

# POSMAT I Programa de Pós-graduação em Engenharia de Materiais



**Course:** Heat Treatment of Metallic Alloys

**Code:** P00TETRATLM.1

**Credits:** 03

**Module:** Specific formation

**Research area:** Selection, processing and characterization

## Contents:

Heat treatments of pure metals and alloys – general objectives, types and variables. Atomic diffusion. Nucleation and growth. Phase transformations – reconstructive and displacive mechanisms. The iron – iron carbide equilibrium diagram. Decomposition of austenite. Isothermal and continuous cooling transformation diagrams. Recovery, recrystallization and grain growth. Heat treatments related to non-hardened structures – stress relief annealing, recrystallization annealing, full annealing, isothermal annealing, spheroidizing and normalizing. Heat treatments associated with hardened structures – quenching, tempering, martempering, austempering and precipitation hardening. Thermomechanical treatments. Thermochemical treatments.

## References:

1. KRAUSS, G. **Steels: heat treatment and processing principles**. 2<sup>nd</sup> ed. Ohio: ASM International, 1990.
2. ABBASCHIAN, R.; ABBASCHIAN, L.; REED-HILL, R.E. **Physical metallurgy principles**. 4<sup>th</sup> ed. Stamford: Cengage Learning, 2009
3. BHADESHIA, H. K. D. H.; HONEYCOMBE, R.W.K. **Steels: microstructure and properties**. 3<sup>rd</sup> ed. Oxford: Butterworth-Heinemann, 2006.
4. TOTTEN, G. E. **Steel heat treatment: metallurgy and technologies**. 2<sup>nd</sup> ed. Boca Raton: CRC Press, 2007.
5. COLPAERT, H. **Metalografia dos produtos siderúrgicos comuns**. 4 ed. São Paulo: Blucher, 2008.