Course Syllabus

Department/Faculty
School of Engineering

Graduate Program
Materials Engineering and Nanotechnology

Degree
☒ Academic Master's ☒ Doctorate (PhD) ☐ Professional Master's

Course Name
Aluminum Alloys: Processing and Applications

Professor(s)

Office hours
48

Course Overview
This course involves the knowledge of the main aluminum alloys and their applications, the processing possibilities, their properties and microstructural characteristics, ending with their recycling. History and evolution of the market. Alloys of aluminum. Effects of alloying elements and impurities. Properties and applications of aluminum alloys. Liquid/solid transformation of aluminum and its alloys. Casting. Solidification. Phase diagrams of aluminum alloys. Heat treatments of aluminum and its alloys. Mechanical conformation of aluminum. Industrial manufacturing processes of aluminum. Industrial processes for the casting of aluminum alloy parts. Surface treatments of aluminum and its alloys. Metallographic analysis of aluminum alloys. Microstructural analysis techniques. Recycling of aluminum and its alloys.

Topics outline

- Obtaining primary aluminum;
- Mechanical conformation of aluminum alloys;
- Casting of aluminum alloys;
- Solidification of aluminum alloys;
- Properties and applications of aluminum alloys;
- Heat treatments of aluminum and its alloys;
- Surface treatments of aluminum and its alloys;
- Microstructural analysis techniques of aluminum and its alloys;
- Welding of aluminum and its alloys;
- Recycling of aluminum and its alloys.

Letter Grade Assignment
Grade A (Excellent) - Grade points between 9 and 10
Grade B (Good) - Grade points between 8 and 8.9
Grade C (Satisfactory) - Grade points between 7 and 7.9
Grade D (Unsatisfactory) - Grade points between 0 and 6.9

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Texts, Materials, and supplies

- ALTENPOHL, D.G. (Ed.). Aluminum: Technology, Applications, and Environment. USA: The Aluminum Association Inc. and TMS, 1998.
- Associação Brasileira do Alumímio. ABAL. Guia Técnico do Alumínio: Extrusão. 3 ed. São Paulo, 2005, v. 1; Guia Técnico do Alumínio: Laminação. 2 ed. São Paulo, 2004, v. 2; Guia Técnico do Alumínio: Tratamento de Superfície. 2 ed. São Paulo, 2005, v.3; Guia Técnico do Alumínio: Tratamento Térmico. São Paulo, 2003, v.6.
- DAVIS, J.R. (Ed.). Aluminum and Aluminum Alloys. USA: ASM International, 1993. JORSTAD, J. L.; RASMUSEN, W. M.
- Aluminum Casting Technology. 2nd. ed. ZALENSAS, L. D. (Ed.) Illinois: American Foundrymen's Society, 1993. KISSEL, R. J.; FERRY, R. L.
- Aluminum Structures: A guide to their specifications and design. 2nd. ed. New York: John Wiley & Sons, 2002. MANDAL, N.R.
- Aluminum Welding. 2nd. ed. USA: Narosa Publishing House and ASM International, 2005. SAHA, P. K. Aluminum Extrusion Technology. USA: ASM, 2000.
- TOTTEN, G.E.; MACKENZIE, D.S.(Ed.). Handbook of Aluminum: Physical Metallurgy and Process. New York: Marcel Dekker,2003, v. 1.
- VASUDEVAN, A.K.; DOHERTY, R.D. (Ed.). Aluminum Alloys: Contemporary Research and Applications. Treatise on Materials Science and Technology. Boston: Academic Press, 1989, v. 31.