MESABI RANGE COMMUNITY & TECHNICAL COLLEGE

Course Outline

Course Title:	**Mining, Manufacturing, and Energy Technology**	**Submitted By:**	**Keith Mattson**
Semester Course Prefix and Number:	**IT 2250**	**Approval Date:**	
Old Quarter Course Prefix and Number:		**Revision Date:**	**3/26/2009**

Number of Credits: **3**

Number of Lecture Credits: **3**

Semester(s) Offered:

Class Size: 35

Negotiated by AASC on (date)_____

Number of Lab Credits: 0 **Number of Lab Hours: 0***

Number of Studio/Demonstration/Internship Credits: 0

**** Outside trips in addition to lecture will be required during semester totaling 12 hrs**

Course Purpose Code:

_____ **0 –** Developmental Courses
_____ **1 –** Non-transferable, General Education
__X__ **2 –** Technical course related to career programs
_____ **3 –** College course which has the primary goal of applying certain concepts (e.g. vocal ensemble)
_____ **4 –** Other college course not considered a part of general education (MNTC) (e.g. computer science, health, physical education)
_____ **5 –** Course which is intended to fulfill the Minnesota Transfer Curriculum (MNTC) requirements or intended for transfer.
_____ **9 –** Continuing Education/Customized Training specialized credit course (not occurring in 0-5)

Catalog Description:

This course will provide an intensive study and analysis of three key industries that employ industrial manufacturing technicians: mining, manufacturing, and energy (power generation, conversion, and usage). The approach taken will be to understand the processes and physical phenomena that govern the processes in these industries. Key chemical, physical, and empirical relationships will be learned, analyzed and applied to each. Both ferrous and non-ferrous mining will be analyzed from a process, environmental, financial, and technical perspective. Modern manufacturing processes will be examined with a focus on the basic principles and equipment used. Examples include forming, molding, shaping, treating, chemical, process, assembly, and fermentation processes. Methods and thermodynamic principles used in power generation and usage will be analyzed and applied. Energy usage and conversion principles, methods, and governing equations will developed and applied in order to objectively understand issues related performance, environmental impact, and financial requirements.

Prerequisites and/or recommended entry skills/knowledge:

Course Prerequisite(s):	IMRT 1215 and EIAT 1256 or equivalent, or consent of instructor.
Reading Prerequisite:	None
Composition Prerequisite:	None
Mathematics Prerequisite:	Math 094 or equivalent

Career Programs and Transfer Majors Accessing this Course:

Industrial Technology – mining emphasis, EIAT, pre-science, pre-engineering, and mathematics students.

Minnesota Transfer Curriculum Goal(s) partially met by this course if applicable:

(Notes: No more than two goals may be met by any one course. Curriculum Committee review and the Chief Academic Officer's approval are required.)

0. __X__ None
1. _____ Communications
2. _____ Critical Thinking
3. _____ Natural Sciences
4. _____ Mathematical/Logical Reasoning
5. _____ History and the Social and Behavioral Sciences
6. _____ The Humanities and Fine Arts
7. _____ Human Diversity
8. _____ Global Perspectives
9. _____ Ethical and Civic Responsibility
10. _____ People and the Environment

Learning Outcomes: (including any relevant competencies listed in the Minnesota Transfer Curriculum)

Upon completion of this course, the student will be able to:

Mining Module:

- Understand the basic processes in mining for exploration, mining, beneficiation (crushing, grinding, separating, concentrating), agglomeration, and shipping
- Understand the chemical makeup of minerals and chemical processes used in the various stages of mining.
- Analyze advanced processes used in mining and processing, including solution mining, autoclave, electrorefining, and others.
- Analyze, compare and contrast the function, capabilities, costs, benefits, tradeoffs, and flexibility of various types of equipment used in a manufacturing process.
- Recite major safety requirements that cover mining and its personnel**.**
- Understand the fundamentals of geology for various ferrous and non-ferrous minerals
- Understand environmental impact issues and the keys to sustainable development
- Understand specifications of end users, as well as industry trends and c
- Perform market and competitive analyses of global mineral mining.

Manufacturing Module:

- Understand the major manufacturing processes used for in forming, shaping, assembling, refining, and processing a wide array of goods and products.
- Analyze the processes in steel making at integrated mills and mini mills
- Apply cost analysis principles to compare and contrast various manufacturing processes
- Analyze, compare and contrast the function, capabilities, costs, benefits, tradeoffs, and flexibility of various types of equipment used in a manufacturing process.
- Understand productivity, ergonomic, cost, performance, and regulations related to various manufacturing processes and methods
- Study the latest trends in manufacturing, including nano technology, environmentally sustainable methods and advanced automation equipment.
- Demonstrate an understanding of robotic equipment used in various manufacturing methods
- Develop a practical understanding of ergonomic and time / motion studies, and training requirements for various manufacturing processes.
- Understand variation and the capabilities of various forms of measurement and manufacturing equipment.
- Understand major safety requirements and regulations that cover manufacturing from an operations standpoint.
- Perform market and competitive analyses of global mineral mining.

Power Generation and Energy Conversion and usage:

- Derive the governing formulas related to energy generation, conversion, and usage to various types of equipment
- Apply the key applied thermodynamic principles related to power generation, such as the Rankine cycle, Enthalpy, Entropy, efficiencies, power cycles.
- Understand key physical, chemical, and thermal/heat transfer principles that apply at the various stages of energy production and usage.
- Contrast a wide array of the benefits and tradoffs of various forms of power generation including: fossil fuel, nuclear, hydroelectric, wind, solar, and chemical.
- Understand environmental impact issues related to various types of power generation.
- Analyze, compare and contrast equipment used in energy generation for cost and productivity
- Recite major safety requirements that cover power generation and its personnel**.**

- Understand new technologies related to energy efficiency, environmentally sustainable production and usage, and smart systems.
- Perform market and competitive analyses of various forms of power generation and energy usage using fully accounted costs, including EOL (end of life) analyses.

Student Assessment Methods:

Various Informal and Formal Assessment methods, Lab assignments, worksheets, exams, Group projects, written reports and analyses. A formal written critical reflection will be required following each site visit.

Use of Instructional Technology: (includes software, interactive video and other instructional technologies):
Videos, software-based lab simulators, Microsoft Excel, Word, and Power Point

Lecture covers theory and terminology
Site visits will be scheduled at the time of student scheduling. Students are required to attend 3 of the 4 site visits.

Outline or Statement of Major Course Content:
See catalog description – course must also include:

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Additional Special Information: (special fees, directives on hazardous materials, etc.)

Transfer Information: (Please list colleges/majors that accept this course in transfer.)

Approvals:

Body	Representative Signatures	Date
Curriculum Committee		
Faculty Association		
Academic Affairs Standards Committee		
Chief Academic Officer		

Distribution: Original – Administrative Office
Copies: Curriculum Committee Chair, AASC Chair, Transfer Specialist, Originating Faculty Member, Scheduler, Records, Student Services, Learning Center, Library
Revised: October 2006

References:
http://www.marthamine.co.nz/ore_process.html