

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY
SAULT STE. MARIE, ON

COURSE OUTLINE

COURSE TITLE: Metallurgy

CODE NO: MET-212 SEMESTER: **THIRD**

PROGRAM: Mechanical Engineering Technician - Machining
Mechanical Engineering Technology

AUTHOR: Greg White

DATE: Sept '94 PREVIOUS OUTLINE DATED: Dec 12,1990

APPROVED: QC/ (Ut^/udC^ Qt/d?
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____ COURSE NAME _____ LODE NO.

TOTAL CREDITS 3

PREREQUISITE(S):

Successful completion of the first year mechanical common program.
The student without the above may be accepted with the permission of the instructor.

I. PHILOSOPHY/GOALS: To provide students with a reasonable understanding of the concepts and procedures related to the fields of extractive metallurgy, heat treatment, physical metallurgy and the mechanical testing of metals, the student should have sufficient background to assist others in the solution of work related (metallurgical) problems. _____

II. STUDENT PERFORMANCE OBJECTIVES (OUTCOMES):

Upon successful completion of this course the student will:

- 1) Describe the various fields of material sciences and their relationship and purpose as well as the relationship of various metallurgic studies and their application _____
- 2) Explain the process of extractive metallurgy specific to iron and steelmaking. _____
- 3) Define the characteristics of various metals, the methods of Identification and material standards.
- 4) Describe and demonstrate the various types of heat-treatment performed on carbon steels. _____
- 5) Describe and demonstrate various procedures required for basic mechanical testing of metals. _____
- 6) Read and interpret simple binary phase diagrams and explain various topic areas related to metallography and structure of metals. _____
- 7) Describe and identify key knowledge relating to non-ferrous metals, speciality materials, surface treatments and testing.

III. TOPICS TO BE COVERED:

Approximate Time

- | | |
|--|-------------------------------------|
| 1) Perspectives of material sciences branches and their interrelationship, characteristics and physical properties of materials. | Week One |
| 2) Stages of iron and steelmaking processes, products and specifications. | Wks 2 & 3 |
| 3) Field identification of metals and material standards. | Wks 4 & 5 |
| 4) Heat treatment processes applied to steels | Wks 6,7,8,9 |
| 5) Mechanical testing | Wks 8,9,10 |
| 6) Structure of metals metallography and phase diagrams | Wks 9,10,11 |
| 7) Other ferrous and non-ferrous materials including
cast irons
stainless steels
copper
nickel and cobalt
aluminum
magnesium
titanium
lead, tin and zinc
precious, refractory and specialty metals
powder metallurgy
as well as various types of hard facing and surface treatments including
carburizing
nitriding
cyaniding
flame hardening
coatings
and other types of testing methods and procedures | Weeks 11, 13
13,14 and 15 |

IV. LEARNING ACTIVITIES/REQUIRED RESOURCES

Topic/Unit: - __ Overview of course requirements and of the study of metallurgy and material sciences. __

Learning Activities;

listen to presentation, participate in class discussion of course and background, reading assignment

Resources:

lecture notes, course outline, text chapters 1 and 2

Topic/Unit: - __ Extractive metallurgy, iron and steel production and processes.

Learning Activities;

listen to presentation, participate in class brainstorming discussion, reading assignment

Resources:

lecture notes, overheads, video, supplementary handout: text chapters 10 and 11

Topic/Unit: - __ Field identification of metals and material standards.

Learning Activities:

listen to presentation, participate in conducting an experiment and discuss results, reading assignment

Resources:

lecture notes, instructor demonstration, lab equipment overheads, text chapters 9 and 10

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Topic/Unit; -__Heat treatment of steels

Learning Activities;

listen to presentation on various heat treatment processes used, participate in various heattreat labs, view subscribed videos regarding heattreat processes, choose heattreat requirements, reading assignment

Resources:

lecture notes, supplementary handouts, overheads
lab equipment and furnaces, text chapter 13 and 14

Topic/Unit: -__Mechanical testing

Learning Activities;

listen to presentation on various hardness, tensile, and other mechanical tests, observe and discuss the lab demonstrations, perform various mechanical tests reading assignment

Resources;

lecture notes, supplementary handouts, overheads and lab equipment, text chapters 2 and 3

Topic/Unit; - structure of metals, metallography and phase diagrams

Learning Activities;

listen to presentation, by group consensus determine characteristics of various steels and test validity of results, participate in laboratory exercises and demonstrations, reading assignment.

Resources;

lecture notes, supplementary handouts, lab and furnace equipment, selected videos, microscopes and test specimens, text chapters 4,5 and 6

METALLURGY

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Topic/Unit: - ___ Other ferrous and non-ferrous materials and processes and inspection techniques*

Learning Activities:

With guidance from the instructor the student will research and collate data, arrange audio / visual aids for presentation and written technical report

NOTES ;

- This represents 20 % of your final grade, therefore 1/5 of your time in this course should be devoted to this technical report.
- Requirements:
 - Week 5 - draft plan of areas and activities you will participate in to complete this project.
 - Week 10 - Submission of written paper
 - Draft of overheads and presentation
 - Weeks 13 thru 15 - 1/2 hour presentation
- Copyright required where applicable
- Submit one hardcopy and disc of entire project using word perfect 5.1
- see your instructor for audio / visual aid materials
- DONE as a FORMAL TECHNICAL REPORT
- Start now, brain storm ideas, collect resources, search now for information.

Resources:

text, various libraries formal and informal, experiments, slides and videos, companies, OEM's College labs, shops and test equipment, local metallurgical labs

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EVALUATION METHODS: (INCLUDES ASSIGNMENTS, ATTENDANCE REQUIREMENTS, ETC.)

A final grade will be given as a letter in accordance with the following percentage equivalent

A+ = 90 - 100%

A = 80 - 89 %

B = 70 - 79 %

C = 55 - 69 %

X = to carry over into next semester given extreme circumstances

R = did not meet course requirements at this time

A final grade will be derived as follows:

Test 1 = 15%

Test 2 = 15%

Test 3 = 15%

Test 4 = 15%

Lab assignments (total) = 20%

Technical Report and presentation = 20%

Attendance including homework **

** You are expected to attend and perform the necessary tasks associated with this course, therefore a poor record on this measure of initiative, cooperation and ability will be detrimental to your final mark.

VI. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the instructor, credit for prior learning will be given upon successful completion of the following:

documentation from previous trainer (academic or work experience.

Successful completion with a minimum grade of 65% on an exam administered by the instructor of the course.

Completion of two lab experiments and written reports to the standards adopted by the course.

VII. REQUIRED STUDENT RESOURCES

Text: Moniz, B.J./Metallurgy, American Technical
Publications, 1994 (available in the Campus shop)
Safety glasses available for lab work
Other safety equipment available from your instructor

VIII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY:

Book Section (TITLE, PUBLISHER, EDITION, DATE, LIBRARY CALL NUMBER IF APPLICABLE - SEE Instructor for up to date list

Periodical Section (MAGAZINES, ARTICLES) available from instructor and libraries - see instructor for up to date list and access to previous editions.

Audiovisual Section (FILMS, FILMSTRIPS, TRANSPARENCIES)

See instructor for "call" numbers and catalogue

IX. SPECIAL NOTES

Students with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.

REQUIREMENTS FOR SUCCESSFUL COMPLETION OF CHALLENGE PROCESS

A challenge process for this course can be made available to learners within a reasonable period of time following a learner's request.

SIGNATURES

PROFESSOR

PROGRAM COORDINATOR OR DEAN

DATE

DATE