

Iwamoto Scott - Voussoir Cloud

ARCH 212
Digital Fabrication

Fall 2019
Tuesdays 10am - 1pm
E Classroom Rm 1101

Instructor:

Cam Parkin
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Office Hours Tuesdays Upon Request

Teaching Assistants:

Shabaan Khokhar
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Office Hours Upon Request

Course Description and Objectives:

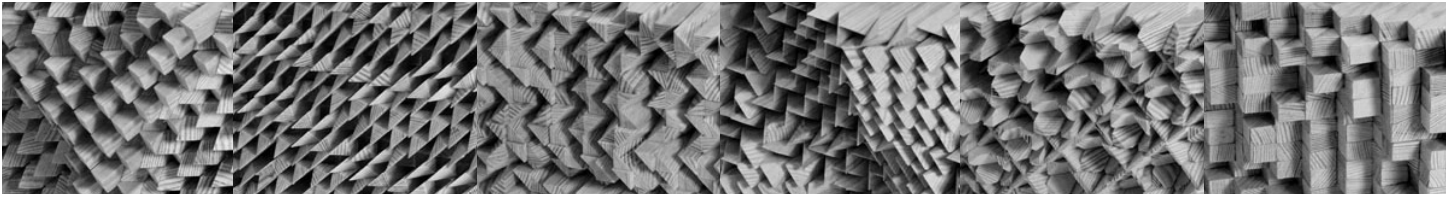
This course will introduce students to the tools, work-flows, and culture surrounding computer-aided design/computer-aided manufacturing (CAD/CAM) and its creative applications within architecture. Students will learn how to work with CAD/CAM technologies while expanding their knowledge of two and three-dimensional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

Specifically, the course will cover 3D scanning, advanced mesh and surface manipulation in Rhinoceros 3D, Grasshopper, as well as 3D printing, CNC routing, and laser cutting.

As this course runs parallel to the Arch 292 design studio, it will provide the ability for students to explore experimental forms using digital and physical models. This course will focus specifically on the role of models and making in design, as well as the translation between digital and physical as a fertile ground for design research. 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.

In addition to becoming literate in digital modeling and fabrication, students will be introduced to parametric / algorithmic / associative modeling. These tools will be employed to streamline and manage the complex geometries and work-flows generated in the course and create procedural design logics.

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 work-flows best suit the type of exploration, representation, or investigation they are pursuing.



Gramazio Kohler Research - Depth Wodulations

Assignments:

Assignment 1 group - 5%

3D Scanning Investigation

Assignment 2 group + individual - 20%

a) Digital Manipulations (individual)

b) Fabrication Proposal

Assignment 3 a,b,c group - 15%x3 = 45%

Fabrication Methods Models and Report

Assignment 4 group - 25%

a) Final set of fabrication reports

b) Reflection/response

c) Assembly proposal

Participation individual - 5%

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

Required Software:

3D Systems Sense

Rhinoceros 3D 5 or 6

Grasshopper for Rhinoceros

Weaverbird for Grasshopper

RhinoCAM

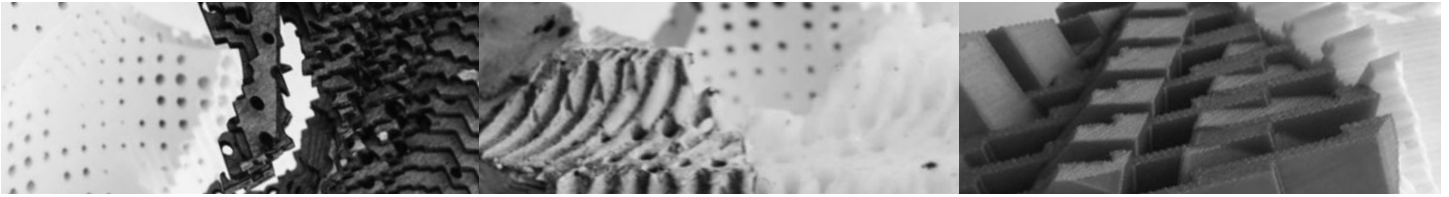
Optional Software:

Lunchbox for Grasshopper

Human for Grasshopper

Intralattice for Grasshopper

Slic3r



Student Work - Alexandra Barker + Olivia Vien's Pratt Studio

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 and solution will be discussed.

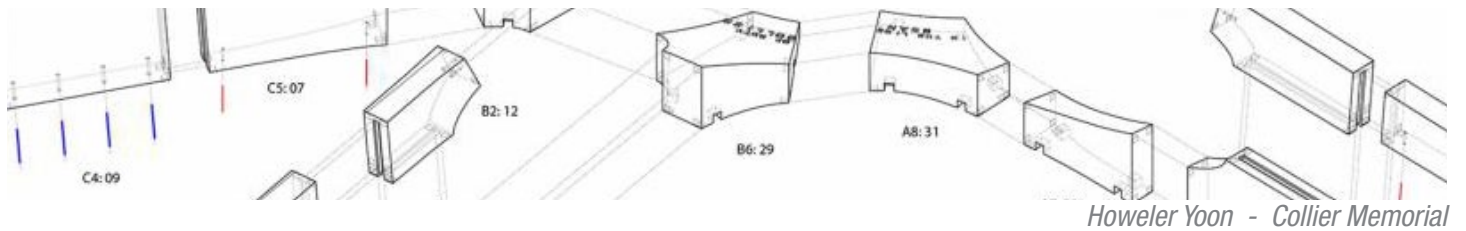
Submissions:

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 5 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.

This course relies heavily on technology. Students are expected to work responsibly and carefully so that they can submit assignments on time. Issues such as forgetting to save before a crash, or not leaving time for digital processes will not be accepted as reasoning for a late assignment. Situations can arise, however, that are out of student's control such as failure of equipment. If there are major technological issues that prevents the timely submission of an assignment, contact the instructor and a resolution will be reached. Students should still submit what they have before the deadline and, if an agreement is reached with the instructor, the assignment can be appended after the deadline.



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	Arch 292 Design Studio	Arch 212 Digital Fabrication Arch 246 Ico	Arch 246 Ico Arch 260 Structures Tutor	Arch 292 Design Studio	Arch 260 Structures	
1	2	3	4	5	6	7
8	9 All School Meeting 12:30 pm	10 Course Introduction Assignment 1 Given	11 260 Quiz	12	13	14
15	16 Assignment 1 Due 10 pm	17 Mesh Modeling Tutorial Assignment 2A Given	18 260 Quiz	19	20	21
22	23	24 Fabrication Processes Decomposition Assignment 2B Given	25 260 Quiz	26	27	28
29 OUF P1. 2 Deadline 10 pm	30 P1. 2 Reviews	October 1 Grasshopper Intro Working Session	2 260 Quiz	3	4 246 Deadline 10 pm	5 Nuit Blanche
6	7 Assignment 2A+B Due 10 pm	8 Fabrication Tutorials Assignment 3A+B+C Given	9 P2 Deadline 10 pm	10 P2 Reviews	11	12
13	14 Thanksgiving Monday	15 Fall Study Day	16 Fall Study Day	17 Fall Study Day	18 Fall Study Day	19
20	21	22 RhinoCAM Tutorial + Laser Test Working Session	23 260 Midterm	24	25 Toronto Interview Day	26 Convocation
27	28 Cambridge Co-op Interviews P3 Deadline – Plotting ACM	29 Working Session Cambridge Co-op Interviews	30 Cambridge Co-op Interviews 260 Quiz	31 P3 Reviews - Installation Bridge	November 1	2 Fall Open House
3 P3 Final Doc Due	4	5 Seminar Working Session	6 260 Quiz	7 Assignment 3A Due 10 pm	8	9
10	11	12 Seminar Working Session 246 Deadline 10 pm	13 260 Quiz	14	15	16
17	18 Assignment 3B Due 10 pm	19 Seminar Working Session Assignment 4 Given	20 260 Quiz	21 P3 Interim Review	22	23
24	25	26 Seminar Working Session	27	28	29	30
December 1	2 Assignment 3C Due 10 pm	3 Show and Discussions Last Day of Classes	4	5 P3 Final Digital Submission 6 pm	6 1A Final Reviews	7
8	9 2A Final Reviews	10 2A Final Reviews	11 MA reviews 3B Final Reviews	12 TRD1 Reviews	13 Final Thesis Reviews 246 Final Submission 10 pm	14
15	16	17 260 Exam	18	19	20 Last Day of exams Assignment 4 Due 10 pm	21
22	23	24 University Closed	25 University Closed	26 University Closed	27 University Closed	28

*Course content subject to change