

Course Syllabus

METC 143 - MATERIALS AND PROCESSES

COURSE TITLE: Materials and Processes

COURSE NUMBER: METC 143

PREREQUISITES: Demonstrated competency through appropriate assessment or earning a grade of "C" or better in ENGL 025 Introduction to College Writing II or ENGL 093 Introduction to College Writing and ENGL 032 Reading Strategies for College II or ENGL 083 Reading Strategies for College and MATH 035 Fundamentals of Algebra II or MATH 043 Essentials of Algebra II

SCHOOL: Applied Science and Engineering Technology

PROGRAM: Mechanical Engineering Technology

CREDIT HOURS: 3

CONTACT HOURS: Lecture: 2, Lab: 2

DATE OF LAST REVISION: Summer, 2011

EFFECTIVE DATE OF THIS REVISION: Fall, 2012

INSTRUCTOR: Bruce Horne

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CATALOG DESCRIPTION: Introduces students to structures, properties, processing, and applications of metals and ceramics commonly used in industry and develop problem solving skills in the areas of material selection, evaluation, measurement and testing.

MAJOR COURSE LEARNING OBJECTIVES: Upon successful completion of this course the student will be expected to:

1. Use phase diagrams and metallographic specimens to explain the compositional and property differences between alloys of ferrous and non-ferrous metals, including determining what phases are present, their compositions and amounts.
2. Use stress-strain diagrams to determine material processes of both ferrous and non-ferrous metals.
3. Conduct metal property tests using standard methods and instrumentation.
4. Identify brittle and ductile failure types and describe the effect of temperature and surface defects on impact toughness.
5. Communicate with colleagues in their field using common terms of foundry, joining, powder metallurgy, hot/cold working, and ceramic fabrication industries.
6. Describe key processes and variable when working with molten metal.
7. Identify and differentiate between common single-use and multi-use mold processes by describing processes and listing advantages and disadvantages of each process.
8. Describe the common fabrication processes for amorphous and crystalline ceramics.
9. Describe a typical powder metallurgy manufacturing process and explain its advantages and disadvantages.
10. Identify the basic material removal processes: turning, boring, drilling, reaming, milling, sawing, broaching, shaping, and grinding and determine the material removal processes that can effectively execute a given manufacturing task.
11. Determine the basic cold forming processes that can effectively execute a given manufacturing task.
12. Describe and differentiate between the hot working processes of rolling, forging, and extrusion and predict the results of heat treating metal alloys.
13. List advantages and disadvantages of joining process including common fusion and solid-state welding processes and integral, discrete, and shrink/expansion fastener systems.
14. Present data on metal/ceramic materials or processes orally and visually.

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COURSE CONTENT: Topical areas of study include –

Phase diagrams	Hot working processes
Stress-strain diagrams	Joining processes for materials
Material property tests and instrumentation	Manufacturing processes
Material removal processes	Failure testing of materials
Cold forming processes	Material property testing
Ceramic fabrication processes	

TEXT:

Manufacturing Engineering and Technology (Sixth Edition) by Serope Kalpakjian and Steven R. Schmid

ACADEMIC HONESTY STATEMENT:

The college is committed to academic integrity in all its practices. The faculty value intellectual integrity and a high standard of academic conduct. Activities that violate academic integrity undermine the quality and diminish the value of educational achievement.

Cheating on papers, tests or other academic works is a violation of college rules. No student shall engage in behavior that, in the judgment of the instructor of the class, may be construed as cheating. This may include, but is not limited to, plagiarism or of forms of academic dishonesty such as the acquisition without permission of tests or other academic materials and/or the distribution of these materials and other academic work. This includes students who aid and abet as well as those who attempt such behavior.

ATTENDANCE POLICY:

Students are expected to attend (and participate in) all class sessions. A sign in/out sheet will be provided by the instructor the day of each class and will provide the official record for attendance. Students who are more than one hour late for class will be considered absent from class for that day.

There are no excused absences. Any work (quiz, Lab, Mid-term exam or Final exam) missed due to tardiness or an absence will receive a “zero” grade.

MAKE-UP POLICY:

Missed work, due to tardiness or an absence, **CANNOT** be made up!

WORK TURNED IN LATE:

Work turned in late will receive a **50%** grade reduction.

DROP PROCEDURE:

If the situation should occur in which the student feels it is in his/hers best interest to drop the class, the student must be sure to complete a drop/add form. Students have up to week 12 (Sunday, **November 11th**) to drop a class. Quitting a class without completing a drop/add form will result in a failing (“FW”) grade.

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METHODS OF EVALUATION:

Student performance will be evaluated through the use of quizzes, examinations, Laboratory projects, homework assignments and class participation

Lab Participation	500 points	A = 92% - 100%	(1840 - 2000 points)
Homework & Quizzes	500 points	B = 84% - 91%	(1680 - 1839 points)
Mid-Term Exam	500 points	C = 77% - 83%	(1540 - 1679 points)
Final Exam	<u>500 points</u>	D = 70% - 76%	(1400 - 1539 points)
Total	2000 points	F < 70%	(< 1400 points)

ATMAE - REQUIREMENTS:

The Association of Technology, Management, and Applied Engineering (ATMAE) is the accrediting organization for Ivy Tech Community College. ATMAE is recognized for accreditation by the Council for Higher Education Accreditation (CHEA). The inclusion of "Outcomes Assessment" as part of accreditation is mandated by CHEA. This means that institutions applying for accreditation of Technology, Management, and Applied Engineering programs, by ATMAE, must demonstrate that institutions have plans in place for assessing educational outcomes. These plans must show evidence that the results of these "Outcomes Assessments" have led to the improvement of teaching and learning processes and improved preparation of program graduates to enter professional positions upon graduation. Accrediting bodies, including ATMAE, are thus revising standards for accreditation that move away from "input" models that prescribe courses, credit hours, etc. to the examination of "output" that has been validated by advisory committees and program graduates and that students can demonstrate. This ATMAE Outcomes Assessment Accreditation Model is being tested in selected institutions and is expected to eventually replace the traditional standards currently used by ATMAE.

Students wishing to graduate from a School of Applied Science and Engineering or the School of Technology, from Ivy Tech Community College Northeast must complete at least 12 semester hours of Management and/or Technical training at this institution

Students transferring to Ivy Tech Community College Northeast and entering into the School of Applied Science and Engineering or the School of Technology must also meet the 12 semester hours of Management and/or Technical training. Credits considered for transfer may be from another Ivy Tech ATMAE accredited campus or obtained from an ATMAE accredited institution.

STUDENT PORTFOLIOS:

All specialties in the Industrial Technology Program use a Student Portfolio as the tool of measurement for the technical "Outcomes Assessment". Students must present their portfolio to the Program Chair prior to graduation because it is a Requirement for Graduation. Even if a student is not degree seeking, they are advised to keep a portfolio in the event that they should change to degree seeking and/or portfolios can be used for job interviews.

The Portfolio items for a course must contain, Course Syllabus. In addition, the portfolio should contain items of work performed in the class that reflect examples of the student's best work. Items can include, but are not limited to: Homework, Drawings, Worksheets, Program Sheets, Lab Assignments and Course Competency Check Sheets.

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COPYRIGHT STATEMENT:

Students shall adhere to the laws governing the use of copyrighted materials. They must insure that their activities comply with fair use and in no way infringe on the copyright or other proprietary rights of others and that the materials used and developed at Ivy Tech Community College contain nothing unlawful, unethical, or libelous and do not constitute any violation of any right of privacy.

ADA STATEMENT:

Ivy Tech Community College seeks to provide reasonable accommodations for qualified individuals with documented disabilities. If you need an accommodation because of a documented disability, please contact the Office of Disability Support Services. If you will require assistance during an emergency evacuation, notify your instructor immediately. Look for evacuation procedures posted in your classroom.

SMOKING:

The use or sale of any tobacco product is prohibited on college-owned, operated, or leased property or vehicles at any time. This policy applies to all Ivy Tech – Northeast facilities and grounds, regardless of location. Smoking, including the use of an e-cigarette, shall not be permitted in any enclosed space and is also prohibited outdoors on all college campus property, including parking lots. This policy applies to all students, faculty, staff and visitors. Tickets and fines will be issued to violators.

Hour	Mon	Tue	Wed	Thr	Fri
8:00			ADMF 103 TC 1400		
9:00					
10:00		Office Hours			Office Hours
11:00					
12:00		Lunch	Lunch	Lunch	Lunch
1:00		Office Hours	Office Hours		Office Hours
2:00					
3:00					
4:00					
5:00		Dinner	Dinner	Dinner	Dinner
6:00		METC 143 TC 1480 TC 1548	ADMF 103 TC 1400	INDT 120 TC 1346 TC 1548	ENGR 116 TC1400
7:00					
8:00					
9:00					
10:00					
Office Hours – TC 1119					

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Week	Date	Chapter	Lecture Topic	LAB Project
1	Aug 21	-	Intro, Class Syllabus, Class Schedule Metallurgical and Chemical Terminology	Mixtures & Solutions
2	Aug 28	1	Structure of Metals	No LAB – Take Home Assignment
3	Sep 4	2	Mechanical Behavior of Metals	Pull 4140 A/R tensile specimen
4	Sep 11	2	Hardness & Failure Mechanisms	Hardness Testing Correlation of Hardness Scales
5	Sep 18	3	Physical Properties of Materials	Hardness test 1018 Carburized Hardness test 4140 H&Q
6	Sep 25	4	Phase Diagrams & Microstructure in Steels	Prepare Photomicrographs Isothermal Transformation Diagrams
7	Oct 2	4	Heat Treatment of Metals Review for Mid-Term Exam	Heating & Quenching Steel
8	Oct 9	-	Mid Term Exam	No LAB
9	Oct 16	5	Ferrous Metals and Alloys	Pull 4140 HQ&T tensile specimen
10	Oct 23	-	Plant Tour (SDI, Butler, IN)	-
11	Oct 30	6	Non-Ferrous Metals and Alloys	Precipitation Hardening Aluminum
12	Nov 6	17 18	Powder-Metal Processing Ceramics and Glass	Annealing Brass after Cold Working
13	Nov 13	23 24	Turning and Hole Making Milling and Broaching	Machine Shop Demo
-	Nov 22	-	Fall Break	No Class
14	Nov 27	-	Plant Tour (C&A Tools, Churubusco, IN)	-
15	Dec 6	30	Fusion Welding Review for Final Exam	Oxy Acetylene Welding
16	Dec 11	-	Final Exam	No LAB

NOTE: This schedule may change at the discretion of the instructor. Sign on to Black Board, each week, to obtain a full definition of your weekly homework assignment.