



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria			
ACADEMIC YEAR	2022/2023			
BACHELOR'S DEGREE (BSC)	ENVIRONMENTAL ENGINEERING			
SUBJECT	APPLIED CHEMISTRY			
TYPE OF EDUCATIONAL ACTIVITY	C			
AMBIT	10653-Attività formative affini o integrative			
CODE	01814			
SCIENTIFIC SECTOR(S)	ING-IND/22			
HEAD PROFESSOR(S)	MISTRETTA MARIA CHIARA	Ricercatore a tempo determinato	Univ. di PALERMO	
OTHER PROFESSOR(S)				
CREDITS	6			
INDIVIDUAL STUDY (Hrs)	96			
COURSE ACTIVITY (Hrs)	54			
PROPAEDEUTICAL SUBJECTS	07844 - GENERAL AND INORGANIC CHEMISTRY WITH ELEMENTS OF ORGANIC CHEMISTRY			
MUTUALIZATION				
YEAR	2			
TERM (SEMESTER)	1° semester			
ATTENDANCE	Not mandatory			
EVALUATION	Out of 30			
TEACHER OFFICE HOURS	MISTRETTA MARIA CHIARA Tuesday 10:00 11:00 Terzo piano Ed.6 Thursday 10:00 11:00 Terzo piano Ed.6			

DOCENTE: Prof.ssa MARIA CHIARA MISTRETTA

PREREQUISITES	In order to understand the topics and to easily achieve the learning goals of the teaching course, the student must be confident with the following subjects: Chemistry and Physics
LEARNING OUTCOMES	Knowledge and understanding ability The student, at the end of the teaching course, will know the physical-chemical properties of water and different softening methods, classes of fuels, physical-chemical properties of different fuels and combustion processes. The student will have full knowledge of different classes of materials, processing methodologies and applications of materials. Ability to apply knowledge and understanding The student will be able to determinate water hardness and to describe the complete and incomplete combustion process and the composition of fumes. The student will also be able to intervene on the materials in terms of composition, production and properties. The student will be able to verify the adequateness and the durability of a material for a specific application by knowing the initial characteristics of the material and the tests necessary to evaluate the properties. At the same time, the student will be able to assess the best choice among different materials in order to obtain a determined device based on the requested specifications. Judging autonomy The student will be able to choose the most appropriate methodologies for water softening and to evaluate the combustion processes. The student will be able to choose the most appropriate material for a certain application based on the requested characteristics. The student will also be able to choose tools and tests necessary to describe the applicability range of a material and the performance of the final products. Communication ability The student will acquire the capability to communicate and express problems inherent the course topics. The student will be able to highlight questions related to the preparation and processing of different materials, exposing the information in an adequate technical language. Learning ability At the end of the course, the student will have learnt how to determinate the water hardness, to choose appropriate methodology for water softening and to describe the combustion complete and incomplete processes. This will allow continuing the studies with improved autonomy, dynamism and with the awareness to be able to make supported choices when realizing potential projects.
ASSESSMENT METHODS	The evaluation will be based on two tasks: a written test and interview. The final assessment is on a 30 basis according to the criteria reported below: 30-30+: excellent knowledge of the topics, excellent language and vocabulary, good analytical capability, the student is able to apply knowledge to solve the proposed problems 26-29: Good management of the topics, nice language and vocabulary, the student is able to apply knowledge to solve the proposed problems 24-25: basic knowledge of the topics, fair language and vocabulary, limited capability to apply autonomously knowledge to solve the proposed problems 21-23: the student does not show full management of the main topics while possessing the knowledge, satisfactorily language and vocabulary, poor capability to apply autonomously the acquired knowledge 18-20: minimal basic knowledge of the main topics and of the technical language and vocabulary, poor or no capability to apply autonomously the acquired knowledge. The exam will be not passed if the student will show a not acceptable knowledge of the topics.
EDUCATIONAL OBJECTIVES	The course aims to study the physical-chemical properties of water, main softening methodologies, physical-chemical properties and composition of different fuels. It will be studied also complete and incomplete combustion processes. It will be studied also the industrial production and treatment of solid, liquid and gas fuels. Additional goal is the study of structures and properties of different kinds of materials in order to formulate the main properties – structure – processing relationships. The final part of course will be devoted to the study of the formulation and production of composites materials.
TEACHING METHODS	Lectures, Exercises
SUGGESTED BIBLIOGRAPHY	• G. Polizotti, "L'Acqua", Ambrosiana • C. Brisi, "Chimica Applicata", Levrotto e Bella • W.F. Smith, "Scienza e Tecnologia dei Materiali", Mc Graw Hill

SYLLABUS

Hrs	Frontal teaching
8	Water: Physical-chemical properties of water and water solutions. Analysis and characterization of mineral waters. Water treatments: sedimentation, softening, demineralization, oxidation
8	Fuels and combustion processes: Solid, liquid and gas fuels: physical-chemical properties and characterizations. Complete and incomplete combustion processes. Composition of fumes (exhaust gas). Treatments of fuels.
6	Materials structure: Solid state and crystalline structures, lattice of Bravais, amorphous materials. Atomic density and density factor. Structural and morphological characterizations. Mechanical properties and static tensile test: stress, strain and elastic modulus.
6	Metals: Diagram Fe-C, steel and cast iron. Diagram TTT – Time- temperature – transformation. Thermal and chemical treatments. Special steel, inox and cast iron.
6	Polymers: Macromolecules: synthesis, classification and applications.
4	Ceramics: structure and main properties
2	Composites: Fibers and particles based composites. Anisotropic properties and micro-mechanics of materials.
Hrs	Practice
4	Water: calculation of water hardness, reagents for water softening
4	Combustion: fumes composition and requested air
2	Structures of materials: calculation of elastic modulus and properties at break
4	Metals: state diagrams