Università degli Studi della Basilicata
Scuola di Ingegneria

COURSE: Materials Technology and Applied Chemistry			
ACADEMIC YEAR: 2019-2020			
TYPE OF EDUCATIONAL ACTIVITY: Characteristic			
TEACHER: Milena Marroccoli			
e-mail: milena.marroccoli@unibas.it		web:	
phone: +390971205221		mobile:	
Language: ITALIAN			
ECTS: 9	n. of hours: 90	Campus: Potenza School of Engineering Program: Mechanical Engineering	Semester: II

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The main knowledges refer to:

- Relationships among composition, microstructure and properties of metals, polymers and ceramics.
- Materials and substances mainly related to the Mechanical Engineering Field.
- Main physico-chemical water treatment techniques.
- Solid, liquid and gaseous fuels.

The student will be able to:

- select the most suitable materials to be employed in the Mechanical Engineering Field;
- determine the most effective methodology for the treatment of industrial water on the basis of the required chemical-physical characteristics
- evaluate the main fuel technological parameters.

PRE-REQUIREMENTS

Basic concepts of Fundamentals of Chemistry

SYLLABUS

The classes of materials. Primary and secondary chemical bonds. The crystal structure of metals and ceramics. Coordinates of Atomic Positions, Directions and Planes. Dense Planes and Directions. Defects in Crystalline solids. Dislocations Mechanism of Plastic Deformation.

Strengthening a Metal: solid solution hardening, precipitate and dispersion strengthening, cold work-hardening, the dislocation yield strength . Increasing the ductility by annealing

Mechanical properties. Stresses and strains. Linear and non linear Elasticity. Anelastic behaviour. Engineering and true stress-strain curves. Plastic deformation of metals. Hardness. Fracture. Fatigue. Creep.

Thermal properties. Heat capacity. Thermal expansion. Thermal conductivity. Thermal stresses.

Phase Diagrams. Gibb's rule. Behaviour of Binary Alloys. Phases, Components and Phase Diagrams. Solid Solutions. Analysis of Binary Phase Diagrams. The Binary Eutectic Phase Diagram. Intermediate Compounds and Intermediate Phases. Peritectic solidification.

Metals. Cast iron and steel manufacturing process. The Iron-Carbon System. Steels. Carbon content influence on the technical behaviour of steels. Cast iron. ccT and TTT diagrams. Thermal treatments on steels. Non-ferrous alloys.

Refractories.

Polymeric materials. Thermoplastics and thermosetting polymers. Polymer production process. Polymer composites.

Combustion and fuels. Heating value. Combustion chemistry. Stoichiometric amount of air and excess air. Theoretical combustion temperature. Burning gas volume. Ignition temperature. Flammable limits. Fossil fuels: combustibile and incombustibile components. Fossil coal and coke coal. Petroleum distillation. Liquid fuels: gasoline, diesel, kerosene and combustible oil. Gaseous fuels: natural and synthetic gas. Non

traditional fuels.

Lubricants. Classification, components, properties, function.

Water. Properties. Analysis. Industrial water treatment method. Suspended solids separation: sedimentation, coagulation, filtration. Degasification. Temporary and permanent water hardness. Dissolved solid separation. Water softening. Demineralization. Sea water treatment processes.

TEACHING METHODS

Theoretical lessons, Classroom tutorials.

EVALUATION METHODS

Written examination lasting 2 hours. Partial written tests may also be held.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

- Notes from lectures
- W. F. Smith – Scienza e Tecnologia dei materiali, McGraw Hill Italia.
- C. Brisi – Lezioni di Chimica Applicata, Editrice Universitaria Levrotto & Bella, Torino.
- AIMAT – Manuale dei materiali per l'ingegneria, McGraw Hill Italia.

INTERACTION WITH STUDENTS

Wednesday 3-5 pm. Other appointments can be arranged with students by e-mail.

EXAMINATION SESSIONS (FORECAST)

2020 Year

4/2; 20/3; 8/5; 12/6; 16/7; 17/9; 6/11; 11/12

SEMINARS BY EXTERNAL EXPERTS YES □ NO X

FURTHER INFORMATION