COURSE OUTLINE

COURSE TITLE: METALLURGY AND HEAT TREATING PROCESSES

CODE NO: ASR 111 SEMESTER : II

PROGRAM: AVIATION MACHINING

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DATE : JANUARY 1998

APPROVED: _____ _____
Dean ,School of Engineering Tech. Date

COURSE NAME: METALLURGY AND HEAT TREATING CODE NO: ASR 111

TOTAL CREDIT HOURS : 30

PREREQUISITE: ENROLLED IN AVIATION MACHINING COURSE

I. PHLOSOPHY /GOALS:

Basic metallury and heat treating processes will be discussed as it pertains to steel, titanium metals and aluminum. Emphasis will be placed on hardening, tempering and annelling steel. Preparation of specimens for viewing under a microscope will be covered as well as hardness testing with the Rockwell Hardness tester.

II. STUDENT PERFORMANCE OBJECTIVES

Upon successful completion of this course, the student will:

- be able to discuss heat treating procedures for steel and to a limited extent for aluminum
- become familiar with the terminology used in heat treating process
- become familiar with testing procedures for inspection and hardness testing
- develop an awareness of how heat treating affects machining

III. TOPICS TO BE COVERED

I. Manufacture of iron and steel
II. Heat Treating of Metals
III. Hardness Testing
IV Specimen Preparation
V Specimen Inspection
VI. SAE and AISI Code Systems for Steels
VII. Aluminum Alloy designations :
VIII. Machinability of a metal in relation to Heat Treating.

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IV.LEARNING ACTIVITIES:

I. Manufacture of Iron and Steel

1.1 Raw materials of steel making.
1.2 Steel making processes
1.3 Shaping steel to meet the needs of the industry.

2. Heat Treating of metals.

2.1 Discuss various terms associated with heat treatment steels.ANNEALING,HARDENING, TEMPERING,NORMALIZING,QUENCHING,SOAKING,CARBURIZING.
2.2 Operate fluidized bed furnace.
2.3 Operate high temperature electric furnace.
2.4 Operate induction furnace.
2.5 Case harden mild steel using casenite.
2.6 Use Temple Sticks to check high temperatures.
2.7 Discuss how various alloys affect the physical properties steel
2.8 Discuss Aging and Soaking in respect to Aluminum and its alloys.

3. Hardness Testing .

3.1 Prepare test samples for hardness testing.
3.2 Recognize hardness of samples with respect to carbon content.
3.3 Setup and use Rockwell hardness tester on both "B"and "C" scales.
3.4 Calibrate hardness testers for accuracy.

4. Specimen Preparation.

4.1 Use abrasive cutoff saw to cut hardened samples.
4.2 Mount specimens using heater with LUCITE powder.
4.3 Polish specimens to mirror finish .
4.4 Etch specimens.

5. Specimen Inspection.

5.1 Inspect specimens with microscope to see grain structure.

5.2 Use comparison charts to identify specimens.
5.3 Identify FERRITE ,PEARLITE and MARTENSITE in specimens under microscope.

6. S.A.E and A.I.S.I. code system for steel identification.

6.1 Become familiar with the coding system so as to be able to identify steels by % of CARBON
and % of major ALLOYING ELEMENT.

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IV .LEARNING ACTIVITIES CONT"D:

7.Aluminum Alloy designations for TYPE , HARDNESS AND HEAT TREAT Identification.

7.1 Aluminum Alloy designations .
7.2 Effect of alloying element.
7.3 Hardness identification
7.4 Heat treatment identification.

8. **NOTE !** Some aspects of the course may be covered in the Machine Shop class , such as physical properties of a metal that can affect its machinability.

V. REQUIRED RESOURSES:

Text books : AIR FRAME & POWER PLANT General hand book A/C 65 –9A

MACHINE TOOL PRACTICES 5 th edition
PROPERTIES AND USES OF FERROUS &NON FERROUS METALS

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ADDITIONAL RESOURSES :

Set of films on Heat Treating and Metallurgy.

Field trips to local industries will also be arranged to suppliment the course and give the students an opportunity to see first hand what a working environment is like.

VI . GRADING:

A+	Consistently Outstanding		[90-100%]
A	Outstanding Achievement		[80-89%]
B	Consistently above average		[70-79%]
C	Average Achievement		[60-69%]
R	Repeat	below	60%
CR	Credit exemption		

X Temporary grade given in extenuating circumstances which allows for student to do remedial work during a specified time period at the discretion of the Instructor. If the student is successful the X will be changed to a C and if not it will revert to an R grade.