

**COURSE OUTLINE IDES 2102A • DESIGN FOR MANUFACTURING B • Winter (2024)**

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Location: **446 AP**

Office Hours: Enter Day/Time or preferred statement.

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**Course Time and Location:**

Course locations are no longer displayed on the public class schedule and are subject to change. For the latest information please refer to Carleton Central under Student Services – Registration – Student Timetable.

**Course Description**

Continuation of IDES 2101. Transformation techniques applied to manufacturing materials. Part-design requirements and cost factors for manufacturing processes. The influences and role of assembly, finishing, production tooling, costing are addressed.

Includes: Experiential Learning Activity.

Prerequisite(s): IDES 2101 or permission of the School of Industrial Design.

Lecture and tutorials three hours a week, laboratory three hours a week.

**Learning Outcomes**

By the end of this course, students will be able to:

1. Demonstrate a process for comparing and contrasting different types of common plastic materials in terms of performance characteristics particular to their intended use (UV, temperature, impact, creep, cost, etc.)
2. Be familiar with plastic raw materials including rod, tubing, and sheet stock as well as pellet forms.
3. Describe the main manufacturing processes for thermoset and thermoplastic materials in terms of tooling and raw material requirements.
4. Compare and contrast various plastic manufacturing processes in terms of production quantity, quality, and cost as a function of mass production volumes.
5. Be aware of important life cycle issues in regards to regrind, material identification, and degradable plastics.
6. Describe the fundamental requirements for plastic part design as it relates to various plastic manufacturing processes.
7. Be aware of Digital Additive Manufacturing processes including powder, liquid, and solid extruded technologies.
8. Be familiar with the primary difference between prototyping and manufacturing.
9. Be able to design simple jigs and fixtures for plastic fabrication from sheet materials.
10. Work as a team and use each other's resources effectively.
11. Write a technical report.
12. Work safely in the lab under supervision by professional staff.

### **Course Deliverables**

These are the deliverables for this course. Please see 'Appendix A Course Schedule' for more detailed information.

### **Course Deliverables and Grading** (\*is a potential for adjustments)

The course mark will be based on the term work as follows:

LECTURE: <b>Testing/Quizzes</b>		LABORATORY: <b>Lab assignments</b>	
Lecture Exercise 1	<b>10%</b>		
Mid-term	<b>15%</b>	Lab 1 - Thermoformed	<b>25%</b>
Final Exam	<b>15%</b>	Lab 2 - Analysis Report	<b>15%</b>
Quizzes	<b>10%</b>		
Participation/Engagement	<b><u>5%</u></b>	Participation/Engagement	<b><u>5%</u></b>
	<b>55%</b>	<b>+</b>	<b>45% = 100%</b>

- A passing grade must be attained in each of the LECTURE and LABORATORY sections of the course in order to receive a passing grade on the course. Understanding of lecture knowledge will be partially assessed in the lab fundamentals.

### **Student Access to Quiz, Test and Exam Papers**

Examinations are for evaluation purposes only and will not be returned to the student.

### **Required Materials**

Materials required for the course are listed below. You may be asked by your instructor to refer to Brightspace for a more comprehensive list of required materials.

#### **Text Books /Papers (REFERENCE not required)**

de Leeuw, M., Series and Mass Production Technology for Product Design. You are advised to make your own notes alongside this text during class. (Note: Text book is the same as used for IDES2101). Available at Haven Bookstore at the corner of Sunnyside Ave and Seneca Street.

#### **Materials suggested and not limited to:**

Utilize the tools that you have purchased for previous years studios. Ensure their availability for Labs and Lectures as required.

- Vernier Calipers with digital display for dimensional measurement (inexpensive versions available for <\$15 - \$40 at Amazon, BusyBee, Canadian Tire, etc.
- One pack of HP Bright White Ink Jet paper or Similar 8 ½ x 11"
- Tape (roll): masking, and duct or packing. (to secure work, or help with mock ups)
- Drawing: Pens, Pencils, Erasers
- Designer Markers - eg. Pilot felt tip red, blue green, black) – ensure a range of colours (to help denote different materials and assembly elements in your assignments, tests and quizzes)
- Segmented Knife – Olfa like, and replacement blades required (a pack of 50 is recommended)
- Cork back steel ruler - 14" minimum or longer preferred.
- Clear Straight Edge for drawing lines (ruler to or triangle).
- Cutting Board – Small 30cm x 45cm
- Engineer Square or equivalent
- 100 and 220 Grit Wet Dry Sand Paper with a Sanding Block
- One set of Safety Goggles/Glasses,
- Dust masks, they can be purchased at SID shops.
- Other lab/project specific materials as determined.

### **Computer Requirements**

Please refer to the computer requirements on the School of Industrial Design Website. You may be asked by your instructor to refer to Brightspace for other information or requirements related to computer work.

<http://www.id.carleton.ca/undergraduate/about-the-bid-program/computer-requirements>

### **Individual/Group Work**

Courses may include individual and group work. It is important in collaborative work that students clearly demonstrate their individual contributions.

## **Review/Presentation Attendance**

Attendance at scheduled SID Reviews/Presentations is mandatory. These are equivalent to exams when indicated in the course outline. Failure to attend the Review/Presentation without reasonable cause will result in a grade of F. Students arriving late for the Review/Presentation or not remaining for the complete session without approval from the instructor, will be addressed on a case-by-case basis at the discretion of the instructor.

If you are not able to attend a Review/Presentation, foresee arriving late, or need to leave before it is complete, please email your instructor in advance explaining the reason for the situation. It is important that you provide a reasonable rationale for your absence, late arrival, or early departure. In the event of an illness or death in the family, you will be required to sign a form verifying your claim and this form is available through the SID administration office.

## **Late Submission of Lecture & Studio Deliverables**

Students who do not hand in deliverables on time will have their earned grade reduced by 10% per day up to a maximum of 3 days.

## **Participation and Professionalism**

Active participation and professional conduct (e.g. class discussion, consultations with instructors, work ethic, etc.) are important in lecture and studio courses and may be formally evaluated by a grade. Professionalism also includes Carleton's Policy on Academic Integrity described in more detail below with links to content that you are required to review.

## **Academic Integrity**

Carleton's Policy on Academic Integrity is available at: <https://carleton.ca/registrar/academic-integrity/> and covers the following topics:

**Plagiarism** (e.g. submitting work in whole or in part by someone else, failing to acknowledge sources through the use of proper citations when using another's work).

**Test and Exam Rules** (e.g. attempting to read another student's exam paper, speaking to another student even if the subject matter is irrelevant to the text, using material not authorized by the examiner).

**Other Violations** (e.g. improper access to confidential information, disruption in classroom activities, misrepresentation of facts for any academic purpose).

This policy governs the academic behavior of students. In industrial design, ideas, and concepts come from a multitude of sources and may be modified and utilized in the design and development process. The student should reference such sources appropriately and it is strongly advised that you read Carleton's Policy on Academic Integrity prior to conducting any work at the University.

### **USE OF ARTIFICIAL INTELLIGENCE (AI) TECHNOLOGIES**

To effectively address the incorporation of AI technologies, specifically generative AI tools, into courses, we have instituted the following guidelines.

1. Academic Integrity Standards: In the absence of explicit permission from the instructor within a given course, the use of generative AI tools to create content, (e.g., text, code, images, summaries, videos, etc.), is deemed a breach of academic integrity standards.
2. Instructor's Discretion: Instructors have the authority to grant permission for the use of generative AI tools, (e.g., ChatGPT and similar tools), based on alignment with the course's educational objectives and learning outcomes. Assignment and examination guidelines will be written to explicitly reflect this granted permission.
3. Clear Instructions: Should instructors choose to permit the use of generative AI tools, an assessment guideline will provide students with clear and detailed direction, including;
  - i. Identification of specific generative AI tools that are acceptable for use.
  - ii. Clarity on the approved applications of these tools.

These measures aim to create a balanced and transparent educational environment, ensuring both academic integrity and the responsible integration of AI technologies into the learning experience.

### **Requests for Academic Accommodation**

You may require special arrangements to meet your academic obligations during the term. For an accommodation request for any of the below topics, refer to this link - <https://students.carleton.ca/course-outline/> and open the needed section.

**Topics:**

- *Pregnancy Obligations*
- *Religious/Spiritual Obligation*
- *Academic Accommodations for Students with Disabilities*
- *Survivors of Sexual Violence*
- *Accommodations for Student Activities*
- *Academic Considerations for Medical and Other Extenuating Circumstances*
- *Scheduling and Examination Support*

**Statement on Student Mental Health**

As a university student, you may experience a range of mental health challenges that significantly impact your academic success and overall well-being. If you need help, please speak to someone. There are numerous resources available both on- and off-campus to support you, refer to this link - <https://wellness.carleton.ca/> and open the needed section.

**Topics:**

- [Counselling](#)
- [Resource Guide](#)
  - [Thriving on Campus](#)
  - [Everyday Stress](#)
  - [Mild Mental Health Concerns](#)
  - [Moderate Mental Health Concerns](#)
  - [Complex Mental Health Concerns](#)
- [Umbrella Project](#)

**Student Responsibility**

The student is responsible for knowing the content of this course outline; the schedule of classes, assignments, and/or Reviews; and the material that was covered when absent. The studio is a professional environment and students should be working during the scheduled hours.

Unless otherwise arranged, the class will meet during scheduled class hours. Please note that attendance is important since issues and questions may be raised in class, and announcements made, along with information disseminated through Brightspace. As external professionals are often involved in our work, scheduling changes for guest lectures, presentations, and Reviews may occur at short notice, requiring students to stay informed.

### Changes to the Course Outline

The course outline may be subject to change in the event of extenuating circumstances.

### Appendix A - Course Schedule

Course Schedule. Version 1.0

Class 1 Jan. 10	Lecture	<ul style="list-style-type: none"> <li>• <b>[No live classes this week. See Class 1 folder in Brightspace for materials]</b></li> <li>• <b>Study Slide Deck: Introduction to Polymers (insure you review the links)</b></li> <li>• Start Assignment - Lecture Exercise 1: Find and Analyze Thermoformed Products. Work in groups of 3. Make your own groups. Everyone participates.</li> </ul>
	Lab	No Lab this week. Read and start the Lab Project 1 (it is in Brightspace - LAB section)
	Reference	de Leeuw Chapter 1 (pgs 1-38) Materials of Manufacture de Leeuw Chapter 5 (pgs 1-11) Fabricating: machining, bending, bonding.
Class 2 Jan. 17	Lecture	<ul style="list-style-type: none"> <li>• <b>[No live classes this week. See Class 2 folder in Brightspace]</b></li> <li>• <b>Study Slide Deck: Thermoplastic: Heat forming, Fabrication + Vacuum forming</b></li> <li>• See fixtures and jig samples in box Lab 3. Design your part(s)</li> </ul>
	Lab	Start on Lab Project 1 - Jigs, fixtures, tools and thermoforming. See Assignment in Brightspace. Note: Your Professor is abroad but School Labs and Technicians are available.
	Reference	de Leeuw Chapter 6 (pgs 1-21) Thermoforming: vac, pressure, twin
Class 3	Lecture	<ul style="list-style-type: none"> <li>• <b>Rob Watters is back ! Live Class on Campus.</b></li> <li>• <b>Recap of Week 1 and Week 2</b></li> <li>• <b>Injection Molding Part 1</b></li> </ul>





Class 9 Mar. 13	Lecture	<ul style="list-style-type: none"> <li>• <b>Compression and Thermosets molding</b></li> </ul>
	Lab	<b>Work on LabProject 2 - Product / Process / Feature Types / contact Suppliers</b> <b>Due: Project selection Abstract (1 Para) and Team document.</b>
	Reference	de Leeuw Chapter (tbd)
Class 10 Mar. 20	Lecture	<ul style="list-style-type: none"> <li>• <b>Composites Forming/ Molding</b></li> </ul>
	Lab	<b>Meet and work on Lab 2 - Product / Process / Feature Types / contact Suppliers</b>
Class 11 Mar. 27	Lecture	<ul style="list-style-type: none"> <li>• <b>Aspects of environmental sustainability in product design</b></li> <li>• <b>Discuss next week's Final Presentations</b></li> </ul>
	Lab	<b>Deliverable: Upload:</b> Hand in of Lab Project 2 Report by 11:50pm
	Reference	de Leeuw Chapter 11 (pgs 1-14) Rapid Prototyping, Rapid Tooling and Rapid Manufacturing.
Class 12 Apr. 03	Lecture	<ul style="list-style-type: none"> <li>• <b>Final Presentations-(Lab Project 2 - Product or Process)</b></li> </ul>
	Lab	<ul style="list-style-type: none"> <li>• <b>Final Presentations (Lab Project 2 - Product or Process)</b></li> </ul>
<b>Final Test/Exam</b>		Exam