RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY
School of Engineering
Materials Science and Engineering Department
Materials Processing I
14:635:204

Course Instructor:
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Term:
Spring Semester, 2010

Office Hours: by appointment

Grade:
The final grade will be calculated in the following manner:

Quizzes & Homework:	10%
Design Project	20%
3 Hourly Exams-equal weight	70%

Tentative Dates: March 3, April 7, May 3

Course Description:
The course will provide an introduction to synthesis, properties and processing of technologically important materials such as polymers, ceramics and thin films.

Objective:
The primary aim of this course is to expose students to challenges encountered in the synthesis and processing of inorganic and organic materials. The students will develop an understanding of how the materials properties, initial conditions and processing parameters impact the final properties of the product.

Prerequisites:
There are no prerequisites for this class

Attendance:
Attendance is mandatory for this class. Absences must be accompanied by an official letter. Each unexcused absence will result in a 5% drop in the final grade. Attendance will be taken in every class. As a reminder, it is the students' responsibility to monitor their absences and provide letters for absences in a timely manner.

Design Project:
A Design Project provided shall be conducted according to the instructions provided (see attachment to this syllabus for further information). This document must be submitted on **the 7th of April**. The topic of your Project should be submitted to me on **the 24rd of February**

Texts (Not Required):
1. A. Brent Strong, **Plastics: Materials and Processing**, Pearson Prentice Hall, 2006.
2. J. Reed, **Principles of Ceramic Processing**, 2nd Edition, John Wiley and Sons, 1995. (Consider purchasing, this text is needed for Materials Microprocessing, 635:305)
3. Reading, posted on Sakai

Course Content (Weeks 1-6):

1. Molecular weight and composition distribution
2. Phase transitions in polymeric systems
3. Polymer solubility
4. Elastomers
5. Adhesives
6. Plastics
7. Fiber technology
8. Polymeric coatings

Weeks (7 – 12)

1. Ceramic Raw Materials
2. Particle Size and Shape Analysis
3. Degree of mixing and batch analysis
4. Chemical analysis
5. Synthesis of ceramics
6. Surface chemistry

Weeks (12 – 14)

1. Vacuum processing
2. Thin film deposition techniques (CVD and PVD)

Note: The syllabus is subject to change during the semester. The students will be advised of any changes well in advance.

Quizzes and Homework:
Both will be given on a regular basis. All assignments will only be accepted on the due date. No credit will be given for late submissions. However, all homework assignments must be submitted in order to receive a grade for the course. Surprise quizzes will be given on subjects covered in the lectures only.

Academic Integrity:
Students will be expected to adhere to the Policy on Academic Integrity listed within the New Brunswick Undergraduate Catalogue. Students are encouraged to review this policy.

Contribution of Course to Meeting the Professional Component of ABET:
This course teaches students basic materials processing through lectures involving theoretical and practical concepts from materials science, chemistry and physics. Students develop both quantitative and qualitative understanding of various ceramic processing topics.

Relationship with Course Program Objectives:
The topics covered in this course are essential for future courses such as Materials Processing II, Polymers Processing and Senior Lab.

Materials Processing I: 14:635:204 DESIGN PROJECT

Working as an applications development specialist for a consulting company, you are asked to formulate a polymer or a ceramic compound for a client of your choice. Details of your assignment are provided below. Submit a type-written document of approximately 1600 words with illustrations and references to reinforce your design decisions. Your report should contain three sections as outlined below. This document must be submitted no later than **the 7th of April at 5:00 pm**. A list of possible materials will be given out. Each student must pick a different material. The topic of your Project along with a one sentence statement under each heading should be submitted to me no later than the **24th of February**.

1. Definition of the engineering/aesthetic properties of the polymeric or ceramic article to be manufactured.

   Describe the end-use demands of the article in concise, measurable engineering terms. This section should establish the basis for formulation and processing recommendations disclosed later in the document.

2. Formulation of a suitable polymer or ceramic compound.

   Discuss the merits and deficiencies of **three** different polymers or ceramics in terms of the material property requirements described in Section 1.

   Choose one polymeric or ceramic material from this group, and develop a complete polymer or ceramic compound recipe that best satisfies product and processing demands.

3. Recommendation of appropriate processing methods.

   Compare two methods of manufacturing the article, and recommend the most appropriate process.

   Outline the overall compounding/forming process, from the mixing of compound ingredients to the shaping/curing/sintering operations that are required to produce a finished article. This may be presented as a diagram, with concise descriptions of each unit operation.

   Examples: Catheters, Contact Lenses, Artificial Joints, Armor Plates, Corrosion Resistant Thin Films ……..