Università degli Studi della Basilicata
Scuola di Ingegneria

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|---|---|---|---|
| COURSE: Materials Technology and Applied Chemistry | | | |
| ACADEMIC YEAR: 2016-2017 | | | |
| TYPE OF EDUCATIONAL ACTIVITY: Characterizing | | | |
| TEACHER: Milena Marroccoli | | | |
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| phone: +39 0971205221 | | mobile (optional): | |
| Language: italian | | | |
| ECTS: 6 | n. of hours: 60 | Campus: Potenza<br>School of Engineering<br>Program: Mechanical Engineering | Semester: II |

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

Aim of the course is to provide students with an overview of the relationships between composition, microstructure, properties and production technology of metallic, ceramic and polymeric materials. In particular, at the end of the course the student will acquire a critical understanding of different classes of materials for industrial engineering and will be able to choose the most suitable for a specific application by foreseeing their expected behavior once carried out; the student will know the characteristics and uses of the main categories of fuels and will learn the basic knowledge of the chemical and physical methods applied to the treatment of water for industrial usage.

PRE-REQUIREMENTS

Basic contents 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.

**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 combustibile 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. Tutorials in classroom. Technical visits.

EVALUATION METHODS
Written examination

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL
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 from 3 to 5 pm.
Another appointment can be arranged by e-mail.

EXAMINATION SESSIONS (FORECAST)[1]
2017 year
15/02, 22/03, 26/04, 24/05, 28/06, 24/07, 18/09, 18/10, 29/11, 13/12

SEMINARS BY EXTERNAL EXPERTS YES □ NO □

FURTHER INFORMATION

[1] Subject to possible changes: check the web site of the Teacher or the Department/School for updates.