



Course code Course title
 METRO 009 Metals and alloys: an introduction

Course summary

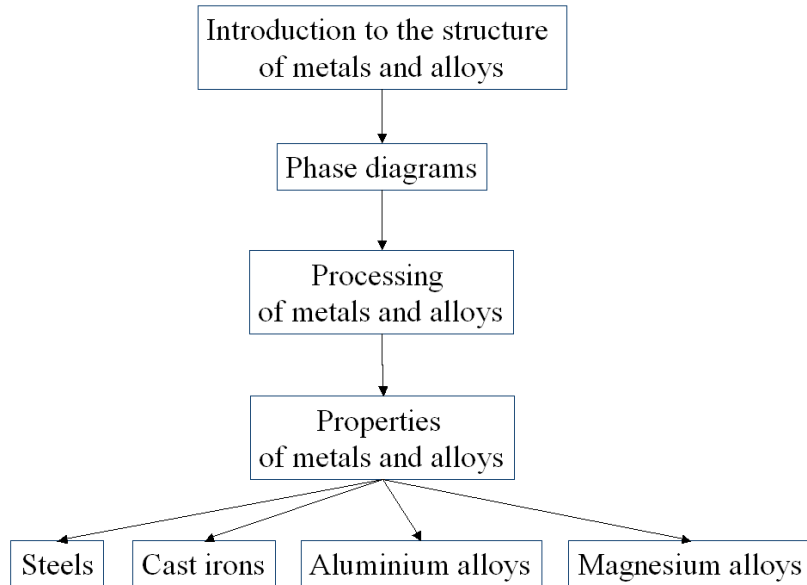
The course gives an introduction to the structure of metals and alloys in the solid state (lattice systems, crystal and their defects, solid solution, phase diagrams). After a short description of the fundamentals of metals and alloys processing (solidification, deformation, diffusion), the main families of commercial metallic alloys (steels, cast irons, Aluminium and Magnesium alloys) are reviewed. Attention is devoted, for each family, to the more frequent microstructures, the processes leading at them and the properties resulting from them.

Lectures list

n.	Title	Summary	Lecturer	Duration
1	Introduction to the structure of metals and alloys	Metallic bonding, crystal structure and defects, solid solutions	Bonollo, Franco	37'
2.	Phase diagrams	The basics of phase diagrams is presented, with reference to the most common cases of binary systems (complete, partial or null solubility in the solid state)	Bonollo, Franco	1h 04'
3.	Processing of metals and alloys (1)	Solidification structures (planar, cellular and dendritic, columnar and equiaxed) and basics of deformation (motion of dislocations)	Bonollo, Franco	39'
4.	Processing of metals and alloys (2)	Solid state diffusions and strengthening mechanisms (solid solution, strain hardening, grain size and precipitation)	Bonollo, Franco	48'
5.	Properties of metals and alloys	Overview of the main engineering properties of metals and alloys; concept of properties-processing-microstructure correlation	Bonollo, Franco	20'
6.	Steels (1)	Fe-C diagram: overview of the main phases and structures, and of the related properties	Bonollo, Franco	39'
7.	Steels (2)	Isothermal and anisothermal transformation of austenite, heat treating of steels, main groups of steels according to standards	Bonollo, Franco	50'
8.	Cast irons	Basics of cast iron: families, microstructures, properties and applications	Bonollo, Franco	31'
9.	Aluminium alloys	Overview of families, microstructure and properties of Aluminium alloys	Bonollo, Franco	34'
10.	Magnesium alloys	Overview of families, microstructure and properties of Magnesium alloys	Bonollo, Franco	34'
				6h 36'

Lectures prerequisites chart

Metals and alloys: an introduction



Each arrow means a prerequisite.