UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Psicologiche, Pedagogiche, dell'Esercizio Fisico e della Formazione
ACADEMIC YEAR	2021/2022
MASTER'S DEGREE (MSC)	PEDAGOGY
SUBJECT	HISTORICAL-EPISTEMOLOGICAL BASES OF PHYSICS
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	21037-Attività formative affini o integrative
CODE	14536
SCIENTIFIC SECTOR(S)	FIS/08
HEAD PROFESSOR(S)	FAZIO CLAUDIO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	180
COURSE ACTIVITY (Hrs)	45
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 and "Modern" Physicis.
LEARNING OUTCOMES	Knowledge and understanding: The student must know the historical development of physical though. He/she must also understand that science is a human enterprise, also linked to socio-cultural factors. The student must know the main conceptual, epistemological, linguistic and didactic nodes related to teaching and learning processes of physics. Applying knowledge and understanding: The student must be able to discuss the topics studied in the graduate program in a significant historical and historiographical framework. He/she must also: be able to develop an historical and critical analysis of scientific developments, with particular attention to the growth of knowledge, productivity and creativity in Physics; discuss the main scientific discoveries and technical applications in their historical and social context; reconsider the physical as a human enterprise, even through the reading of original memories; apply what he/she has learned in different situations, including research on the physical content and its teaching / popularization in various contexts. Making judgements The student must: be able to recognize that physical knowledge ise the result of a discovery and research process influenced by social and economic aspects; autonomously organize the physical knowledge and reconstruct the historical paths that led to their development, also from a pedagogical point of view. Communication skills The student must: choose and use the most appropriate communication methods and software; discuss the problems related to the historical development of physical content; present his/her historical research results in a peer-context and in educational / outreach activities. Learning skills The student must be able to autonomously study selected topics of History of Physics and deepen the historical development of Physics using the knowledge and the skills developed during the course. The student must be able to set up educational paths aimed at presenting physics in secondary school
ASSESSMENT METHODS	The final evaluation is done through a written test and an oral test, with final grades expressed in thirty. The written test consists of an essay on one of the topics covered during the course and is designed to verify the possession of the required skills and abilities. Students can choose between three proposed themes, well defined, clear and uniquely interpretable and will independently formulate a coherent and self-consistent discourse on the theme chosen, in not more than four A4 pages. A score equal or greater than 16/30 will give access to the oral test. The written test can be replaced by a presentation on a topic of History and Epistemology of Physics chosen by the candidate that has been particularly studied. The oral test consists of a discussion, with question aimed at checking the skills and disciplinary knowledge dealt with the course. The questions take a cue from the written elaborate and are generalized to other topics covered during the course. They are designed to test the learning outcomes and are aimed at checking a) the student knowledge; b) his/her argumentative skills, c) his/her presentation skills. With respect to the knowledge assessment, the understanding of topics discussed during the course and the ability of establish relationships and make connections among them is mainly verified. With regard to the verification of processing capacity, it is verified if the student: * is able to provide independent judgments about the subject contents; * understands the applications and/or implications of the same in the context of the historical development of Physics and the related socio-cultural context. The final evaluation will be made on the basis of the following conditions: Score 30-30 and praise: excellent knowledge of the topics, excellent exposition skills, very good argumentative skills. The student is fully capable to frame the development of the themes of physics in the proper socio-cultural context. Score 26-29: good knowledge of the topics, good exposition skills, good argumentative skills. The student is well able to frame the development of the themes of physics in the proper socio-cultural context. Score 23-25: decent knowledge of the topics, good exposition skills, decent argumentative skills. The student is able to frame the development of the themes of physics in the proper socio-cultural context.

	Score 21-22: acceptable knowledge of the topics, acceptable exposition skills, acceptable argumentative skills. The student is not completely able to frame the development of the themes of physics in the proper socio-cultural context. Score 18-20: minimal knowledge of the topics, acceptable exposition skills, not well developed argumentative skills, but at least minimally present. The student is barely able to frame the development of the themes of physics in the proper socio-cultural context. Insufficient score: the student does not have an acceptable knowledge of the contents of the topics treated during the course, is not able to justify their claims and to frame the development of the themes of physics in the proper socio-cultural context.
EDUCATIONAL OBJECTIVES	To present a historical, historiographical and epistemological framework of physics. To focus on key ideas in History of Physics, on experiments and particularly significant events for the advancement of scientific knowledge, on models of scientific progress. To emphasize the role of History of Physics in researcher and teacher training. To highlight the conceptual, epistemological, linguistic and didactic nodes of the teaching and learning processes of physics To historically reconstruct the contents of Physics and the basic elements of the experimental method, discussing them in the socio-cultural contexts in which they are developed. To relate the development of Physics with that of other scientific, and non-scientific, disciplines. To highlight the role of science in Culture and in the technological and social development.
TEACHING METHODS	The educational activities are carried out through lectures, reading and commentary of original historical texts, viewing and commentary of videos. At the end of the course students can choose to give a brief (half an hour) lecture, during which a subject of History of Physics of their choice is presented and discussed with the teacher and the classmates. These lectures allow students to test their skills in exposing a topic and discussing it with the teacher and classmates.
SUGGESTED BIBLIOGRAPHY	Testi di Riferimento (Recommended books): Alessandro Braccesi: "Una storia della fisica classica. Dalla leva al moto browniano", Zanichelli, Bologna, 1992. Alessandro Braccesi: "Al di la' dell'intuizione. Per una storia della fisica del ventesimo secolo. Relativita' e quantistica", Bononia University Press, Bologna, 2008. Thomas Kuhn: La struttura delle rivoluzioni scientifiche, Piccola Biblioteca Einaudi, 2009 Testi e pubblicazioni forniti dal docente (books and papers provided by the teacher).

SYLLABUS

Hrs	Frontal teaching
1	Description of the course aims and initial test
4	Physics foundations and history and their relevance in researcher / teacher training. Conceptual, epistemological, linguistic and didactic nodes of the teaching and learning processes of physics.
3	Scientific knowledge from the physical point of view. The role of models in research and in education
4	Elements of the philosophy of science. The dynamism of the history of science
4	The classical heritage
2	Construction of new foundations of Science. 1600.
2	Galileo Galilei and his students
2	Light, vacuum and matter in the seventeenth century
2	The pre-Newtonian science
2	Newton's Principia
2	Completion of Classical Physics.
2	Il secolo della luce
5	Electricity 'and the fundamental laws of the electromagnetic field
4	Energy, work, heat. The laws of Thermodynamics
1	The structure of matter: the classical atom
1	Problems for Classical Physics
1	The pre-relativistic theories of Lorentz and Poincare. The crisis of Fundaments in the early decades of '900. The birth of the Theory of Relativity
3	Quantum Physics