



AMAR 318 Course Syllabus Spring 2023

AMAR 318- Sustainable Plastics– 3.0 Units

Prerequisite: AMAR 316

Course Times: Lecture M, W 11 to 11:50 AM LANG 104
 Lab W 2:00PM to 4:50PM LANG 118

Instructor: Professor Joe Greene (jpgreene@csuchico.edu)

Office: Location- LANG 118 – Phone: 898-4977
 Hours W: 12:00 to 2 PM

Course Objective: Provide students a thorough study of thermoplastic plastics and polymer composites by investigating commodity plastics, bio-based plastics, engineering thermoplastic polymers, and thermoset polymer composites.

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

Textbooks:

- Automotive Plastics and Composites, J.P. Greene, (2021) Elsevier Publishing

Reference:

- Plastic Injection Molding ...Manufacturing Process Fundamentals, D. Bryce, SME, Dearborn, MI (1996)

Course Goal

Provide students a thorough study of commodity plastics, bio-based polymers, and engineering plastics.

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Understand the definitions of commodity and engineering plastics.
2. Understand the chemistry of biobased plastics.
3. Understand the processing parameters for plastics.
4. Understand the recycling process of plastics.
5. Understand the processing parameters of engineering plastics.



6. Understand the rheology and plastic flow of polymers during injection molding and extrusion.
7. Measure the melt index, density, and thermal properties of biobased and engineering plastics.

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 AMAR 318.
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. Exams are open book and notes. Make-up exams and quizzes are closed book 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. You must adhere and follow the Code of Professional Conduct while in this class. The code will be available on BlackBoard Learn



11. Academic integrity is taken seriously at the University, in this College, and Department, and by your professor. Violations will be referred to student judicial affairs and can result in penalties ranging from failure of the course to long term suspension from the university. See the *Academic Integrity* document for additional information. Read and understand the university policy (<http://www.csuchico.edu/sjd/integrity.shtml>). Examples of academic dishonesty include: a) copying the work/assignment of others, and b) allowing others to copy yours.
12. 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. Please also contact Accessibility Resource Center (ARC) as they are the designated department responsible for approving and coordinating reasonable accommodations and services for students with disabilities. ARC will help you understand your rights and responsibilities under the Americans with Disabilities Act and provide you further assistance with requesting and arranging accommodations. ARC is located at Student Services Center 170 and may be reached at 530-898-5959 or arcdept@csuchico.edu.
13. Accessibility Resource Center
530-898-5959
Student Services Center 170
arcdept@csuchico.edu
14. Note that modifications to the syllabus may be made throughout the semester. Please check back to Blackboard for the most current version.
15. COVID Information
Per CSU policy, vaccinations against COVID-19 are required for students in this class. **Booster shots are required** for students in this class.



Grading

1. Midterm exam	20%
2. Final exam	20%
3. Quizzes Unannounced	10%
4. Lab (2 papers plus lab book)	30%
5. Papers (2 papers)	10%
6. Homework/Attendance/Participation	<u>10%</u>
	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.
- Lab report**: Each student will participate in a lab group (4 students max) for 12 lab experiments. Each student group is required to complete two lab reports. The technical paper should be 3 to 5 pages typed and double spaced. Format will be provided on BlackBoard Learn.
 - Lab Report 1: Flow analysis of an injection molding part.
 - **Due Date- March 29, 2022**
 - Lab Report 2: Layup of thermoset composite skateboard.
 - **Due Date- April 26, 2022**

2. Technical Paper (Teams of 2 students) –

Due Date: **Paper 1: Due: March 08, 2022; Paper 2: Due: May 10, 2022**

Each student team will be responsible for completing two technical papers on literature: a review paper on Recycled Plastics Product and a second paper on CAD, flow analysis, and 3-D printing of SLA mold and then injection molding of plastics injection molding. The SLA tooling paper covers processing in the lab and should be written in both English and Spanish. The technical paper should be 4 to 6 pages typed and double spaced. Format will be provided on BlackBoard Learn.

**** Note:** One 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.



<u>Week</u>	<u>Chapter</u>	<u>Homework</u> ++
1. Jan 23	Introduction to Plastics	Chap 1
2. Jan 30	Physical and Mech Props	Chap 4
3. Feb 6	Rheology and Plastic Flow	Chap 5
4. Feb 13	Flow Analysis	Chap 6
5. Feb 20	Commodity Plastics	Chap 7
6. Feb 27		
7. Mar 6	Engineering Plastics	Chap 8
	<i>[Technical Recycled Plastics Paper 1 Due W]</i>	
*** Mar 13	Spring Break ***	
8. Mar 20		
	<u><i>Mid-term (Wednesday)</i></u>	
9. Mar 27	Elastomers and Rubber	Chap 9
	<i>[Flow Analysis Paper Due W]</i>	
10. Apr 3	Bio-based Polymers	Chap 10
11. Apr 10	Thermoset Polymers	Chap 11
12. Apr 17	Polymer Composites	Chap 12
13. Apr 24	<i>[Thermoset Composites Paper Due W]</i>	
14. May 1	Recycling and Enviro	Chap 17
15. May 8	<i>[Plastic 3-D Printed Tooling Due W]</i>	
16. May 15	TBD Final Exam	

++ Note: Homework will be due on Monday

++ Note: Papers will be due on Wednesday