



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Fisica e Chimica - Emilio Segrè		
ACADEMIC YEAR	2023/2024		
MASTER'S DEGREE (MSC)	CHEMISTRY		
SUBJECT	METHODOLOGIES AND TOOLS IN TEACHING CHEMISTRY		
TYPE OF EDUCATIONAL ACTIVITY	B		
AMBIT	50483-Discipline chimiche inorganiche e chimico-fisiche		
CODE	19827		
SCIENTIFIC SECTOR(S)	CHIM/02		
HEAD PROFESSOR(S)	CHILLURA MARTINO DELIA FRANCESCA	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)	2° semester		
ATTENDANCE	Mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	CHILLURA MARTINO DELIA FRANCESCA Monday 15:00 16:00 Studio Prof. Chillura. Ed. 17 - Viale delle Scienze		

DOCENTE: Prof.ssa DELIA FRANCESCA CHILLURA MARTINO

PREREQUISITES	Students should have acquired a sound knowledge and understanding of the basic concepts in general chemistry usually present in introductory chemistry courses belonging to any science and/or technology degree program as well as basic mathematical and computer skills. Furthermore, the course Fondamenti di didattica della chimica (cod. 19829) provides useful supporting tools for implementing the practical activities of this course.
LEARNING OUTCOMES	<p>Content and objectives of this course are coherent with the general guidelines by the Didactic Division of the Italian Chemical Society (DD-SCI). The course aims at making science graduates aware of the cultural value as well as social and economical role of chemistry. As a consequence, the course has an independent education function. However, credits gained with this course can be used within the 24 CFU required for the admission to the teacher training program in high schools.</p> <p>At the end of the course the student will be able to:</p> <ul style="list-style-type: none">-Design learning sequences in chemistry according to a structured work plan taking into account the target, the conceptual hurdles, the adopted learning processes, the necessary conceptual requisites and the available resources and multimedia tools;-Use interactive and laboratory techniques, multimedia tools useful to develop chemical concepts and visualize specific aspects of objects and structures used in chemistry teaching;-Use appropriate assessment tools for the detection of pre-existing knowledge and acquired competences;-Finalize the teaching process to educate citizens capable to formulate informed and independent ideas about economic, social and ethical topics involving chemistry
ASSESSMENT METHODS	<p>The overall assessment is the result of a successful achievement of the specific objectives of one of two activities (activity 1/activity 2) which are individually assigned and handed in, as a written report, at the end of the course, of the presentation (activity 3) and of an oral exam. The oral exam has the objective of verifying that the student has acquired competences and content dealt with during the course. The student will be required to address two different questions on any topic of the course program.</p> <p>The final assessment aims at verifying the student knowledge and understanding of the course content, didactic and interpretation skills as well as autonomous thinking. The student will be required to present in a teaching context the basic concepts in chemistry and to convey, in a clear and unambiguous fashion, the connection between chemistry and society even to a non specialized audience.</p> <p>The assessment is graded on a thirty-point scale. The passing level will be reached when the student demonstrates a basic content knowledge and understanding and is able to construct didactic approach to the resolution of a specific problem. In addition, the student has to demonstrate communication skills in order to transfer his/her own ideas to the examiner.</p>
EDUCATIONAL OBJECTIVES	<p>Present and discuss the use of the main key models and modelling techniques in chemistry didactics;</p> <p>Present and discuss examples of laboratory teaching in chemistry;</p> <p>Present and discuss examples of specific resources and multimedia tools in chemistry education;</p> <p>Discuss the connection between chemistry and society in terms of technological implications, ethical and economic aspects related to high social impact issues;</p> <p>Present and discuss self-evaluation and assessment tools coherent with the adopted strategies and methods and with the education level.</p>
TEACHING METHODS	The course includes lectures as well as individual and group practical classroom and/or laboratory activities
SUGGESTED BIBLIOGRAPHY	<p>Testi di riferimento:</p> <p>A Guidebook of Good Practice for the Pre-Service Training of Chemistry Teachers scaricabile da http://www.zdch.uj.edu.pl/documents/87419401/e347904e-c062-4275-b688-c222629d57a4</p> <p>G. Villani, La Chiave del mondo. Dalla filosofia alla scienza: l'onnipotenza delle molecole, CUEN, 2001, scaricabile da http://www.culturachimica.it/wp-content/uploads/2017/04/La-chiave-del-mondo.pdf.</p> <p>V. Domenici, Insegnare e apprendere la chimica, Mondadori, 2018, ISBN: 8861846009</p> <p>Testi di approfondimento:</p> <p>L. Cerruti, Bella e potente: la chimica del Novecento fra scienza e società, (2a ed.) Ed.Riuniti, 2016.</p> <p>J.G. Garcia-Martinez (Ed.), E. Serrano-Torregrosa (Ed.), Chemistry Education: Best Practices, Opportunities and Trends, Wiley 2015.</p> <p>L. Paoloni, Nuova didattica della chimica: un progetto culturale per la scuola secondaria, Società Chimica italiana, 1982.</p>

E. Roletto, La scuola dell'apprendimento Erickson, 2005.
 J. K. Gilbert, D. Treagust, Models and modeling in science education: Multiple representations in chemical education, Springer (2009)
 H.-D. Barke, A. Hazari, S. Yitbarek, Misconceptions in Chemistry: Addressing Perceptions in Chemical Education, Springer, 2009.
 R. Cervellati, F. Olmi, Tecniche di verifica dell'apprendimento della chimica, Zanichelli, 1989.

SYLLABUS

Hrs	Frontal teaching
4	Role of models and modeling in chemistry: epistemology and educational aspects.
4	Teaching by problems and the role of the experimental laboratory in chemistry education.
6	Criteria for planning educational approaches based on inquiry and for selecting learning evaluation tools which take into account the concept development and the conceptual planes required by the different school levels. Planning stages: objectives and target identification, process and time requirements definition, selection of the learning outcome assessment.
2	Chemistry and Society
Hrs	Practice
18	Activity 1: Implementation of a learning sequence on one of the basic concepts in chemistry with the objective of specify: the target, the necessary requisites; the expected learning outcomes; the necessary implicit conceptual framework; the detailed description of activities to be performed in the classroom or in the laboratory; the time requirements; acquired competences assessment techniques. In this activity individual and group sessions are used (peer education).
18	Activity 2: Investigation of the teaching and learning processes in chemistry by tools and techniques including recent multimedia tools. Analysis of the effectiveness of multimedia tools, simulations and interactive software packages for the understanding of chemistry, with particular reference to conceptual, epistemology, linguistic and didactic hurdles and the role of the teacher. In this activity individual and group sessions are used (cooperative learning).
12	Activity 3: Individual presentations to the entire classroom, according to the Flipped Classroom idea, of a literature review of material dealing with Chemistry and Society issues: discussion of aspects and ethical, economical and social implications dealing with general interest topics such as environment, health, food, energy, new materials, cultural heritage conservation, etc.