Syllabus
ME 4720/6720
Structure and Properties of Engineering Polymers

Fall 2018
Wright State University
Department of Mechanical and Materials Engineering

Instructor: Dr. Nikolai V. Priezjev
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Tuesday Thursday, 5:00 pm - 6:20 pm, Russ 145
Office Hours: TR; 4:00-5:00, or by appointment.
Grading: Kathryn Doyle, email: doyle.35@wright.edu

Textbook: Plastics: Materials and Processing (Third Edition), by: A. Brent Young (Pearson, New Jersey, 2006).

Course description:

Plastics are very broad category of materials. They include most elastomers (such as rubber), adhesives (such as epoxies and acrylics), fibers (such as Nylon and Polyesters), and traditional engineering plastics. Plastics is more common name for Polymers. Polymers have been under development since the eighteenth century. In the last few decades, polymers have been replacing other materials in an increasing number of products. It is therefore important for modern materials engineers to understand the fundamental concepts of engineering polymers and be able to select, modify, and develop the proper polymer for a certain performance.

Prerequisites:

ME 2700 or equivalent fundamental knowledge of Material Science and Engineering.

Course Objectives:

The main objective is to introduce polymers as an engineering material and emphasize the basic concepts of their nature, production and properties. Polymers are introduced at three levels; namely, the molecular level, the micro level, and macro-level. Through knowledge of all three levels, student can understand and predict the properties of various polymers and their performance in different products. The course also aims at introducing the students to the principles of polymer processing techniques and considerations of design using engineering polymers.

The following topics will be covered:

1. General introduction including definition and history of plastics, plastic industry and their use in modern society.

2. Polymers from the Molecular viewpoint including basic concepts in organic chemistry, polymerization processes, thermoplastics and thermosets, and copolymers.

3. Micro-structure of polymers including molecular weight distribution and determination, crystallinity in polymers, thermal transitions, and polymer blends.

4. Mechanical properties of polymers including elastic, viscoelastic, and plastic behavior, creep, toughness, impact strength, as well as effects of fillers and modifiers.

5. Chemical and physical properties including weathering, chemical resistivity, electrical and optical properties, and flammability of polymers.

6. Properties and applications of specific engineering plastics such as Polyethylene, Polypropylene, Nylons, Polycarbonate, and some typical polymer blends.

7. Contemporary issues in polymer engineering science. A class discussion of one of the most recent developments in the field of engineering polymers.

8. Principles of polymer and composite processing techniques.

Conduct of the course:

The course will be taught in the lecture format. Two lectures will be given every week. During the lecture hours, new material will be presented and explained with emphasis on the main points as well as demonstration and distribution of elementary notes of needed. There will be two exams throughout the course (a midterm and a final exam).

In addition a term paper will be requested during the term. Term paper will be on a recent topic related to the course material. The topic is suggested by the student and approved by the instructor. A hard copy report (and, for extra credit, a short oral presentation of the term paper) will be due on the last week of classes. The purpose of the term paper is to give the student an **in-depth** experience in some specific area of plastics. It should utilize the principles discussed in the class such as systematic material and process selection. The term paper should include a discussion of molecular, micro and macro structure of a particular polymeric material and a connection to its mechanical, chemical, or physical properties. Choosing a material or project without some quantitative design assessment will result in a lowered grade. Interaction among students is encouraged but the final report has to written individually.

Attendance:

Lecture attendance is not required, however highly recommended. If absent, it is the student's responsibility to catch up the material covered. No late exams/make-ups or quizzes will be allowed except in case of verifiable emergency.

Grading:

Exam 1: 25% Final Exam: 35% Term Paper 20% Weekly Quizzes: 10% Homework: 10%

(mid October) Final Exam Date: TUESDAY, DECEMBER 11, 2018 5:45pm - 7:45pm

Fall Exam Schedule: http://www.wright.edu/registrar/scheduling/exam-schedules

To pass the course you need to pass each category with a grade of 60% or higher.

Academic Integrity:

Code of Student Conduct: https://www.wright.edu/student-affairs/student-life/community-standards-and-student-conduct/code-of-student-conduct/academic-integrity