroom communication effectively, encouraging the use of appropriate language.* • *Learning skills:* *- Expands their knowledge by taking cues and being able to discern between various media sources.*
Final exam and grading criteria	*The final grade is given in thirtieths. The exam is considered passed when the grade is greater than or equal to 18. Honors are awarded in case of particular originality in the proposal of the simulated lesson*
Further information	
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