SMFG 216 Course Syllabus

SMFG 216- Introduction to Plastics – 3.0 Units

Prerequisite: Chemistry 107 or 111

Course Times:
- Lecture: M, W 10 to 10:50 AM (LANG 104)
- Lab 1: T 2:00PM to 4:50PM (LANG 118)
- Lab 2: W 2:00PM to 4:50PM (LANG 118)

Instructor: Prof. Joe Greene (jgreene@csuchico.edu)

Office: Location- O’Connell 418 – Phone: 898-4977

Course Objective: Provide students a thorough study of thermoplastic polymers by investigating commodity plastics, engineering plastics, plastic elastomers, and thermoset polymers.

Laboratory Objectives: Provide students a thorough knowledge of a plastics molding business, including areas such as set-up, operation, process control, and maintenance of the lab thermoplastic molding machines.

Textbook:
- Plastics – Materials and Processing, 2006 A.B. Strong, Prentice Hall, New Jersey

Reference:

Course Goal
Provide students an introduction to materials, processing, and design of petroleum-based plastics and engineering polymers and the plastics manufacturing equipment used with the polymers.

Student Learning Outcomes
Upon successful completion of this course, students will be able to:
1. Understand the general physical, mechanical, and chemical properties of polymer materials
2. Understand the processing parameters of thermoplastic engineering materials.
3. Understand the recycling process of plastics.
4. Understand the processing parameters of engineering plastics.
5. Measure the melt index, density, and thermal properties of plastics.
6. Functionally communicate technical information in both written and oral form to a general and technical audience.
Course Usage of Blackboard Learn
Copies of the course syllabus, lectures, and homework assignments may be found on Blackboard Learn. You are responsible for regularly checking the online resources, which is accessed through the Chico State Portal at http://portal.csuchico.edu.

Safety  Laboratory Safety Policies and Procedures are strictly enforced in the labs. Students will be given safety training and are expected to become familiar with the safety policies and procedures. Each student is required to submit a signed acknowledgement form for safety training before the first lab experiment. A sticker will be placed on the student’s campus ID card upon completion of training.

General
1. Absences are allowed only for illness (doctor’s note required) or other serious reasons with permission prior to the class. There will be grade penalty for absence, arriving after roll call, or leaving before completion of the lab exercise. Three or more absences will result in an incomplete for SMFG 216
2. Homework problems will be available on BlackBoard Learn. You are required to do the homework and submit the answers online by the due date.
3. Late work will not be accepted.
4. You will be dropped from the class if you do not complete the first two homework assignments.
5. Quizzes and exams are open book and open computer. Make-up exams and quizzes are closed book, computer, and notes unless prior arrangements are made with the instructor.
6. Students run experiments in groups, all data collection in lab books are individual work. Students are encouraged to work together in data processing, but printing copies of the same figures from others is not allowed. University policies, due process, and sanctions for academic dishonesty are followed.
7. All cellular phones should be turned off in the lecture and lab except with instructor’s permission.
8. Shirts and shoes are required in the laboratory. Sandals and open-toe shoes are not allowed for safety reason. Students who are not safely dressed will be asked to leave the laboratory resulting in an absence.
9. You are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. found http://www.csuchico.edu/catalog/. You should be aware of the new deadlines and penalties for adding and dropping classes
10. If you need course adaptations or accommodations because of a disability or chronic illness, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours.
11. Students with disabilities requesting accommodations must register with the Accessibility Resource Center (http://www.csuchico.edu/arc/students/) to establish a record of their disability. Special accommodations for exams require ample notice to the testing office and must be submitted to the instructor well in advance of the exam date.
12. You must adhere and follow the Code of Professional Conduct while in this class. The code will be given to you to sign and is available on BlackBoard Learn.

Grading

1. Midterm exam 20%
2. Final exam 20%
3. Quizzes Unannounced 10%
4. Lab (lab book) 20%
5. Literature review papers (2 papers) 10%
6. Technical papers (2 papers) 10%
7. Homework/Attendance/Participation 10%

100%

Reports (All reports will be typed and double spaced.)

1. Lab Work (Teams of 4 students)
   - The lab notebook will be used to record material and manufacturing information during the lab experiments. The notebook will be graded in lab according to effectiveness and organization of the data. The format of the notebook will be provided in class.
   - Each student will participate in a lab group (4 students max) for 12 lab experiments.

2. Literature Review Paper
   - Each student will complete a summary report from industry magazine articles, journal articles, and textbooks on environmentally responsible design/process/material, experimental designs with engineering plastic, elastomeric, or thermoset materials (3 to 4 pages typed with 1” margins and double spaced). You must have a minimum of two cited sources. Format will be available in Blackboard Learn.
   - Feb 15, 2017 – Polymer Material or Processing
   - Mar 29, 2017 – Polymer Recycling /Environmental

**Note:** The literature review paper can be replaced with membership in SPE student club and a 1-page summary of the field trip to a plastics company.
3. **Technical Paper** (Teams of 2 students) – Polymer Material
   **Due Date: Paper 1: Due: April 12, 2017**
   Each student team will be responsible for completing a technical paper on “polymer materials.” The technical paper should be 3 to 4 pages typed and double spaced. Format will be provided on BlackBoard Learn. The polymer materials paper should include the following:
   - Commercial name and Manufacturer or Supplier (including contact names and phone numbers of resin suppliers)
   - Chemical name
   - Chemical structure of repeating unit
   - Origin of polymer. What raw materials are used to make the polymer (Natural gas, petroleum, acidic acid, etc)
   - Different forms that you can order the plastic in (powder, pellets, film, etc)
   - Commercial applications
   - Cost ($/lb) and typical cycle time
   - Physical properties- Density, paintability, flammability, etc
   - Mechanical properties in Tensile, Shear, Compression, Flexural, and sensitivities to moisture and chemicals
   - Typical processing methods for Manufacturing
   - Advantages and limitations of the material
   - 2 minimum references on Journal articles that study the material, (e.g., SPE ANTEC, Plastics World, Plastics Technology, Modern Plastics)

4. **Technical Paper** (Teams of 2 students) – Environment or recycling
   **Due Date: Paper 2: Due: May 3, 2017**
   Each student team will be responsible for completing a technical paper on “environment or recycling.” The technical paper should be 3 to 4 pages typed and double spaced. Format will be provided on BlackBoard Learn.
   Topics can include one of the following: mechanical recycling of PET, rubber, or HDPE, pyrolysis chemical recycling, PET chemical recycling, composting, anaerobic digestion, incineration, pollution cause by plastics, and biodegradable plastics from PLA, PHA, starch, Ecoflex, PBS, others, etc.
   The recycling/environmental paper should include the following:
   - History of the process/Issues/Concerns
   - Steps in the recycling process
   - Feedstock and resultant recycled product
   - Equipment used
   - Plastics used with recycling process
   - Cost of equipment
   - Advantages and Disadvantages
   - Companies and countries using the process
   - Future uses and possibilities with recycling
   - Sustainable solutions to environmental issues offered by the recycling process.
## References

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<th>Week</th>
<th>Chapter</th>
<th>Homework**</th>
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<td>1. Jan 23</td>
<td>Intro/Polymer Materials</td>
<td>Chap 1/2</td>
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<td>2. Jan 30</td>
<td>Micro Structures in Polymers</td>
<td>Chap 3</td>
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<td>3. Feb 6</td>
<td>Mechanical/Chemical Props</td>
<td>Chap 4/5</td>
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<td>4. Feb 13</td>
<td>Extrusion <em>(Lit Review Paper1)</em></td>
<td>Chap 11</td>
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<td>5. Feb 20</td>
<td>Injection Molding</td>
<td>Chap 12</td>
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<td>6. Feb 27</td>
<td>Blow molding/Compression</td>
<td>Chap 13/18</td>
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<td>7. Mar 6</td>
<td><strong>Mid-term (W)</strong></td>
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<td>Mar 13</td>
<td>----Spring Break No Classes--------</td>
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<td>8. Mar 20</td>
<td>Thermoplastics- Commodity</td>
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<td>10. Apr 3</td>
<td>Thermoplastics- Engineering</td>
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<td>11. Apr 10</td>
<td><em>(Materials Paper – W)</em></td>
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<td>12. Apr 17</td>
<td>Thermoset Polymers</td>
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<td>13. Apr 24</td>
<td>Elastomeric Polymers</td>
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<td>14. May 1</td>
<td>Environ Aspects <em>(Env Paper-W)</em> Chap 23</td>
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<td>15. May 8</td>
<td>Designing with Plastics</td>
<td>Chap 6</td>
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<td>16. May 17</td>
<td><strong>Final Wednesday 10 to 11:50 AM</strong></td>
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** Note: Homework will be due on Monday’s (one week after assigned)

Note: Lab schedule will be handed out during lab time and available on Black Board Learn