



COURSE OUTLINE: MAC202 - METALLURGY II

Prepared: Kevin Sloss

Approved: Corey Meunier, Chair, Technology and Skilled Trades

Course Code: Title	MAC202: METALLURGY II					
Program Number: Name	6346: GENERAL MACHINIST L2					
Department:	MECHANICAL TECHNIQUES PS					
Academic Year:	2022-2023					
Course Description:	Upon successful completion the apprentice will be able to describe elements of non-ferrous metals and the heat-treating and testing of ferrous metal.					
Total Credits:	1					
Hours/Week:	3					
Total Hours:	12					
Prerequisites:	There are no pre-requisites for this course.					
Corequisites:	There are no co-requisites for this course.					
Essential Employability Skills (EES) addressed in this course:	<p>EES 6 Locate, select, organize, and document information using appropriate technology and information systems.</p> <p>EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.</p> <p>EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.</p> <p>EES 11 Take responsibility for ones own actions, decisions, and consequences.</p>					
Course Evaluation:	<p>Passing Grade: 70%,</p> <p>A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.</p>					
Books and Required Resources:	<p>Technology Of Machine Tools by Steve F. Krar, Arthur R. Gill, Peter Smid, Robert J. Gerritsen Publisher: McGraw - Hill Edition: 8 ISBN: 9781260565782</p>					
Course Outcomes and Learning Objectives:	<table border="1"> <thead> <tr> <th>Course Outcome 1</th> <th>Learning Objectives for Course Outcome 1</th> </tr> </thead> <tbody> <tr> <td>1. Describe safe working procedures associated with heat-treating furnaces and hand held equipment.</td> <td> 1.1 Describe furnace heat-treating safety procedures and equipment including: <ol style="list-style-type: none"> i. protective clothing ii. protective equipment iii. temperatures iv. ventilation v. fire hazards 1.2 Describe hand held heat-treating safety procedures including: </td> </tr> </tbody> </table>	Course Outcome 1	Learning Objectives for Course Outcome 1	1. Describe safe working procedures associated with heat-treating furnaces and hand held equipment.	1.1 Describe furnace heat-treating safety procedures and equipment including: <ol style="list-style-type: none"> i. protective clothing ii. protective equipment iii. temperatures iv. ventilation v. fire hazards 1.2 Describe hand held heat-treating safety procedures including:	
Course Outcome 1	Learning Objectives for Course Outcome 1					
1. Describe safe working procedures associated with heat-treating furnaces and hand held equipment.	1.1 Describe furnace heat-treating safety procedures and equipment including: <ol style="list-style-type: none"> i. protective clothing ii. protective equipment iii. temperatures iv. ventilation v. fire hazards 1.2 Describe hand held heat-treating safety procedures including:					



	<ul style="list-style-type: none"> i. protective clothing ii. protective equipment iii. temperatures iv. ventilation v. storage and handling of equipment vi. fire hazards
Course Outcome 2	Learning Objectives for Course Outcome 2
2. Describe ferrous metal heat-treating processes.	<ul style="list-style-type: none"> 2.1 Describe flame hardening and tempering processes: <ul style="list-style-type: none"> i. tempering colours ii. quenching media iii. surface preparation iv. workpiece holding/positioning 2.2 Describe the process for hardening of ferrous metals: <ul style="list-style-type: none"> i. heat-treating specifications ii. metallurgical structural change iii. maximum hardness iv. strength v. toughness vi. wear resistance vii. machinability viii. distortion ix. work preparation procedures x. time-temperature cycle xi. depth of hardness xii. quenching procedures xiii. pre-heating xiv. cooling xv. case hardening 2.3 Describe the process and advantages for pack carburizing of steel: <ul style="list-style-type: none"> i. heat-treating specifications ii. carbon content iii. hardenability iv. strength v. toughness vi. wear resistance vii. machinability viii. type of furnace ix. carbonaceous mixtures x. depth of case xi. selective areas to be carburized xii. time-temperature cycle 2.4 Describe the process and advantages for tempering of ferrous metals: <ul style="list-style-type: none"> i. heat-treating specifications ii. metallurgical structural change iii. hardness iv. strength v. toughness vi. wear resistance vii. machinability

		<ul style="list-style-type: none"> viii. type of furnace ix. temperature colours x. workpiece application colours <p>2.5 Describe the process and advantages for annealing of ferrous metals:</p> <ul style="list-style-type: none"> i. heat-treating and cooling procedures ii. internal stresses iii. machinability iv. type of furnace
	Course Outcome 3	Learning Objectives for Course Outcome 3
	3. Describe hardness testing methods.	<p>3.1 Describe hardness testing methods and procedures.</p> <p>3.2 Describe types and operating principles of hardness testers:</p> <ul style="list-style-type: none"> i. Rockwell ii. Brinell iii. Vickers iv. Scleroscope v. Scratch <p>3.3 Describe the range and values of hardness tester scales.</p> <p>3.4 Describe equipment for hardness testers:</p> <ul style="list-style-type: none"> i. penetrators ii. anvils iii. loads
	Course Outcome 4	Learning Objectives for Course Outcome 4
	4. Describe elements and machinability of non-ferrous metals.	<p>4.1 Describe non-ferrous metals:</p> <ul style="list-style-type: none"> i. smelting and shaping process ii. shapes iii. sizes iv. tolerances v. surface conditions vi. SAE/ASTM code classifications vii. manufacturers= code classifications viii. applications ix. chemical/physical properties x. alloying elements xi. tensile strength xii. malleability xiii. ductility xiv. machinability xv. castability xvi. weight comparison xvii. hardness xviii. corrosion resistance xix. wear resistance xx. colour xxi. melting point

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
Assignment	70%

	Final Test	25%
	Quiz	5%

Date: July 11, 2022

Addendum: Please refer to the course outline addendum on the Learning Management System for further information.