North Central State College

MASTER SYLLABUS
2019-2020

A. Academic Division: Business, Industry and Technology

B. Discipline: Mechanical Engineering

C. Course Number and Title: MECT2230 Engineering Materials

D. Course Coordinator: Mike Beebe
Assistant Dean: Toni Johnson, PhD

Instructor Information:
- Name: Click here to enter text.
- Office Location: Click here to enter text.
- Office Hours: Click here to enter text.
- Phone Number: Click here to enter text.
- E-Mail Address Click here to enter text.

E. Credit Hours: 3
Lecture: 2 hours
Laboratory: 2 hours

F. Prerequisites: None

G. Syllabus Effective Date: Fall, 2019

H. Textbook(s) Title:

Practical Metallurgy and Materials of Industry
- Author: Neely and Bertone
- Copyright Year: 2002
- Edition: 6th
- ISBN #: 0130945803

I. Workbook(s) and/or Lab Manual: None; Class Handouts will be distributed

J. Course Description: Physical metallurgy emphasizing commercial alloys, heat treatment, and surface treatment of the iron, steel, aluminum, copper, and aerospace metals. The laboratory covers basic metallographic techniques of specimen polishing, etching, and examination. (TAG # OET013)

K. College-Wide Learning Outcomes:

College-Wide Learning Outcome	Assessments - - How it is met & When it is met
Communication – Written	
Communication – Speech	
Intercultural Knowledge and Competence	
Critical Thinking	
Information Literacy	
Quantitative Literacy	

L. Course Outcomes and Assessment Methods:

Upon successful completion of this course, the student shall:

Outcomes	Assessments – How it is met & When it is met
1. List how engineering materials, metals, polymers, ceramics, and composites are related in origin and structural characteristics. (crystal structure, organic composition and properties, basic chemistry and atomic structure)*	This material is covered in Chapters 2 and 4, over physical properties and structures of metals. It is also covered in the last section over composite materials (non-metallic origin, including organic). Exams at Week 5, 10 and Final Exam
2. List the properties that must be reviewed when making materials selections. (modulus of elasticity, tensile strength, yield strength, shear strength)*	Physical properties of materials is covered in Chapter 7, Plastic Deformation, as well as during lab exercises performing yield, tensile and shear strength testing. Exams at Week 5, 10 and Final Exam Bi-weekly Lab Reports
3. Differentiate between the properties of stiffness, strength, and toughness. (stiffness – modulus, strength – tensile strength, yield, shear strength)*	Physical properties relating to stiffness, strength and toughness are covered during lab exercises using Charpy Impact testing, tensile and shear testing. It is also covered in Chapters 4 and 7, Structure of Metals and Plastic Deformation. Exams at Week 5, 10 and Final Exam Bi-weekly Lab Reports
4. Define vocabulary used in steel terminology.*	Multiple lessons contain vocabulary relating to steel. Chapters 11 thru 17 cover steel related terms from cast iron to stainless steel. This vocabulary is also presented during most labs. Exams at Week 5, 10 and Final Exam Bi-weekly Lab Reports
5. Describe how steels are made. (melting, casting, hot rolling, cold rolling)*	This material is covered within Chapter 11 thru 17, specifically Chapter 11 on the melting, casting and rolling. Exam at Week 5 and Final Exam
6. List and describe the common heat treatments used on steels. (annealing – heat and slow cool, quenching - fast cooling, tempering - low temperature reheating)*	Heat treating is covered in Chapters 13 and 14, Cooling Rates of Steel and Heat Treating. Lab exercises involved in quench and tempering high carbon steel is performed, as well as forging steel above its critical temperature. Exams at Week 5, 10 and Final Exam
7. Describe how cold working and alloy additions alter steel properties. (increase strength, lower ductility)*	This material is covered in Chapter 7, Plastic Deformation as well as in lab exercises where steel is cold worked and hardness is monitored. Exams at Week 5, 10 and Final Exam Bi-weekly Lab Reports
8. Specify tool steels based upon their properties and the heat treatment to which they have been subjected. (evaluate operating temperature, strength, stiffness, cyclic loading)*	Tool steel material is covered in Chapter 15, along with a presentation of tool steels, their make-up and properties. A presentation of carbide cutters is also given. Exams at Week 10 and Final Exam

Outcomes	Assessments – How it is met & When it is met
9. Develop a guideline on how to screen candidate materials and arrive at the proper choice.*	Chapter 7, Plastic Deformation, along with tensile tests and non-destructive hardness testing lab exercises are used to develop skills in material selection. This is also covered in each chapter as non-ferrous and non-metallic material information is introduced. Exams at Week 5, 10 and Final Exam Bi-weekly Lab Reports
10. Demonstrate a basic understanding of polymers, aluminum, and copper	Chapters 18 through 23 cover non-ferrous materials, plus a presentation of composite materials provides information. Week 10 midterm and Final Exam

M. Topical Timeline (Subject to Change):

Wk 1 Space Lattices, Unit Cells, Nucleation, Gram Growth, Dendrites, Allotropy Crystal Defects, Alloy Types, Deformation, Recovery, Recrystalization
Wk 3 Cooling Curves, Equilibrium Diagrams, Iron-Carbon Diagram
Wk 4 Heat Treatment, T-T-T or IT Curve, C-C Curve and Critical Cooling
Wk 5 Hardenability, Joining Test, Quenching, Tampering Problems, Interrupted Quenches
Wk 6 Surface Treatments - Surface Hardening, Surface Coatings, Corrosion
Wk 6 Commercial Steels - SAE and AISI Classifications Trade Designations
Wk 7 Irons - Wrought, Gray, White, Ductile, Malleable
Wk 8 Stainless Steel
Wk 9 Aluminum - Alloy Systems, Properties, Application, Heat Treatment Corrosion, Surface Treatments Commercial Classifications
Wk 10 Other Light Metals - Alloy Systems and Properties, Heat Treatment Hazards
Wk 11 Copper Metals - Alloy Systems and Commercial Designations, Application Heat Treatment, Properties
Wk 12 Nickel Metals
Wk 13 Powder Metallurgy - Description, Characteristics, Application
Wk 14 Foundry - Melting, Alloying, Fluxing, Problems

Wk 1 Examinations of Lab Equipment
Wk 1 Discussion of Lab Safety
Wk 2 Specific gravity and density
Wk 2 Discussion of Report Writing
Wk 3 Tension test
Wk 4 Properties of wood
Wk 5 Hardness testing
Wk 6 Determine tension test with stress raisers
Wk 7 Shear test
Wk 9 Check Buckling
Wk 10 Beam deflection
Wk 12 Composite Materials

N. Course Assignments:

Graded assignments:
1. Written lab reports
2. Lab exercises
3. Midterm
4. Final Exam

O. Recommended Grading Scale:

NUMERIC	GRADE	POINTS	DEFINITION
93–100	A	4.00	Superior
90–92	A-	3.67	Superior
87–89	B+	3.33	Above Average
83–86	B	3.00	Above Average
80–82	B-	2.67	Above Average
77–79	C+	2.33	Average
73–76	C	2.00	Average
70-72	C-	1.67	Below Average
67–69	D+	1.33	Below Average
63-66	D	1.00	Below Average
60-62	D-	0.67	Poor
00-59	F	0.00	Failure

P. Grading and Testing Guidelines:

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Q. Examination Policy:

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R. Class Attendance and Homework Make-Up Policy:

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S. Classroom Expectations:

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T. College Procedures/Policies:

Important information regarding College Procedures and Policies can be found on the syllabus supplement located at https://sharept.ncstatecollege.edu/committees/1/curriculum/SiteAssets/SitePages/Home/SYLLABUS%20SUPPLEMENT.pdf

The information can also be found Choose an item.