



# COURSE OUTLINE

## MET207

Prepared: Neal Moss    Approved:

<b>Course Code: Title</b>	MET207: METALLURGY
<b>Program Number: Name</b>	4039: MECH. ENG. TN-MANUFA
<b>Department:</b>	MECHANICAL TECHNIQUES PS
<b>Semester/Term:</b>	18W
<b>Course Description:</b>	The general objective of this course is to give students destined for the mechanical trades a basic understanding of metals and alloys they will be working with in heavy industry. A heavy emphasis is placed on the iron-carbon system and the physical metallurgy of steel including heat treating and welding. Some laboratory work on heat treating steel is included to witness the effect heat treating has on the microstructure and harness of carbon steel.
<b>Total Credits:</b>	3
<b>Hours/Week:</b>	2
<b>Total Hours:</b>	30
<b>Substitutes:</b>	ASR118, MET212
<b>General Education Themes:</b>	Science and Technology
<b>Course Evaluation:</b>	
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	<p>Grade                      Definition Grade Point Equivalent                      A+ 90 - 100% 4.00                      A 80 - 89%                      B 70 - 79% 3.00                      C 60 - 69% 2.00                      D 50 - 59% 1.00                      F (Fail) 49% and below 0.00</p> <p>CR (Credit) Credit for diploma requirements has been awarded.                      S Satisfactory achievement in field /clinical placement or non-graded subject area.                      U Unsatisfactory achievement in field/clinical placement or non-graded subject area.                      X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.                      NR Grade not reported to Registrar's office.</p>

W Student has withdrawn from the course without academic penalty.

**Evaluation Process and Grading System:**

Evaluation Type	Evaluation Weight
Labs / Assignments	15%
Participation	15%
Tests and Quizzes	70%

**Books and Required Resources:**

Safety Boots and Safety Glasses  
Publisher: Handouts provided by Prof  
Safety Boots and Safety Glasses

**Course Outcomes and Learning Objectives:**

**Course Outcome 1.**

INTRODUCTION TO METALLURGY

**Learning Objectives 1.**

Potential Elements of the Performance:

Define:

- i. Extractive Metallurgy
- ii. Mechanical Metallurgy
- iii. Physical Metallurgy

**Course Outcome 2.**

ATOMIC STRUCTURE OF METALS

**Learning Objectives 2.**

Potential Elements of the Performance:

Explain the differences between the atomic order of:

- i. Gases
- ii. Liquids
- iii. Solids
  - Describe the atomic and crystalline structures of iron as a function of temperature.
  - Describe how carbon can be in solid solution with iron.

**Course Outcome 3.**

IRON-CARBON EQUILIBRIUM DIAGRAM

**Learning Objectives 3.**

Potential Elements of the Performance:

- Demonstrate an understanding of the iron carbon diagram.

**Course Outcome 4.**

## TIME/TEMPERATURE/TRANSFORMATION DIAGRAM

### **Learning Objectives 4.**

Potential Elements of the Performance:

- Describe what happens when iron-carbon alloys are cooled from the austenitic temperature region to room temperature in real time.
- Describe how differing cooling rates affect the structure of iron-carbon alloys.
- Describe what happens to the time/temperature diagram when the carbon content is varied and when other alloying elements are added.
- Determine and demonstrate a plain carbon steel hardening process as assigned.
- Identify certain microstructures using a microscope.

### **Course Outcome 5.**

## STEEL ALLOYING AND PROCESSING (ROLLING/FORGING)

### **Learning Objectives 5.**

Potential Elements of the Performance:

To describe the effect that alloying and mechanical working has on:

- i. The crystal structure of steel
- ii. The mechanical properties of steel

### **Course Outcome 6.**

## HEAT TREATING

### **Learning Objectives 6.**

Potential Elements of the Performance:

To describe the processes and reasons for:

- i. Normalizing
- ii. Quenching and tempering
- iii. Case hardening
- iv. Annealing
- v. Stress relieving

### **Course Outcome 7.**

## MECHANICAL PROPERTIES AND TESTING OF STEEL

### **Learning Objectives 7.**

Potential Elements of the Performance:

- Explain the procedures and interpretation of hardness testing for Rockwell hardness
- Explain how elevated temperatures affect strength.
- Explain the procedure and interpretation of toughness testing and how low temperature affect toughness.

- Explain the phenomena of fatigue and creep.

## **Course Outcome 8.**

WELDING

### **Learning Objectives 8.**

Potential Elements of the Performance:

To describe metallurgical effects of welding on the structure and properties of weldments.

## **Course Outcome 9.**

INTRODUCTION TO STEEL SPECIFICATIONS

### **Learning Objectives 9.**

Potential Elements of the Performance:

- Explain what a standard is
- Explain what a specification is
- Explain how the numbering system in the AISI/SAE steel specification relates to chemical content of steel alloys.

**Date:**

Monday, December 18, 2017

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