UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Fisica e Chimica - Emilio Segrè
ACADEMIC YEAR	2022/2023
MASTER'S DEGREE (MSC)	PHYSICS
SUBJECT	PHYSICS TEACHING METHODOLOGY
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	20901-Attività formative affini o integrative
CODE	02335
SCIENTIFIC SECTOR(S)	FIS/08
HEAD PROFESSOR(S)	FAZIO CLAUDIO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	86
COURSE ACTIVITY (Hrs)	64
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**FAZIO CLAUDIO** Monday 14:00 16:00 Studio P2030, Dipartimento di Fisica e Chimica, Edificio 18 di Viale delle Scienze, oppure Canale Teams "Ricevimento Prof. Claudio Fazio", codice di accesso: 53tzmt2. Link di accesso: https://teams.microsoft.com/l/team/19%3af5f7dc869cc04aedba96507e0f0f67ba%40thread.tacv2/conversations?groupId=7bdda581-b29b-450f-860b-8835b71d24ce&tenantId=bf17c3fc-3ccd-4f1

DOCENTE: Prof. CLAUDIO FAZIO

PREREQUISITES	Basic topics of Classical Physicis. Basic topics of Quantum Mechanics
LEARNING OUTCOMES	Knowledge and understanding: basic knowledge of: evolution of physics teaching; founding ideas, research themes, cultural references; disciplinary teaching and general pedagogy; science education; didactic transposition of knowledge; common knowledge and scientific knowledge; conceptual change; nature and epistemological status of conceptions; forms of reasoning and typical explanations; teaching methods based on exploration and scientific discovery; systems for collecting and analyzing experimental data for educational purposes; modeling systems for teaching; specific hardware and software for physics teaching; educational databases dedicated to physics and available on the INTERNET; methods of analyzing sociometric data applied to the teaching of physics; methods of evaluation of teaching and learning; methods of peer communication. Applying knowledge and understanding: The student must be able to: have a good knowledge of the main lines of constructivist pedagogy; adapt the contents of physics to a specific scholastic context; use the proper methods of physics in the construction of educational paths based on exploration and discovery of natural reality; to build physical didactic paths oriented to the comprehension of the main physical laws; appropriately use computer-assisted data collection and analysis systems available on the market and available in school laboratories; use the most widespread modeling systems to construct and discuss descriptive and explanatory models; use the resources present on the INTERNET for the preparation of physics courses; apply to the teaching of physics some of the most common methods of analysis of sociometric data; appropriately evaluate their teaching and student learning; communicate the results obtained and discuss the didactic paths elaborated in a peer context. Making judgments Knowing the evolution of physics teaching, the basic ideas behind teaching and the main research topics. Being able to evaluate how to organize knowledge in order to build an effective educational path; choosing in the most appropriate way and use educational data collection software and hardware; choosing teaching methods considered by research as the most effective ones, and adapting them to the scholastic context. Communication skills Ability to discuss the problems related to an educational path; data and information processing capabilities; ability to present experimental results and educational projects in a peer context; Learning skills Being able to independently continue in the study and deepening of teaching methods of physics using the knowledge and skills developed during the course
ASSESSMENT METHODS	The final evaluation of learning is performed through a written report on the activities carried out in the laboratory and an oral exam, with a final evaluation out of 30. The oral exam consists of an open discussion aimed at ascertaining the possession of the disciplinary skills and knowledge required by the course and discussing the work presented in the written report. The questions are designed to test the expected learning outcomes, they tend to verify a) the acquired knowledge; b) the processing capabilities, c) the possession of an adequate communication capacity. As regards the verification of knowledge, the appropriate acquisition of the contents of the course and the ability to establish connections between them is verified. With respect to the processing skills, the student's ability to provide independent judgments regarding the disciplinary contents, and understanding of the applications and / or the implications of the contents in the didactic transposition of the Physics in different contexts and in the socio-cultural context

	of reference, is verified. The final evaluation will be formulated based on the following conditions: Score 30 - 30 and praise: excellent knowledge of the topics, excellent property 'of language, excellent argumentative capacity. The student is perfectly able to frame the development of the themes of physics teaching in the correct socio-cultural context of reference and to report on the didactic transposition of physics contents. Score 26-29: good knowledge of the subjects, good language properties, good argumentative capacity. The student is well able to frame the development of the topics of physics teaching in the correct socio-cultural context of reference and to report on the didactic transposition of physics contents. Score 23-25: fair knowledge of the subjects, good property of language, fair argumentative capacity. The student is able to frame the development of the themes of physics teaching in the correct socio-cultural context of reference and to report on the didactic transposition of physics contents. Score 21-22: more than sufficient knowledge of the subjects, acceptable properties of language, acceptable argumentative capacity. The student is not entirely able to frame the development of the subjects of physics teaching in the correct socio-cultural context of reference and to report on the didactic transposition of physics contents. Score 18-20: minimum knowledge of the topics, acceptable properties of language, undeveloped argumentative capacity, but at least minimally present. The student is barely able to frame the development of the subjects of physics teaching in the correct socio-cultural context of reference and to report on the didactic transposition of physics contents. Insufficient score: the student does not possess an acceptable knowledge of the contents of the subjects dealt with in the teaching and is not in a position to argue his own affirmations and to frame the development of the subjects of physical teaching in the correct socio-cultural context of reference and to relate on the didactic transposition of physics contents.
EDUCATIONAL OBJECTIVES	To provide basic knowledge on the evolution of the teaching of physics, on its founding ideas, on research topics and on cultural references typical of the teaching of physics. To introduce the student to the subjects of disciplinary teaching and general pedagogy. To favour the didactic reconstruction of the contents of physics and of the elements of the experimental method in the perspective of teaching in Secondary Schools. To discuss conceptual, epistemological, linguistic and didactic nodes that influence the teaching and learning of physics and take them into account when planning educational activities. To provide the student with a basic practice in the design of educational laboratory experiences based on research results in physics teaching. To build descriptive and explanatory mathematical models also through the use of specific educational software. To use IT tools for collecting and analyzing experimental data. To design educational activities based on significant research results in physics education. To communicate appropriately the results of physics and its teaching. To know and use some of the most common methods for analyzing sociometric data for teaching
TEACHING METHODS	Teaching is held during the second year of the graduation course in Physics. The teaching activities are carried out through interactive lectures, group discussions, development of significant laboratory experiences for teaching in schools, work groups. At the end of the course there will be presentations (seminars) optional of about half an hour each, during which the students who wish can present to the teacher and to the course colleagues an experience that they consider significant for the teaching of physics in one specific context and / or with particular and innovative methodologies. These presentations allow students to verify their own capacity in presenting the chosen topic and in subsequently discussing it with the teacher and course colleagues.
SUGGESTED BIBLIOGRAPHY	Testi di base: U. Besson: Didattica della Fisica - Carocci Editore - Studi Superiori, Roma - ISBN: 9788843077359 U. Besson e M. Malgieri: Insegnare la Fisica Moderna - Carocci Editore - Studi Superiori, Roma - ISBN: 9788843090235 Testi per l'approfondimento: A. Arons: Guida all'Insegnamento della Fisica - Zanichelli - ISBN: 978880811378 Dispense tratte da : Matilde Vicentini e Michela Mayer (Eds.): Didattica della Fisica - La Nuova Italia - ISBN: 8822116577 Pubblicazioni scientifiche di ricerca in Didattica della Fisica Manuali e documentazione software utilizzati

SYLLABUS

Hrs	Frontal teaching
1	Description of the course aims and initial test
4	Teaching a scientific discipline. Constructivism. Teaching / Learning: references for a teacher of scientific disciplines. conceptual, epistemological, linguistic and didactic nodes in the teaching and learning of Physics
4	Common knowledge and scientific knowledge: spontaneous models and learning styles. Knowledge schemes. The problem of conceptual change in Physics and its teaching. The role of History of Physics in teaching
3	Cooperative/collaborative learning and use of the laboratory. The role of laboratory in the teaching of scientific disciplines and the construction of a teaching experience. Operational examples of setting, method and application aspects
2	Inquiry Based Science Education. Comparison and analogies with constructivist approaches to knowledge. Analysis of research results in Physics teaching
1	Communication tools in Physics Education
5	The use of Information Technology tools for collection and processing of experimental data. Applications to teaching in schools
3	The use of Information Technology tools for the construction of simulation environments in Physics. "Open" and "closed" modeling systems. Applications to teaching in schools
4	Review of Error Theory for the analysis of experimental data. Data analysis methods for sociometry and their use in teaching
2	Skills, objectives and aims in an educational path. Examples of learning units and didactic modules of classical and modern Physics based on real laboratory and "virtual" laboratory
3	Assessment and evaluation methods of teaching and learning. Analysis of written tests and oral tests

Hrs	Workshops
8	Application of teaching methodologies and technologies discussed during the frontal teaching activities for the preparation of Physics learning paths and teaching experiences, with reference to the subjects provided by the national guidelines for Secondary Schools
8	Use of data collection and analysis hardware and software for the preparation of Physics laboratory experiences to be included in Physics learning paths
8	Use of physical modeling software for the preparation of Physics learning paths
8	Individual activity in the laboratory aimed at designing an educational path to be discussed during the final exam