Materials Science and Engineering Design 635:411  
Department of Materials Science and Engineering  

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Course Description:  
Materials Science and Engineering Design is a 2 part course covering aspects of design related to part manufacturing and process development. This course covers the fundamentals of equipment and plant design. Included in the course are concepts relating to material selection, fabrication methodology (including tool design), machining and post fire evaluation. Concepts related to total quality and quality manufacturing are reviewed. The Scope of this class is to design and plan the manufacturing of assigned parts. Student will work in groups, with each group being assigned a type of part to produce. Groups will work on 1) designing a QC lab, 2) designing forming tooling, and 3) designing green and fired machining processes.  

Prerequisites:  
The prerequisites for this course are Processing I, II, III.  

Textbooks:  
The course is not taught from a textbook. The following resources are suggested:  

Objective:  
The objective of this course is to provide the student with a capstone experience in Materials Science and Engineering. MSE Design stresses the concept of design related to the manufacturing of parts having detailed specifications. Students will develop an understanding of real world manufacturing. Students will work in teams. Topics such as how to make effective presentations, total quality management, risk and reliability analysis, “green” manufacturing, and the use of materials processing and testing will be integrated within the teams project.  

Student groups will select a project from a list provided by the instructor. Groups will have the opportunity to discuss the various topics prior to the final selection.  

Grading:  
The Grading for the class will be as follows:  
30% Participation  
30% Final Exam  

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40% Projects 1-4, with each Project counting for 10% of the final grade.

The projects for the class will be as follows: 1) Quality Control Workshop, 2) QC Laboratory, 3) Design of a forming method and 4) Design of green and fired machining processes. The grading for each project will be divided as follows: 50% oral, 50% written. No written report will be accepted after class the dates indicated. No makeup oral will be given.

Course Content
WEEK  1 Introduction and the Design Process
         2 Quality
         3 Quality Processes, Material Properties and Selection
         4 Properties of Ceramics: Composition and Microstructure
         5 Materials Selection without a Shape
         6 Materials Selection without a Shape – case studies
         7 Materials Processing
         8 Materials Processing and Design
         9 Manufacturing and Material Selection
        10 Machining
        11 Machining
        12 Inspection, Testing
        13 Government Regulations
        14 Final Exam

Contributions of Course to Meeting the Professional Component:
MSE Design I is the capstone course for students wishing to emphasize production and management in ceramic engineering. The course integrates the fundamental science, e.g. physics and chemistry, and mathematics with the engineering courses the students completed in earlier semesters. By going through the process of material selection and process development, the student teams are able to understand how their prior education is critical in the engineering profession.

Relationship of Course to Program Objectives:
MSE Design I provides the student with an opportunity to integrate engineering principles developed in prior courses into a single goal, that being the conceptualization and manufacturing of parts needed for a specific application. The students must demonstrate an understanding of structure, processing, performance and properties of a specific ceramic system in order to complete the course. Students will prepare reports and make presentations weekly in a manner similar to that expected from an engineer. Students develop an understanding of teamwork and by making presentations develop organizational skills. Communication is stressed in this course, with emphasis on the student becoming more confident in both written and oral presentations over the duration of both Design I and II.

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Scheduling Conflicts with Class:

MSE Design I is scheduled to meet on the following dates:

- **September** – 6, 13*, 20, 27*
- **October** – 4*, 11, 18, 25
- **November** – 1, 8, 15, 22*, 29
- **December** – 6

The dates indicated with an * denote dates which I cannot hold class. I propose that we make these dates up on 4 Thursday classes. I propose that those classes be replaced on October 27th, November 3rd, December 1st and December 8th. Class will be held 6/7th periods or 7/8th periods. The alternative would be to hold classes on Monday with dates of October 17th, November 7th, November 14th and December 12th.

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