Course Syllabus

ARCH 684 | The New Model: experimentation in the designer's material practice

Schedule: Wednesdays 9:30am – 12:20pm EST

Location : ARC 1110

Instructors: James Clarke-Hicks (he/him) – j2lclark@uwaterloo.ca

Territorial Acknowledgment

We acknowledge that the School of Architecture is located on the traditional territory of the Neutral, Anishinaabeg and Haudenosaunee peoples. The University is situated on the Haldimand Tract, the land promised to the Six Nations that includes 10 kilometres on each side of the Grand River. (see references here: https://uwaterloo.ca/engineering/about/territorial-acknowledgment)

Course Description

Architectural models have the ability to serve as figurative, allegorical, and anagogical tools for representing design concepts beyond physical space. Throughout history, models have played a pivotal role in articulating architectural ideas, moving beyond the constraints of conventional spatial representation. Models are not limited to miniaturized illustrations of preconceived architectural concepts. This course will engage with model-making as a generative design tool to explore material behaviour and novel modes of fabrication.

Architectural design and representation techniques have radically evolved in the last 30 years due to the adoption of digital technologies. Arch 684 will engage with this transformation by exploring productive relationships between complex material behaviours and digital fabrication techniques. The intersection of material experimentation and rapid physical prototyping with digital technologies forms the crux of the curriculum. This approach encourages students to create architectural models that represent, generate, and investigate creative impulses.

This course is geared towards students who want to incorporate model-making and material practice into their research methodology. The course will be divided between lectures, seminars and tutorials. Lectures will cover various topics and expose students to new methods in architectural model-making. Seminars will focus on translating research into productive spatial experiments. Tutorials will focus on how digital fabrication techniques (laser cutting, CNC milling, SLA printing, FDM printing) can be integrated into craft-based workflows.

> *"Architecture is born when actual phenomena and the idea that drives it intersect. Whether a rationally explicit statement or a subjective demonstration, a concept establishes an order, a field of inquiry, a limiting principle. The concept acts as a hidden thread connecting disparate parts with exact intention."*
>
> – Steven Holl, "Phenomenon and Idea" (1983), *The Material Imagination,* 49-50.

Ee 7 - exhibition. 'Gegenstand', Halle (Saale), Peter Bertram (DK), Moulds for A workshop (Cast elements for a barrel vaults and an I-beam), 2016.

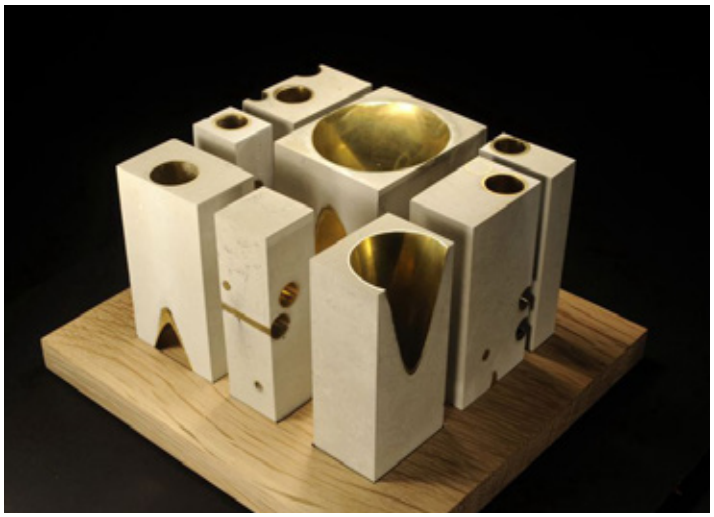
> *"The architect's ability to interpret the mechanical and phenomenal performance of a found, imagined, or constructed object as an analogical model for architecture suggests that our perception of building construction and our perception of model construction are also interconnected... Although cognitive associations between things are traditionally associated with the making of metaphors in language and specifically literature, our capacity to create them arises directly from our perception of the world."*
>
> – Matthew Mindrup, *The Architectural Model: Histories of the miniature and the prototype, the exemplar and the muse,* 231.

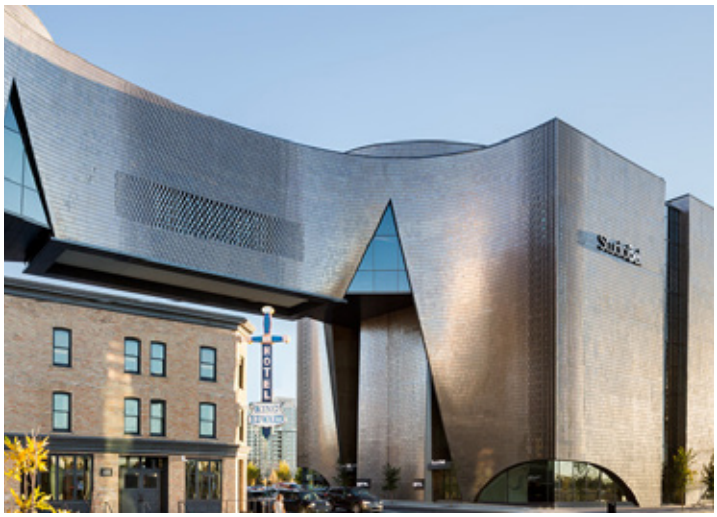
Course Structure

This course is divided into three sections. As the course schedule outlines, each section will have a corresponding project. Similarly structured as a studio, the three projects will build off one another and grow in complexity as the term progresses. All projects are rooted in iterative physical prototyping, relying on students to work on deliverables with consistency and intention. The three sections are:

- **Model Narratives (W1-3):** The history and context of architectural model making. We are examining intent in the construction of models and artifacts.
- **Problem Invention in Material Research (W4-8):** Constructing the basis for material exploration and integrating digital fabrication technologies into craft-based working methodologies.
- **Constructing Methodologies (W9-14):** Prototyping and producing a final artifact synthesizing subsequent material and thesis research.

This course will be comprised of lectures, seminar discussions and technical tutorials. The calendar is subject to change depending on the course's collective research interests and progress.





The National Music Centre of Canada (NMC), Allied Works Architecture, Calgary, Alberta, 2016.

Learning Objectives

The following is a list of expected learning outcomes for ARCH 684. To obtain a passing grade in the course, students must demonstrate an understanding of these concepts and an ability to apply these skill sets in course deliverables:

1. Translate creative impulses into constructive and rigorous working methods.
2. Identify the limitations and opportunities of different materials through controlled experimentation.
3. Build familiarity and dexterity with digital design tools and fabrication methods, including 3D printing, CNC milling, and laser cutting.
4. Utilize digital fabrication as a method of inquiry to support craft-based model-making techniques.
5. Develop a critical approach to rapid physical prototyping as a mode of design/research.
6. Communicate intent by translating architectural concepts into physical artifacts.

Evaluation Criteria and Assessments

Students must complete all exercises and obtain a passing average to receive credit for this course. All projects are completed and submitted individually. Course assessment will be broken up into three projects, and all correspond to a section of the course:

Project 01: Model Narratives, Due 31/01 – 15% of the total grade. *P1 is a series of 3 study models that iterate through material palettes and abstractions of form.*
Project 02: Problem Invention in Material Research, Due 13/03 – 25% of the total grade. *P2 is a matrix of experiments that isolates and tests variables in material behaviour.*
Project 03: Constructing methodologies, Due 17/04 – 45% of the total grade. *P3 is the construction of an architectural model that incorporates digital fabrication and material experimentation.*
General Participation: group discussions, desk crits, attendance – 15% of total grade

In addition to the criteria provided as part of each assignment outline, students will also be evaluated on:

- Completion of deliverables.
- Clarity of intention and quality of research.
- Demonstrated understanding of skills acquired during tutorials.
- Consideration of production methodologies and concepts discussed during lectures.
- Breadth and ambition of exploration.
- **NOTE:** This course will encourage experimental modes of fabrication. Intention and rigour will be prioritized over conventional notions of visual craft. This is done to incentivize students to look beyond pre-conceived ideals of craft and enter uncomfortable territories in their creative practice.

All submissions will be due on a specific date at 9:30 am before a scheduled class starts. Extensions for ARCH 684 deadlines are exclusively permitted in instances of illness or incapacity. Extension requests must be submitted using the extension request form, accessible from the Student Services Coordinator. Making these requests as promptly as possible before the project deadline is crucial.

Fabrication and Material Costs

This course primarily consists of material experimentation and physical prototyping. All material and fabrication costs are the responsibility of the course participant. There is no set expectation for the material palette; please budget appropriately. Note that all digital fabrication equipment at UWSA is run at cost for the benefit of student use. This course will utilize equipment in the A.Lab, D.Lab and M.Lab. All course participants are required to familiarize themselves with all Design and Fabrication Lab staff protocols and training exercises. Guidelines and resources will be provided for all students requiring training on fabrication equipment. Becoming certified on all equipment available to students is not required. Students are responsible for becoming certified on equipment they wish to incorporate into their working methodologies.

Course Delivery Platforms and Communication

The following platforms will be used to deliver, organize, and share course content:

- **LEARN –** Work submission, grade recording, and release.
- **Teams –** Course documents and recorded lectures.
- **Email –** Official communications including communications outside of class hours.

Response times for communication outside class time with the teaching team will be up to 24 hours, Monday to Friday 9AM-5PM EST. Please use **email only** to communicate with the teaching team outside of class hours. When asking the teaching team for digital support, please follow these protocols:

- Include files in question.
- List the steps you have already taken in problem-solving.
- Include images and notes of what you are trying to achieve.

Supporting Literature

There are no required textbooks for this course. Students are strongly encouraged to reference publications and digital media to develop literacy on specific topics discussed in lectures. Supplemental readings will be provided at critical points during the course.

Achim Menges. (2015). Fusing the Computational and the Physical: Towards a Novel Material Culture. Architectural Design, 85, 8-15. doi:10.1002/ad.1947

Bertram, P. (2019). Technique and Material. *Problem invention* (1. print run 2019 ed., pp. 57-105). Baunach: Spurbuchverlag.

Borden, G. P. (2018). [X]perience Mechanisms. *New essentialism* (First edition ed., pp. 148-202). Novato, California: Applied Research and Design Publishing.

Bronner, P., & Hillier, T. (2021). *Handmade Worlds: Constructing an Inhabitable Modelscape* Wiley. doi:10.1002/ad.2692

Gourdoukis, D.*Digital craftsmanship: from the arts and crafts to digital fabrication*

Gürsoy, B.*From Control to Uncertainty in 3D Printing with Clay*

Gürsoy, B., & Özkar, M. (2015). *Visualizing making: Shapes, materials, and actions* Elsevier BV. doi:10.1016/j.destud.2015.08.007

Kolarevic, B.Designing and Manufacturing Architecture in the Digital Age. doi:10.52842/conf.ecaade.2001.117

Mindrup, M. (2019a). Model Material As Medium. *The Architectural Model* (1st ed., pp. 157-178). Cambridge, MA, USA: MIT Press. doi:10.7551/mitpress/12252.001.0001

Mindrup, M. (2019b). Modeling Architectural Concepts. *The Architectural Model* (1st ed., pp. 203-225). Cambridge, MA, USA: MIT Press. doi:10.7551/mitpress/12252.001.0001

Morris, M., & Aling, M. (2021). *Scaling Up: The Many Worlds of the Architectural Model* Wiley. doi:10.1002/ad.2687

Sina Mostafavi.*Hybrid Intelligence in Architectural Robotic Materialization (HI-ARM) Computational, Fabrication and Material Intelligence for Multi-Mode Robotic Production of Multi-Scale and Multi-Material Systems*

Starkey, B. (2006). *Models, architecture, levitation: design-based research into post-secular architecture* Informa UK Limited. doi:10.1080/13602360600931508

Ursprung, P., & Herzog & de Meuron. (2005). Beauty and Atmosphere. *Herzog & de Meuron Natural history* (Neuaufl ed., pp. 355-415) Lars Müller.

Wolf, M. J. (2021). *Miniature Places for Vicarious Visits: Worldbuilding and Architectural Models* Wiley. doi:10.1002/ad.2689

Topics and Schedule

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
January 8	9	10 Intro + Lecture 01 **P1** Handout	11	12	13	14
15	16	17 Lecture 02 progress discussion	18	19	20	21
22	23	24 Lecture 03 progress discussion	25	26	27	28
29	30	31 **P1** Reviews	**February** 1	2	3	4
5	6	7 Lecture 04 **P2** Handout	8	9	10	11
12	13	14 **No class**	15	16	17	18
19 Reading Week	20	21	22	23	24	25
26	27	28 Lecture + Tutorial 01 progress discussion	29	**March** 1	2	3
4	5	6 Lecture + Tutorial 02 progress discussion	7	8	9	10
11	12	13 **P2** Reviews **P3** Handout	14	15	16	17
18	19	20 work session progress discussion	21	22	23	24
25	26	27 work session progress discussion	28	29	30	31
April 1	2	3 work session progress discussion	4	5	6	7
8 Classes End	9	10	11	12	13	14
15 Admissions week	16	17 **P3** Reviews	18	19	20	21
22	23	24	25 Last Day of Exams	26	27	28

COVID-19 Special Statement

Given the on-going situation around COVID-19, students are to refer to the University of Waterloo's developing information resource page (https://uwaterloo.ca/coronavirus/) for up-to-date information on academic updates, health services, important dates, co-op, accommodation rules and other university level responses to COVID-19.

Fair Contingencies for Emergency Remote Teaching

To provide contingency for unforeseen circumstances, the instructor reserves the right to modify course topics and/or assessments and/or weight and/or deadlines with due and fair notice to students. In the event of such challenges, the instructor will work with the Department/Faculty to find reasonable and fair solutions that respect rights and workloads of students, staff, and faculty.

Late Work

Assignments that are handed in late will receive an initial penalty of 5% on the first calendar day late and a 5% penalty per calendar day thereafter. After 5 calendar days, the assignment will receive a 0%. Only in the case of a justified medical or personal reason will these penalties be waived, and only if these have been officially submitted. Students seeking accommodations due to COVID-19, are to follow Covid-19-related accommodations as outlined by the university here: (https://uwaterloo.ca/coronavirus/academic-information#accommodations).

Passing Grades

The standard minimum passing grade in each ARCH course is 50% with the following exceptions: the minimum passing grade is 60% for all studio courses (ARCH 192, ARCH 193, ARCH 292, ARCH 293, ARCH 392, ARCH 393, ARCH 492, and ARCH 493). Grades below the specified passing grade result in a course failure.

CACB Student Performance Criteria

The BAS/MArch program enables students to achieve the accreditation standards set by the Canadian Architectural Certification Board as described here. This course addresses the CACB criteria and standards that are noted on the Accreditation page of the School of Architecture website.

Mental Health Support

All of us need a support system. We encourage you to seek out mental health supports when they are needed. Please reach out to Campus Wellness (https://uwaterloo.ca/campus-wellness/) and Counselling Services (https://uwaterloo.ca/campus-wellness/counselling-services). We understand that these circumstances can be troubling, and you may need to speak with someone for emotional support. Good2Talk (https://good2talk.ca/) is a post-secondary student helpline based in Ontario, Canada that is available to all students.

Equity, Diversity and Inclusion Commitment

The School of Architecture is committed to foster and support equity, diversity and inclusion. If you experience discrimination, micro-aggression, or other forms of racism, sexism, discrimination against 2SLGBTQ+, or disability, there are several pathways available for addressing this:

A) If you feel comfortable bringing this up directly with the faculty, staff or student who has said or done something offensive, we invite you, or a friend, to speak directly with this person. People make mistakes and dealing them directly in the present may be the most effective means of addressing the issue.

B) you can reach out to either the Undergraduate office, Graduate office, or Director. If you contact any of these people in confidence, they are bound to preserve your anonymity and follow up on your report.

C) You can choose to report centrally to the Equity Office. The Equity Office can be reached by emailing equity@uwaterloo.ca. More information on the functions and services of the equity office can be found here: https://uwaterloo.ca/human-rights-equity-inclusion/about/equity-office.

D) Racial Advocacy for Inclusion, Solidarity and Equity (RAISE) is a student-led Waterloo Undergraduate Student Association (WUSA) service launching in the Winter 2019 term. RAISE serves to address racism and xenophobia on the University of Waterloo campus with initiatives reflective of RAISE's three pillars of Education and Advocacy, Peer-to-Peer Support, and Community Building. The initiatives include but are not limited to: formal means to report and confront racism, accessible and considerate peer-support, and organization of social events to cultivate both an uplifting and united community. You can report an incident using their online form.

Academic integrity, grievance, discipline, appeals and note for students with disabilities:

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., , 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.

Turnitin.com: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit the alternate assignment.