Engineering Program

Specialization Production and Computer Aided Manufacturing Technology
Course Number **020202212**
Course Title **Metallurgical Treatment**
Credit Hours (1)
Theoretical Hours (0)
Practical Hours (3)

Brief Course Description:

Preparation of specimen: Microscopic inspection, Cooling curves and phase diagrams,
Materials structure analysis. Surface-hardening. Heat treatment effect on properties. Electro plating processes.
Iron-carbon system. Heat treatment and tests.

Course Objectives:

At the end of this course student will be able to:
1. To practically distinguish between the different phases of iron
2. Use the metallurgical microscope to study microstructure
3. Harden the surface of the metals by electroplating process.

Detailed Course Description:

Number	Title	Content	Time
	Optical observation of cast macrostructure	Cast preparation (melting/casting/grinding and polishing) Optical observation	
	Microscopic specimen observation	Metallurgical microscope to observe metallurgical microstructure and to distinguish different phases and metallic structure features	
	Non-Crystalline material cooling curve	Melting Cooling curves construction (manual/computer aided)	
	Crystalline material cooling curve	Melting Cooling curves construction (manual/computer aided)	
	Binary alloy equilibrium phase diagram (completely soluble in the liquid state, completely/partially soluble or insoluble in the solid state)	Melting Cooling curves construction (manual/computer aided) Binary phase diagram construction	
	Cast iron types macro/micro-scopic observation	Grey cast iron White cast iron Chilled cast iron Spherodite Malleable cast iron	
	Effect of aging/quenching/annealing/normalizing on macro/micro-structural/mechanical properties		
	Hardenability (Jominy test)		
	Chemical heat treatment of steel	Carbiding Nitriding Carbon-nitriding Diffusion case hardening	
	Electroplating		

Evaluation Strategies:

Evaluation		Percentage	Date

Exams	Midterm	20%	
	Final Exam	50%	
Projects and Laboratory Assignments		30%	

Teaching Methodology:

- Lecturing
- Workshop practicing and team work
- Projects
- Technical videos watching

Text Books & References:

Text Books:

- Introduction to physical metallurgy, Avner
- علم المعادن والمعاملة الحرارية للمعادن، يو.لاختين

References:

- Supplied laboratory manual
- الميتالورجيا الفيزيائية (الفلزات)، أحمد سالم الصباغ