CARLETON UNIVERSITY
SCHOOL OF INDUSTRIAL DESIGN

COURSE OUTLINE IDES 2102A • DESIGN FOR MANUFACTURING B • Winter (2025)

Instructor: **Rob Watters**

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Location: **ME 3481**

Office Hours: By appointment

Teaching Assistant: **Sofia Parra**

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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.

Lecture, Tuesdays, 9:30am-12:30pm

Lab Group A1 - Mondays, 9:35-12:35pm

Lab Group A2 - Mondays, 1:35-4:35pm

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.

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

LECTURE: **Testing/Quizzes**		LABORATORY: **Lab assignments**	
Quiz Mid-term	**15**%	Lab 1 - P1 Thermoformed	**25**%
Final	**22**%	Lab 2 - P2 Analysis Report	**15**%

Quiz	**10**%			
Participation/Engagement	**8**%	Participation/Engagement	**5**%	
	55%	**+**	**45% = 100%**	

- 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. Quizzes will not be returned but will be discussed in class.

Required Materials

All Materials required for the course and their costs are listed below. Please note some materials costs are dependent on the project and the materials chosen so a range listing minimum and maximum values will be given.

Lab portion of this course: You likely have most of these items yourself, or, amongst your project group of four people.

- Tape (roll): masking, duct or packing. (to secure work, or help with mock ups) ~$3
- Segmented Knife – Olfa Utility like, and replacement blades required (a pack of 10 is recommended) ~$15
- Cork back steel ruler - 12” minimum (or longer preferred) ~$10
- Clear Straight Edge for drawing lines/right angles (triangle) ~$10
- Cutting Board – Small ~30cm x 45cm ~$19
- 100 and 220 Grit Wet Dry Sand Paper with a Sanding Block ~$16
- One set of Safety Goggles/Glasses (each person requires this) ~$13
- Dust masks can be purchased at SID shops.
- Sheet plastic materials for group developed Lab project 1. materials available from Carleton SID labs (for purchase) or suppliers such as Canus Plastics (or similar) ~$10-40

Lecture portion of this course: Students are not required to purchase textbooks or other learning materials.

Technology Requirements

Please refer to the technology 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 coursework.

https://carleton.ca/id/student-info/computer-it-support/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 instructor's discretion.

If you are unable 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.

Late Submission of Assignments

Students who do not hand in assignments on time will have their earned grade reduced by X% per day at the instructor's discretion. If you foresee not meeting the submission due date and are requesting an extension, please provide your instructor with a minimum of 24 hours notice.

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.

Health and Safety

Students must participate in training to access all the SID Labs and Maker Space. Apart from this training, students are required to follow the health and safety standards of the School of Industrial Design as well as Carleton's health and safety standards. All materials related to SID health and safety are available here Health and Safety and it is expected that students review and understand these materials and apply these standards throughout their studies.

Use of Studio Spaces

Access to studio space to attend courses and complete assignments is an important part of student success. To support access, specific studios have been designated to certain years and/or sections.

1st Year Studio Section A – Studio A
1st Year Studio Section B – Studio B
2nd Year Studio Section A – Studio A
2nd Year Studio Section B – Studio B
3rd Year Studio Section A & B – Studio C
4th Year Studio All Sections (Capstone and Minor) – Studio D
MDes Studio – MDes Studio

Students are welcome and encouraged to use their designated spaces to work during non-studio hours. Out of respect for your colleagues, instructors, and Carleton cleaning staff, ensure you leave the space in good condition. This includes cleaning your area and storing your items in your designated storage space. The School will not be responsible for items that are not stored properly.

Academic Integrity

Carleton's Policy on Academic Integrity is available at: https://carleton.ca/registrar/academic-integrity/ and covers the following violations, but is not limited to:

- *Plagiarism*
    - *Submitting work written 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*
    - *Attempting to read another student's exam paper*
    - *Speaking to another student (even if the subject matter is irrelevant to text)*
    - *Using material not authorized by the examiner*

- *Other Violations*
    - *Improper access to confidential information such as exams or test questions*
    - *Disruption of classroom activities or periods of instruction*
    - *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 before 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. Further information can be found here - https://carleton.ca/tls/teachingresources/generative-artificial-intelligence/recommendations-and-guidelines/. Another useful resource is the Library's guide on AI tools - https://library.carleton.ca/guides/subject/artificial-intelligence-ai-tools.

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, or valuable information may be shared, all of which can greatly benefit the student's learning experience. As external professionals may be 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 including the availability of external community members and of lab technicians.

Course Schedule

During the term, please refer to Brightspace for any necessary Course Schedule updates.

2102W25		
Week 1	**Lab** Jan.06	**No Lab session.** The course will start with the Jan.07 Lecture.
	Lecture Jan.07	**Introduction to Polymers (Thermoplastics and Thermosets)** **Thermoplastics:** **Introduction to Extrusions (Sheet and Section stock)** **Introduction to Heat forming, Fabrication** **Introduction to Lab Project 1**
Week 2	**Lab** Jan.13	**Start Lab Project 1 (P1)** Review sample materials, project jigs, tools and parts samples.
	Lecture Jan.14	**Introduction to Vacuum Forming (sheet, twin sheet).** **Introduction to Prototyping and Manufacturing.**
Week 3	**Lab** Jan.20	Work on lab Project 1 in Lab3 during your section time. **Deliverable: Project 1 sample parts (Qty3) by end of class**
	Lecture Jan.21	**Introduction to Extrusion Blow Molding** **Introduction to Rotomolding**
Week 4	**Lab** Jan.27	Work on lab Project 1 in Lab3 during your section time. **Deliverable (into Brightspace):** Lab Project 1 - Part Design Concept Drawings with dimensions, design mockup and 3 formed sample parts.
	Lecture Jan.28	**Quiz 1 (Material including Week 3)** **Introduction to Injection Molding (Part 1)**
Week 5	**Lab** Feb.03	Work on lab Project 1 in Lab3 during your section time. > make prototypes, try materials in the labs, explore your need for jigs, consult about vacuum forming, etc.
	Lecture Feb.04	**Injection Molding (Part 2) including Structural Foam**

Week 6	**Lab** Feb.10	Work on lab Project 1 in Lab3 during your section time.
	Lecture Feb.11	>>>>>>> No class. Rob Watters is Travelling
Break	**Lab** Feb.17	>>>>> No class. Winter Break
	Lecture Feb.18	>>>>> No class. Winter Break
Week 7	**Lab** Feb.24	Work on lab Project 1 in Lab3 during your section time. > make prototypes, try materials in the labs, explore your need for jigs, create accommodations for material characteristics, consult about vacuum forming, etc.
	Lecture Feb.25	**Quiz 2 Mid-Term (Material including Week 5)** **Introduction to Injection Blow Molding**
Week 8	**Lab** Mar.03	**Deliverable: P1 - Produced Parts, Jigs, Fixtures and Tooling.**
	Lecture Mar.04	**Thermosets:** **Introduction to Thermoset Molding (Closed Molds).** **Introduction to Lab Project 2**
Week 9	**Lab** Mar.10	**Deliverable: P1 - Process Book** **Start Lab Project 2 (P2)** Sustainability. Group project.
	Lecture Mar.11	**Introduction to Composites/Reinforced Plastics. (Fiberglass Layup - Open Mold)**
Week 10	**Lab** Mar.17	**Lab Project 2 (P2) Sustainability. Group project.**
	Lecture Mar.18	**Introduction to aspects of environmental sustainability in product design**
Week 11	**Lab** Mar. 24	**Lab Project 2 (P2) Sustainability. Group project.**
	Lecture Mar.25	**Introduction to Composites/Reinforced Plastics (Compression, RTM, Autoclave)**
Week 12	**Lab** Mar.31	**Lab Project 2 (P2) Sustainability. Group project.** **Deliverable: Lab Project 2 Upload to Brightspace.**
	Lecture Apr.01	**Lecture Class: short review of material** **Presentation of Final P2 Projects**
Week 13	**Lab** April.07	TBD

	Lecture Apr.08	**Lecture Class: short review of material** **Presentation of Final P2 Projects.**
	TBD	**Exam: date to be set by the University**