



**ARCH 212**  
**Digital Fabrication**

Fall 2018

Tuesdays 10am - 1pm

E Classroom Rm 1101

**Instructor:**

Cam Parkin

[jcparkin@uwaterloo.ca](mailto:jcparkin@uwaterloo.ca)

Office Hours/Fabrication Supervision: Tuesdays 6pm-9pm (open to discussion)

**Teaching Assistants:**

Shamir Panchal

[s2panchal@uwaterloo.ca](mailto:s2panchal@uwaterloo.ca)

Daniel Bassakyros

[d2bassakyros@uwaterloo.ca](mailto:d2bassakyros@uwaterloo.ca)

Office Hours Upon Request

**Course Description and Objectives:**

This course will introduce students to the tools, work-flows, and culture surrounding computer-aided design/computer-aided manufacturing (CAD/CAM) and its creative applications within architecture. Students will learn how to work with CAD/CAM technologies while expanding their knowledge of two- and three-dimensional CAD geometries that inform the digital fabrication process.

Specifically, the course will cover 3D scanning, advanced mesh and surface manipulation in Rhinoceros 3D, an introduction to Grasshopper, as well as 3D printing, CNC routing, and laser cutting. These technologies will be supplemented with seminars exploring more advanced digital modeling techniques.

The course will begin in physical space, with maquettes created for the exploration of affect in Arch 292. Through the course, the maquettes will be 3D scanned, digitally manipulated and rationalized, before being fabricated using a series of tools and strategies.

As this course runs parallel to the Arch 292 design studio, it will provide the ability for students to explore more complex and experimental forms using digital and physical models. This course will focus specifically on the role of models in design, as well as the translation between digital and physical. This gives students a chance to explore various methods of realizing a form through digital fabrication in a way that communicates the intent of the model and allows for productive exploration.

By the end of the course, students will have a strong understanding of the strengths, limitations, and intricacies of different fabrication methods, and have the ability to think critically regarding what workflows best suit the type of exploration, representation, or testing they are pursuing.

**Assignments:****Assignment 1** group - 5%

3D Scanning Investigation

**Assignment 2** group + individual - 20%

a) Digital Manipulations (individual)

b) Fabrication Proposal

**Assignment 3a** group - 15%

Fabrication Method 1 Models and Report

**Assignment 3b** group - 15%

Fabrication Method 2 Models and Report

**Assignment 3c** group - 15%

Fabrication Method 3 Models and Report

**Assignment 4** group + individual - 20%

a) Final set of fabrication reports

b) Final reflection/response (individual)

**Participation individual** - 10%

Attendance and engagement during working sessions and seminars

**Recommended Readings:***Digital Fabrications - Lisa Iwamoto*

Broken into methods: Sectioning, Tessellating, Folding, Contouring, Forming

Helpful introduction for each chapter explaining origins, tools, and applications for the given technique

Good drawings

*CITA works - Martin Tamke, Mette Ramsgard Thomsen, Paul Nicholas, and Phil Ayres*

Informative introduction on research through built material investigations

Installation scale precedents

Nice drawings

*Digital Fabrication In Architecture - Nick Dunn*

Wide, shallow look at the field of digital fabrication and techniques used

Quick explanations of processes

Breaks down tools and techniques

Additional readings will be recommended through the duration of the course

**Required Software:**

3D Systems Sense

Rhinoceros 3D 5 or 6

Grasshopper for Rhinoceros

Weaverbird for Grasshopper

**Optional Software:**

Lunchbox for Grasshopper

Intralattice for Grasshopper

T-Splines for Rhino

Slic3r

RhinoCAM

**Culture:**

While the structure of the assignments in this course are fairly straight forward, success will depend on the student's ability to apply the themes and tools covered in this course to purposeful and ambitious design exploration. Students are expected to be present and engaged in all tutorials and working sessions to ensure they are getting the most out of their explorations.

**Evaluation:**

Each assignment will have a rubric stating the evaluation criteria, however consistent criteria through the course will include clarity of intent, detail in documenting processes, ambition of exploration, and modeling nuance.

**Group Work:**

The majority of the work done in this course will be in groups. This will allow more time on the fabrication machines, encourage sharing knowledge, and promote constructive collaboration. Projects will be given one mark that all team members will receive. Team members are expected to contribute equally to each project. If there are concerns regarding a member pulling their weight, please reach out to the course instructor or a TA and solution will be discussed.

**Submissions:**

All submissions will be digital on learn. Each submission should be a single PDF under 25 MB

**Late Submissions:**

It is important that all assignments are handed in on time to allow students to keep up with the course and have materials to work on during tutorials and working sessions. All assignments that are handed in late will receive a penalty of 5% per day, and after 10 days, the assignment will receive a 0. If an individual extension is required due to illness or a special circumstance, a request can be made to the instructor before the deadline, with a Request for Extension form from the front office, and a medical certificate if appropriate. If there is a class-wide issue with a deadline, please communicate it to the class representative, who can contact the instructor.

**Academic integrity:**

In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check the Office of Academic Integrity for more information.]

**Grievance:**

A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4. When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

**Discipline:**

A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. [Check the Office of Academic Integrity for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline. For typical penalties, check Guidelines for the Assessment of Penalties.

**Appeals:**

A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals.

**Note for students with disabilities:**

AccessAbility Services, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
SEPTEMBER						
2	3	4	5	6	7	8
9	10	11 Course Intro  ASSGN: Assignment 1	12	13	14	15
16	17 DUE: Assignment 1	18 Mesh Modeling Tutorial  ASSGN: Assignment 2a	19	20	21	22
23	24	25 Fabrication Processes Lecture	26	27	28	29 Nuit Blanche Field Trip
30	OCTOBER 1	2 Mesh and Surface Working Session  ASSGN: Assignment 2b	3	4	5	6
7	8 Thanksgiving Monday University Closed	9 Fall Study Day No Classes	10 Fall Study Day No Classes	11 Grasshopper Intro  Grasshopper working session	12	13
14	15 DUE: Assignment 2	16 Decomposition Tutorial  ASSGN: Assignment 3	17	18	19	20
21	22	23 Seminar 1 Working Session	24	25	26 Toronto Interview Day	27
28	29 Cambridge Co-op interviews	30 Seminar 2 Working Session Cambridge Co-op interviews	31 Cambridge Co-op interviews	NOVEMBER 1	2 DUE: Assignment 3a	3
4	5	6 Working Session	7	8	9	10
11	12 DUE: Assignment 3b	13 Seminar 3 Working Session	14	15	16	17
18	19	20 Working Session ASSGN: Assignment 4	21	22	23	24

25	26 <b>DUE: Assignment 3c</b>	27 <b>Final Display + Discussion</b>	28	29	30	<b>DECEMBER 1</b>
2	3	4	5	6	7	8
9	10 2A Final Reviews	11 2A Final Reviews	12	13	14	15
16	17	18	19	20 <b>DUE: Assignment 4</b>	21 Last Day of exams	22
23	24 <i>University Closed</i>	25 <b>University Closed</b>	26 <i>University Closed</i>	27 <i>University Closed</i>	28 <i>University Closed</i>	29

\*Note: Daily course content is subject to change