

MODULE	AREA	YEAR	SEMESTER	ECTS CREDITS	COURSE
Industrial Electronic	Thermofluidics and Materials	2nd	3rd	6	Required
LECTURER			ADDRESS		
José María Moreno Sánchez			Departamento de Química Inorgánica Facultad de Ciencias Despacho nº 5 Tfno. 958248095 email: jmoreno@ugr.es		
			TUTORIAL ASSISTANCE		
			http://inorganica.ugr.es		
GRADE			OTHER GRADES		
Industrial Electronic Engineering Grade			Chemistry Grade / Chemical Engineering Grade		
RECOMMENDATIONS					
Fluent reading of scientific English. Backgrounds in General Chemistry.					
BRIEF DESCRIPTION OF CONTENTS					



Introduction to Materials Science and Engineering. Physical-Chemistry properties of different materials. Materials Composition-Structure-Properties correlation.

SYLLABUS

THEORETICAL CONTENT:

UNIT 1. Introduction to Material Science and Technology.

UNIT 2. Crystalline and Vitreous Materials.

Crystal structure versus vitreous (glass) structure. Important metal and ceramic crystal structures. Defects. Slip systems.

UNIT 3. Mass diffusion.

Metal casting. Solid State Kinetic: Fick's laws. Diffusion. Material Science applications.

UNIT 4. Metals: ferrous and nonferrous alloys.

Metal Processing. Metal hardening. Ferrous Alloy: Fe-C phase diagram. Plain carbon steels. Alloy steels. Cast Irons. Nonferrous Alloy: Al, Cu, Ti, Mg, Ni, Zn.

UNIT 5. Ceramic Materials.

Overview. Glass ceramics. Traditional and Engineering ceramics.

UNIT 6. Electrical Properties of materials.

Conduction and carriers. Dielectrics and Insulators. Superconductors. Intrinsic and Extrinsic semiconductors. Applications: Ferroelectrics, piezoelectrics, pyroelectrics and thermistors (vs thermocouples).

UNIT 7. Optical and Magnetic Properties of materials.

Reflection, refraction, absorption and transmission. Color. Lasers. Optical fibers. Liquid Crystals. NLO Materials. Diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, ferrimagnetism. Hard and Soft magnetic materials.

UNIT 8. Polymers.

Overview. Polymerization reactions and morphology. Thermoplastic, Thermosetting and Elastomer polymers. Processing of polymers.

UNIT 9. Composite Materials.

Reinforcement of composites. Fiber reinforcement Polymers. Processing of composites in materials. Traditional composites: Concrete and Asphalt.

SEMINARS:

Mechanical properties of materials.

Phase diagrams.

Characterization of solids.

Preparation of monocrystals.

Thermal properties of materials.



LABORATORY PRACTICE:

Stress-Strain testing.

Hardness testing.

REFERENCES

MAIN BIBLIOGRAPHY:

«Foundations of Materials Science and Engineering». William Fortune Smith, Javad Hashemi. McGraw-Hill, 2011.

«Materials Science and Engineering: An Introduction». William D. Callister, Jr., David G. Rethwisch. Wiley, 2016.

«Introduction to Materials Science for Engineers». James F. Shackelford. Pearson, 2010.

ADDITIONAL BIBLIOGRAPHY:

«Principles of Materials Selection for Engineering Design, The». Pat L. Mangonon. Pearson, 1999.

«Introducción a la Metalurgia Física». S.H. Avner. Mc Graw-Hill, 1988.

«Introducción a la Química de los Polímeros». R.B. Seymour y C.E. Carraher, Jr. Reverté, 2002.

LINKS

- <http://grados.ugr.es/electronica/>
- <http://fciencias.ugr.es/estudios/titulos-de-grado>
- <http://prado.ugr.es/moodle/>

ATTENDANCE SYSTEM

Attendance at lectures and laboratory classes is mandatory.

ADDITIONAL INFORMATION

