

EDMM 2500 PLASTICS PROPERTIES AND PROCESSING

COURSE SYLLABUS

2018-2019 Catalog Data:

Effects of polymer chemistry, additives, plasticizers, fillers, and reinforcements on the properties of plastics. Molding, forming, extrusion, casting, lamination, coating, welding, and decorating of thermoplastic and thermoset materials. Lecture/Lab: (2/3 hours per week), Credits: 3 hrs. Recommended prerequisite: CHEM 1100.

Prerequisites by topic:

Working knowledge of the periodic table, chemical reactions, compound formation, valence and bonding. (CHEM 1100 - General Chemistry I)

Textbooks: (Required) - Engelmann, P. & Shoemaker, J. (2018). Plastics Properties and Processes. 22nd Edition (Lecture/lab Manual) - sold by the SPE Student Chapter
(Required) - Lokensgard, E. (2017). Industrial Plastics - Theory and Application, 6th Edition, Cengage-Delmar.

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Lab Instructor: Michael Schmidt, michael.l.schmidt@wmich.edu

Course Objectives	Course Performance Criteria (department) ¹	ABET/ETAC Outcomes ²
1. Identify a logical potential polymer for a given plastic product.	(D3) List of series of appropriate polymers for a given well-defined application.	d
2. Perform experiments with major forming, casting and molding processes found in the plastics industry	(C2) Determine the most appropriate process settings for a combination of process variables in a compression molding experiment.	c*
3. Define the dependent and independent processing variables found within plastics processes.	(C1) Correctly differentiate between dependent and independent variables in write-ups of the laboratory experiments.	c
4. Identify the relationship between the chemical make-up of selected plastics and certain of their resulting physical and mechanical properties.	(B3) Determine the molecular weight of a mer given a chemical diagram of a polymer.	b
5. Evaluate polymer materials and product disposal at the end of use.	(J1) Determine appropriate methods disposal processing of waste plastics based upon the makeup of the polymer(s) involved.	j*
6. Correctly identify the plastics process used to manufacture a product from the attributes of the part.	(D4) Determine the process used to produce a plastic part, through deductive reasoning based strictly on product design attributes.	d

Performance Criteria¹: EDMMS performance criteria may be found at <http://www.wmich.edu/edmms>

ABET/ETAC Outcomes²: Outcomes may be found at <http://www.abet.org/>

* Results tracked in ABET course notebook

WEEK OF	LECTURE TOPICS	ASSIGNMENTS	LAB ACTIVITY
Week 1	Course introduction Molecular weights & weight distributions	Chapter 4 Modules 0 & 1 Safety Guidelines	No lab meeting View E-learning demonstrations of Compression and Injection molding, Rotational, Slush & Dip Casting, Thermoforming, and Fluidized bed coating
Week 2	Polymerization reactions	Chapter 3 Module 2	Discussion of lab write-ups, E-learning resources, plant tour setup & display guidelines, Synopsis guidelines, process variables and Lab Safety
Week 3	Structure & compounds Additives	Chapter 7 Module 3 Industrial tour – prep (1%) due	Open lab IM – Group 1 & 2, PP
Week 4	Colorants & Fillers	Synopsis (2%) due	Open lab IM – Group 3 & 4, PP
Week 5	Reinforcements Test methods	Chapter 6 & 8	Open Lab IM – Group 5 & 6, PP
Week 6	Olefins Test 1	Appendix E Module 4 (*Bring Activity to lecture) Display 1 follow-up letter (1%) due	First Displays (3%) Open Lab IM – Group 1 & 2, ABS
Week 7	Commodity & *Specialty polymers **Engineering thermoplastics	Module 5 (Bring Activities 1* & 2** to lecture) Display 2 follow-up letter due Slush/dip lab (2%) due	Second Displays Open Lab IM – Group 3 & 4, ABS
Week 8	*Thermoset resins Plastication	Appendix F Module 6 (*Bring Activity to lecture) Display 3 follow-up letter due Fluidized Bed lab (2%) due	Third Displays Open Lab IM – Group 5 & 6, ABS
Week 9	*Extrusion systems Injection molding	Module 7 (*Bring Activity to lecture) Module 8 (videos 1 & 2) Chapter 13 Display 4 follow-up letter due Thermoforming Memo (3%) due	Fourth Displays Open Lab IIM – Group 1 & 2, PC
Week 10	Test 2 *Blow molding	Module 9 (*Bring Activity to lecture) Display 5 follow-up letter due Frisbee lab (2%) due	Fifth Displays Open Lab IM – Group 3 & 4, PC
Week 11	Compression molding Other thermoset processes	Module 8 (video 3) Display 6 follow-up letter due	Sixth Displays Open Lab IM – Group 5 & 6, PC
Week 12	*Thermoforming Castings & coating processes	Chapter 15 Module 13 (*Bring Activity to lecture) Compression lab (4%) due	Open Lab
Week 13	Decorating processes	Chapter 19 Begin Module 16 Rotational presentations (2%) due	Rotational Casting presentations
Week 14	Environmental issues Final review & synthesis	Chapter 2 Injection Comparison lab (4%) due	Comprehensive Lab Clean-up
Week 15	Comprehensive Final Exam		

*Indicates the module **example parts** are due at the class meeting **after** the lecture is actually presented.

Evaluation:

1. Lab experiments	22%	
2. Industrial tour and display	5%	93-100 = A
3. Reports and papers	3%	89- 92 = BA
4. Modules & quizzes	12%	83-88 = B
5. Attendance	4%	79-82 = CB
6. Test 1	14%	73-78 = C
7. Test 2	14%	69-72 = DC
8. Final exam	16%	63-68 = D
9. Identification exam	<u>10%</u>	<62 = E
	100%	

The grading scale for this course is as follows:

Usage of Electronic Devices during Class

Cell phones are to be turned off or set to vibrate. They are to be placed either at the front of your desk or in a back pack or purse. Surfing the web, sending email, text messaging, talking on a cell phone, listening to an iPod or Mp3 player in class is prohibited.

Laboratory Projects:

Students in this class are required to do experiments in the following areas: compression molding, injection molding, rotational casting, dip or slush casting, fluidized bed coating, and thermoforming. Students will gain familiarity with the molding, casting and forming equipment used for these experiments. The primary purpose of this work is to gain an understanding of the relationship between process, product, and material variables.

Oral and Written Communications:

Each student will function as a member of a lab team for the duration of the semester. All lab experiments will be conducted and discussed as a group; **however the write-up for each experiment must be done individually.** Group communication and coordination will be evaluated during the presentation each group delivers to explain the inter-relationship of process and product that they observed during their plant tour. Precise, succinct, and thorough writing is required for each of the laboratory experiments, as well as the reports.

Academic Honesty

Experiments are best done as a group. Write-ups will be done as an individual. Failure to observe this directive will result in the penalties outlined in the University Policy on Academic Honesty. You are responsible for making yourself aware of and understand the University policies and procedures that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. The academic policies addressing Student Rights and Responsibilities can be found in the Undergraduate Catalog at <http://catalog.wmich.edu/content.php?catoid=24&navoid=974>.

If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s) and if you believe you are not responsible, you will have the opportunity for a hearing. You should consult with your instructor if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.

You must make yourself aware of and abide by the “Western Michigan University Sexual and Gender-Based Harassment and Violence, Intimate Partner Violence, and Stalking Policy and Procedures” related to prohibited sexual misconduct under Title IX, the Clery Act and the Violence Against Women Act (VAWA) and Campus Safe. Under this policy, responsible employees (including instructors) are required to report claims of sexual misconduct to the Title IX Coordinator or designee

(located in the Office of Institutional Equity). Responsible employees are not confidential resources. For a complete list of resources and more information about the policy see www.wmich.edu/sexualmisconduct. In addition, students are encouraged to access the Code of Conduct:

- Office of Student Conduct www.wmich.edu/conduct
- Division of Student Affairs www.wmich.edu/students/diversity
- University Relations Office <http://www.wmich.edu/registrar/calendars/interfaith>

Academic Accommodation:

Any student registered with Disability Services for Students (DSS) who would like to discuss accommodations for this class should contact the instructor of record in a timely manner. Students with documented disabilities who are not registered with DSS should call the office at (269) 387-2116 or visit www.wmich.edu/disabilityservices. Students cannot request academic accommodations without scheduling an appointment and meeting with a DSS staff member. If a student does not register with DSS, their academic accommodations/modifications cannot be executed.

Expectations for Attendance:

Excused Absences

Each student is allowed to miss two (2) class periods without being penalized. These two (2) excused absences are provided as a buffer against family problems, weather, job and class conflicts. In the case of illness, WMU does not wish to have any student attend class if they suspect that they have the flu. Please email your instructor immediately to determine how assignments and tests will be handled.

The two (2) excused absences in no way relieve the student of any class responsibilities. The student is responsible for all missed materials and should review other class members' notes for lectures and demonstrations missed. Any assignment due on the day of an excused absence is considered due at the beginning of the next class period attended.

If sickness or other unforeseen circumstances prevent attendance, the student should email his/her instructor at the time of the absence.

Unexcused Absences

If more than two (2) classes are missed, a doctor's note or other documentation is required or the absence will be considered unexcused. The attendance grade will be reduced for each unexcused absence.

Late Assignments

Late assignments will be docked a substantial amount of if they are accepted at all. An assignment over 1 week late will require either Dr. Engelmann or Mr. Schmidt to determine if the assignment will be accepted and what additional penalty will be applied.

Safety

All students are expected to:

- conduct themselves in accordance with both departmental and college safety
- wear ANSI Z87.1 approved safety glasses at all times in the lab
- safely dispose of chemicals that can't be recycled
- ONLY put WATER (and soap) in the sink!!

Failure to follow safe procedures will result in a lower grade.

Clean-up Responsibilities

Between five and ten minutes before the end of each class period, it is the responsibility of each class member to:

1. Place molded items in your locker or book bag
2. Return tools to tool cabinet or to designated location.
3. Return materials being worked on to locker or designated areas.
4. Brush machine or bench top clean of any waste materials.
5. Sweep the floor of the work area.

If each class member will do his/her part, then the laboratory will remain orderly, clean, safe, and a good environment in which to work.

Comprehensive laboratory clean-up is the last lab period. The laboratory will be returned to the same (or better) condition that existed on the first day of class. Failure to participate will result in loss of **one full letter grade**. If you are unable to participate at the scheduled time, you must arrange a mutually acceptable make-up time.

Materials to Be Provided by Students:

1. A shop coat or other protective clothing
2. ANSI Z87.1 approved pair of safety glasses
3. Padlock
4. Materials for group display & presentation

Prepared by: Paul Engelmann

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