

Updates to

Self-Study Report for

**Industrial Engineering
Department**

New Mexico State University

June 2006

Updates as of July 31, 2006

Minor Errata: The following typographical errors have been noted.

- P. 79 – “CH 361” (2nd entry under Junior year in Table I-1) should be “CH E 361.”
- P. 97 – IE 110 is a required course.

The rest of this document consists of replacements of existing pages or inserts that make the Self Study Guide more complete.

**Table I-5. Support Expenditures
(Industrial Engineering)**

Fiscal Year	1	2	3	4
	FY 03-04	FY 04-05	FY 05-06	FY 06-07
Expenditure Category				
Operations (not including staff)	31,640	34,008	29,650	24,750
Travel	14,936	15,622	12,024	--- ¹
Equipment				
Institutional Funds	19,507	24,093	8,047	TBA
Grants and Gifts				
Graduate Teaching Assistants	89,966	92,665	89,539	83,902
Part-time Assistance (other than teaching)	0	0	0	0

¹ There is no formal travel budget.

ChE 361-Engineering Materials (Required)

Catalog Description: Bonding and crystal structure of simple materials. Electrical and mechanical properties of materials. Phase diagrams and heat treatment. Corrosion and environmental effects. Application of concepts to metal alloys, ceramics, polymers, and composites. Selection of materials for engineering design.

Course Prerequisite: Chem 111 or Chem 114 or equivalent.

Required Text: W. D. Callister, Jr., *Materials Science and Engineering: An Introduction*, 6th edition, John Wiley and Sons, NY, NY.

Course Objectives: To provide engineering students a fundamental understanding of materials and the interrelationship between processing, structure, properties, and performance. Specifically, the student who successfully completes this course will be able to:

1. Describe the structure of atoms and the bonding between atoms
2. Describe quantitatively and qualitatively the structure of FCC and BCC crystals
3. Determine the mechanical properties of a material from its stress-strain diagram
4. Determine 1-dimensional steady state and transient diffusion profiles
5. Conduct simplified failure analysis
6. Determine the equilibrium phase structures in binary alloys
7. Determine the structure of a material resulting from isothermal transformations
8. Calculate the potential of an electrochemical as it applies to corrosion behavior
9. Describe techniques to prevent corrosion in metals.

Topics Covered: The following topics are covered in this course:

- Atomic Structure & Interatomic Bonding
- The Structure of Crystalline Solids
- Imperfections in Solids
- Diffusion
- Mechanical Properties
- Dislocation & Strengthening Mechanisms
- Failure
- Corrosion
- Phase Diagrams
- Phase Transformations
- Thermal Processing
- Ceramics, Polymers, & Composites

Class Schedule: three 50-minute periods per week.

Contribution to meeting professional component

This course addresses the following professional components:

- advanced chemistry (materials chemistry) and
- thermodynamics of physical equilibrium;

Which address both basic science and engineering topics

Relationship to program outcomes

This course addresses IE program outcomes a, e, f, g, i, and k.

Prepared by: Stuart H. Munson-McGee, January 2006.

Edited by: John Mullen, July 2006

CE 233 MECHANICS – STATICS (3 credits)
(IE students must take either CE 233 or ME 236)

Course Description: Engineering mechanics using vector methods.

Prerequisites: Math 192 (Grade of “C” or better)

Co-requisite: Physics 215

Text: *Vector Mechanics for Engineering* (7th Edition), by Beer, Johnston, and Eisenberg

Course Objectives:

- Providing a strong technical foundation to our graduates for engineering problem solving
- Preparing quality graduates for licensure and professional careers in civil engineering

Topics Covered

- Forces in a plane and in space
- Moment couple, dot and cross product of two vectors
- Equilibrium in 2-D and 3-D
- Distributed forces, centroids and center of gravity
- Analysis of structures: trusses, frames, and machine
- Forces in beams: shear and moment diagrams
- Friction, wedges and belt friction
- Distributed forces: moment of inertia

Class Schedule: Three 50-minute periods per week.

Contribution of Course to Meeting the Professional Component: This course prepares the students for the statics section of the Fundamentals of Engineering (FE) Examination, which is a prerequisite for professional licensure. The course also serves as a prerequisite for following engineering analysis and design courses. In this course, students are trained to develop skills of problem formulating, problem solving, teamwork, and written communication.

Relationship of Course to Program Outcomes: This course contributes to the program outcomes by reinforcing the following points:

- an ability to apply knowledge of mathematics, science, and engineering (a)
- an ability to identify, formulate, and solve engineering problems (e)

Prepared by: Ruinian Jiang, March, 2006

Edited by: John Mullen, July, 2006

IE 351 APPLIED PROBLEM SOLVING (required)

Catalog Description: Application of computational techniques to engineering problems including the use of commercial programs in statistics and applied mathematics.

Corequisite: I E 311. Restricted to majors.

Text: None, but students refer to a set of class notes provided at the start of the course.

Course Objectives:

- To introduce class participants to virtual reality technology, information modeling principles and nanotechnology
- To develop critical thinking, assessment and problem solving skills of class participants.
- To expose students to principles of function and information modeling in the context of computer aided manufacturing.
- To develop a competency in topics, principles and methods related to information modeling and virtual engineering.

Course Topics:

1. Virtual Prototyping
2. Information Modeling (IDEF-0 and IDEF-3) methods
3. Introduction to Nanotechnology

Class Schedule: Class meets for two 75-minute periods per week.

Contribution to Meeting the Professional Component

Information modeling and virtual engineering are emerging areas in manufacturing and industrial engineering. Virtual Engineering approaches are being used worldwide to reduce product development time and costs. Information modeling is another subject area which is being widely used by manufacturing organizations. An understanding of these two information based manufacturing oriented topics is important to the success of any modern manufacturing organizations especially those who are interested in responding quickly to changing customer needs. Understanding of nanotechnology processes is important to every engineer as it is the next frontier of technology which has the potential to revolutionize the way products are manufactured. Industrial Engineers need to be at the forefront of this revolution; obtaining a basic understanding of the technology and the instruments used in such environments is an important step towards building a broad based knowledge of such systems as well. By acquiring knowledge and software skills in these three areas, the next generation of industrial engineers will be able to contribute significantly to manufacturing organizations becoming more agile as well as help design collaborative processes which support cross functional design in a global environment.

Relationship of the Course to Program Outcomes

The IE program outcomes addressed in this course are b, c, e, i, and k

Prepared by Dr. Cecil Joe, May 19, 2006

Edited by John Mullen, July 31, 2006

ME 159 - Graphical Communication and Design (2 cr)
(Required)

Catalog Description: Sketching and orthographic projection. Detail and assembly drawings, dimensioning , tolerance specification, and design projects.

Prerequisites: Basic algebra and trigonometry

Text: *Computer Aided Design with Unigraphics NX3*, H. Felix Lee and David W. Fulton, Kendall/Hunt Publishing, 2005.

Note: This is a WebCT course.

Class Schedule: One 50-minute class and one 170-minute lab per week

Course Objectives (Outcome):

- The student will become familiar with 3-D, featured based, parametric solids modeling as a design tool in mechanical engineering. (k).
- The student will become familiar with the practices and procedures used to produce and read engineering working drawings. (k)
- The student will become familiar with computers from an historical, software, and hardware perspective as they are used in mechanical engineering.
- The student will become familiar with the general principles of computer aided design and drafting (CADD), and be reasonably proficient in the use of one modern CADD software package -Unigraphics NX3 from UGS Corporation (k)
- The student will work in a team environment to produce a set of engineering drawings for a small engineering assembly. (c)

Topics Covered:

- Using Unigraphics NX3.
 - Feature-based solids modeling -creation of basic and intermediate features
 - NX3 as a design tool -building design intent into models
 - Assembly modeling
 - Creating engineering drawings of parts and assemblies
- Practices and Procedures Used to Produce Engineering Drawings:
 - Creating 2D orthographic drawings of 3D objects -standard views, required number, placement, etc
 - Required drawing dimensions -identify features, decide how many dimensions, etc.
 - Good dimensioning practices -where paced in drawing? How should they look?
 - Reading engineering drawings -using 2D orthographic views and dimensions to infer 3D shape.

Relationship To Program Objectives:

- to prepare students for successful careers and lifelong learning
- to develop skills pertinent to the design process, including the students' ability to

formulate problems, to think creatively, to communicate effectively, to synthesize information, and to work collaboratively.

Relationship to Program Outcomes

- c - ability to design a system, component, or process
- k - ability to use techniques, skills and modern engineering tools for engineering practice.

Contribution To Professional Component: A major design experience and engineering topics (engineering science and design).

AUTHOR/DATE: R. Pederson Spring/2006

Edited by: John Mullen, July 2006

ME 236 Engineering Mechanics-1 (3 cr)
(IE Students must take either CE 233 or ME 236)

CATALOG DESCRIPTION: Force systems, resultants, equilibrium, distributed forces, area moments, friction, and kinematics of particles.

PREREQUISITES: MATH 192

Corequisite: PHYS 215

TEXT: *Engineering Mechanics, Statics*, R.C. Hibbeler., 10-th ed Prentice Hall

CLASS SCHEDULE: Three 50-minute lectures per week

COURSE OBJECTIVES (Outcome): After completing this course, a student should be able to:

- Determine resultants of concurrent force systems using both force triangle and component methods (a).
- Apply equilibrium conditions to force systems (a).
- Construct free body diagrams of particles, rigid bodies, and structures, and identify all external forces and moments acting on them (k).
- Use principles of equilibrium to determine forces and moments acting on individual members of trusses, and other structures (k).
- Apply concepts of friction to a variety of problems including ramps, sliding vs. tipping, wedges, and belts (e).
- Determine the centroid and moment of inertia of cross-sectional areas, including structural shapes (a).

TOPICS COVERED

- Vectors
- Particle equilibrium
- Equivalent force systems
- Rigid body equilibrium
- Structural analysis
- Centroids, distributed load systems, fluid pressure
- Area and mass moments of inertia
- Friction
- Internal forces
- Principle of virtual work

RELATIONSHIP TO PROGRAM OBJECTIVES

- To prepare students for successful careers and lifelong learning
- To educate students thoroughly in engineering science and methods of analysis, including the mathematical and computational methods appropriate for engineers when solving problems.
- To develop the skills pertinent to the design process, including the students' ability

to formulate problems, to think creatively, to communicate effectively, to synthesize information and to work collaboratively

RELATIONSHIP TO PROGRAM OUTCOMES

- a -ability to apply knowledge of math, science, and engineering
- e -ability to identify , formulate and solve engineering problems
- i -ability to use techniques, skills and modern engineering tools for engineering practice

CONTRIBUTION TO PROFESSIONAL COMPONENT: 1½ years engineering topics (engineering science and design).

AUTHOR/DATE: Igor Sevostianov, 1/18/2006

Edited by: John Mullen, July 2006

Markson Ofuoku, Instructor

EDUCATION

- New Mexico State University, Department of Industrial Engineering, Las Cruces, NM. PhD candidate in Industrial Engineering with specialization in Stochastic Inventory Optimization Advisor: Prof. John Mullen (May 2005 – present).
- New Mexico State University, Department of Industrial Engineering, Las Cruces, NM. MSIE Degree in Industrial Engineering with concentration in Stochastic Processes Grade (3.7/4.0) (December 2004). Advisor: Prof. Tim Matis
- University of Houston, Computer/Mathematical Department, Houston Texas BS Degree in Applied Mathematics.

SERVICE: 2.5 years at NMSU since August 2003. Instructor since January 2006.

TEACHING EXPERIENCE

- **Instructor:** Spring 2006 to present.
- **Teaching Assistant:** Spring 2004 to present.

RESEARCH EXPERIENCE: Industrial Engineering department, New Mexico State University, Las Cruces, NM. Research Assistant (Spring 2004 – present). Minimizing glove box failure for Los Alamos Nuclear Security.

CONSULTING, PATENTS, etc.: None.

REGISTRATIONS: None

PUBLICATIONS

- 1) Statistical Analysis of Glovebox Glove failure. Young Ho Park, Ed Pines, Markson Ofuoku. *Proceedings of ASME PVP Conference*, March 2006.

SOCITIES

- Student member, National Society of Black Engineers (NSBE).
- Student member, Alpha Phi Mu.
- Student member, IIE.
- Student member, Mathematical Society of America.

ACADEMIC HONOURS, FELLOWSHIPS

- Distinguished black scholar Award for the fall 2004 and fall 2005 semester.