

**COURSE OUTLINE IDES 2102A • Design for Manufacturing B • WINTER(2022)**

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**Instructor: Rob Watters**

RobertWatters@cunet.carleton.ca

Office Hours: by appointment

**Teaching Assistant: Son Vu Dang**

[sonvudang@cmail.carleton.ca](mailto:sonvudang@cmail.carleton.ca)

Office Hours: by appointment

**Laboratory Technicians:** Walter Zanetti 520-2600 x3554 walter.zanetti @carleton.ca

Paul Durocher 520-2600 x2852 paul.durocher@carleton.ca

**Time and Location:** Lecture (synchronous): Jan 10, 2022 to Apr 12, 2022 , Thurs, 18:05 - 20:55 Location ONLINE

Lab (synchronous): Jan 10, 2022 to Apr 12, 2022 Days: Thu Time: 11:35 - 14:25 Building: Minto Centre, Room: 5050 \*temporarily online to January 31st.

Schedule: [https://central.carleton.ca/prod/bwysched.p\\_select\\_term?wsea\\_code=EXT](https://central.carleton.ca/prod/bwysched.p_select_term?wsea_code=EXT)

**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 material including rod, tubing and sheet stock as well as pellet forms.
3. Describe the main manufacturing processes for thermoset and thermoplastics 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, 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 and Grading** (\*is a potential for adjustments)

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

<b>Testing/Quizzes</b>		<b>Labs</b>	
Mid-term	15%	Lab no.1	20%
Final/Exam	15%		
Quizzes	30%	Lab no.2	20%
Participation/Engagement	5%	Participation/Engagement	5%
	<b>55%</b>	<b>+</b>	<b>45% = 100%</b>

- A passing grade must be attained in each of the exam and lab sections of the course in order to receive a passing grade on the course.

### **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 (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.

Bayer Part-and-Mold-Design.pdf

**Suggested:**

Kula, Daniel, Materiology. A great book on materials written by a designer for designers. Available at Amazon/Chapters web stores or Ebay.

**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.

- 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)
- Various Nylon Tipped or Roller Ball Pens - investigate different pens, you will get a feel for what you like, When it comes to pens purchase Black , My personal favorite ball point for drawing is the BIC Crystal , medium point.
- Drawing: 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.
- Vernier Calipers with digital display for dimensional measurement (inexpensive versions available for <\$15 - \$40 at Amazon, BusyBee, Canadian Tire, etc.

## **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 contribution.

## **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 which 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.

## **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 following topics below, refer to the link provided for more information: <https://students.carleton.ca/course-outline/>

- *Parental Leave*
- *Religious/Spiritual Obligation*
- *Academic Accommodations for Students with Disabilities*
- *Survivors of Sexual Violence*
- *Accommodations for Student Activities*

### **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**

**(EXTREMELY IMPORTANT: follow instructor guidance wrt adjustments resulting from covid and situational responses as necessary)**

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

### **Zoom sessions**

You are expected to have your video on during web conferencing sessions to facilitate participation and studio collaboration. This is similar to being present and available in-class. Remember that while in class, your at-home computer is your classroom - stay engaged in class material throughout class time.

*Unauthorized student recording of classroom or other academic activities (including advising sessions or office hours) is prohibited. Unauthorized recording is unethical and may also be a violation of University policy. Students requesting the use of assistive technology as an accommodation should contact the Paul Menton Centre: <https://carleton.ca/pmc/>*

*Unauthorized use of classroom recordings – including distributing or posting them – is also prohibited. Under the University’s Copyright Policy (<https://library.carleton.ca/copyright-carleton>), faculty own the copyright to instructional materials – including those resources created specifically for the purposes of instruction, such as lectures slides, lecture notes, and presentations. Students cannot copy, reproduce, display, or distribute these materials or otherwise circulate these materials without the instructor’s written permission. Students who engage in unauthorized recording, unauthorized use of a recording, or unauthorized distribution of instructional materials will be referred to the appropriate University office for follow-up.*

**Appendix A - Course Schedule** (\* if adjusted, the most current version will be available in brightspace)

Course Schedule.

Class 1 Jan. 13	Lecture	<ul style="list-style-type: none"> <li>● <b>Introduction to Course</b></li> <li>● Polymer Families and Fabrication</li> <li>● Assignment of Lab 1</li> <li>● Material Spotlight - Styrenes,</li> </ul>
	Lab	No Lab in Week 1
	Homework	de Leeuw Chapter 5 (pgs 1-11)
Class 2 Jan. 20	Lecture	<ul style="list-style-type: none"> <li>● Quiz?</li> <li>● <b>Thermoforming</b></li> <li>● Creating fixtures and jigs</li> <li>● Material Spotlight - PMMA, PC, PSO</li> </ul>
	Lab	Work on Lab 1



	Homework	de Leeuw Chapter 6 (pgs 1-21)
Class 3 Jan. 27	Lecture	<ul style="list-style-type: none"> <li>• Quiz?</li> <li>• <b>Injection Molding Part 1</b></li> <li>• Material Spotlight – ABS, PP, POM</li> </ul>
	Lab	Work on Lab 1 - Deliverable: Strategy and Solution Approach (stage permission)
	Homework	de Leeuw Chapter 2 (pgs 1-35)
Class 4 Feb. 03	Lecture	<ul style="list-style-type: none"> <li>• Quiz?</li> <li>• <b>Injection Molding Part 2</b></li> <li>• Material Spotlight – CAS, TPEs, PAs</li> </ul>
	Lab	Lab 1 Progress Check
	Homework	Work on Lab 1
Class 5 Feb. 10	Lecture	<ul style="list-style-type: none"> <li>• Quiz?</li> <li>• <b>Structural Foam, RIM Molding</b></li> <li>• Quiz 3 – Structural Foam vs. RIM Molding</li> <li>• Material Spotlight – PUR, PFs, EVA</li> </ul>
	Lab	<b>Deliverable: Final Hand in of Lab 1 – physical</b>
	Homework	de Leeuw Chapter 3 (pgs 1-19)
Class 6 Feb. 17	Lecture	<ul style="list-style-type: none"> <li>• Quiz?</li> <li>• <b>Extrusion / Pultrusion, Blow molding and Roto molding</b></li> <li>• Assignment of Lab 2</li> <li>• Material Spotlight – PVC, Fiberglass, UP</li> </ul>
	Lab	<b>Deliverable: Upload:</b> Hand in of Lab Report 1 11:59, <b>Hand-In:</b> Lab 1 – physical items 3:30pm
	Homework	de Leeuw Chapter 4 (pgs 1-11), Chapter 8 (pgs 1-20)
Feb. 21-25	Fall Break	Winter Break
Class 7 Mar. 03	Lecture	<ul style="list-style-type: none"> <li>• <b>Midterm Test (*)</b></li> <li>• <b>other TBD</b></li> </ul>
	Lab	Introduction to Lab 2. Start Lab 2
Class 8 Mar. 10	Lecture	<ul style="list-style-type: none"> <li>• <b>Composites + Alloys, Compression Molding</b></li> <li>• Material Spotlight – Fiber reinforced materials, EP</li> </ul>

	Lab	Work on Lab2 - Lab 2 Progress Check
<b>Class 9</b> Mar. 17	Lecture	<ul style="list-style-type: none"> <li>• Quiz?</li> <li>• <b>Woods and Special Materials</b></li> <li>• <b>Quiz 5</b> – Composites</li> </ul>
	Lab	Work on Lab 2 - Lab 2 Progress Check
	Homework	de Leeuw Chapter 10 (pgs 1-38),
<b>Class 10</b> Mar. 24	Lecture	<ul style="list-style-type: none"> <li>• Quiz?</li> <li>• <b>Aspects of environmental sustainability in product design</b></li> </ul>
<b>Class 11</b> Mar. 31	Lecture	<ul style="list-style-type: none"> <li>• Quiz?</li> <li>• <b>Rapid Prototyping Technologies</b></li> <li>• <b>Final Presentations</b></li> </ul>
	Lab	<b>Deliverable: Upload:</b> Hand in of Lab Report 2 by 11:59pm, <b>Hand-In:</b> Lab 1 – physical items  3:30pm at SID drop-off (or in Class at 6pm depending)
	Homework	Review Rapid Prototyping slides and videos
<b>Class 12</b> Apr. 07	Lecture	<ul style="list-style-type: none"> <li>• <b>Final Presentations</b></li> </ul>
	Lab	<ul style="list-style-type: none"> <li>• <b>Final Presentations</b></li> </ul>
	Homework	de Leeuw Chapter 11 (pgs 1-14)
<b>Final Test/Exam</b>		TBD