Dalhousie University - School of Architecture

ARCH 5299.03: Technology Seminar
Microclimate + Materials

Course Outline - Fall 2024

Classes: Wednesdays, 9.30am-12:30pm
Room TBA / NSCAD Ceramic Studio unless otherwise posted
Instructor: Brian Lilley
Guest Instructor: Rory MacDonald
Office and office hours: for an appointment contact brian.lilley@dal.ca

Brightspace site: dal.brightspace.com
Teams site: **M2 Tech 24 - Lilley - Microclimate + Materials**
Any Zoom meetings will be arranged by invitation.

ACADEMIC INFORMATION

Calendar Description

This course focuses on an advanced topic in architectural technology. The topic changes from year to year. It may emphasize materials, environmental strategies, or building details.
FORMAT: Seminar RESTRICTIONS: Graduate students - Architecture

Additional Course Description

The Intention of this Technology Course is to examine Microclimates through Material Attributes and Material testing. A review of Passive Principles will inform the layered production of a composite material. Testing of Material attributes will be made (or simulated) as a basis for the Architectural Design of a Microclimate. Readings, discussions, and simple experiments will help reveal beneficial relationships between materials and environmental factors. Keyword definitions:

Microclimate

/ˈmīkrōˌklīmət/ noun

Microclimates are described in terms of climatic variables, their temporal and vertical variability, as established by the balance equations that govern the exchange of radiation, heat, water, and other atmospheric constituents. Encyclopedia of Atmospheric Sciences (Second Edition), 2015

These environmental variables—which include temperature, light, wind, and moisture—provide meaningful indicators for habitat selection and other ecological activities. In seminal studies, Shirley (1929, 1945) emphasized microclimate as a determinant of ecological patterns in both plant and animal communities and a driver of such processes as growth and mortality of organisms.
Biotic Functions of Riparia, Robert J. Naiman, Henri Décamps, Michael E. McClain, Gene E. Likens, 2005

Material Attributes

Materials play a significant role in design, that is, material attributes (properties) define, enhance (or limit) performance. Most products need to satisfy performance targets, which are determined by considering the design (or specification) goals. The most informative way of screening / selecting materials is via the use of material selection charts or a material properties database.
Screening of Materials, Ali Jahan, Kevin L. Edwards, 2013

Course Structure

The course is structured in four parts, that examine in turn Passive Principles, Material Attributes, Material creation and testing, and Architectural Expression.

To begin, we will consider the various scales of the phenomena, from larger climate to local site condition. The question of 'how do we respond to these phenomena?' will be answered by examining strategies of harvesting, shielding, and porosity, as per the M1 Course. We will be examining materials and assemblies in terms of attributes that directly respond to those strategies. We will be producing composite materials and testing their attributes with guest instructor Rory MacDonald, head Instructor in the Ceramics Studio at NSCAD University. The final part will pose a simple microclimate design problem, to be addressed with data and knowledge from the material testing phase, that will be the basis for the design of an assembly.

In exploring and researching these topics, we will be starting with readings across scales, and looking at particular case studies and architectural translations. To understand the phenomena in general terms, there will be the possibility for a number of smaller experiments (Harvesting, Shielding, Porosity) based on readily available materials. There will also be the opportunity to consider scripting as it applies to the problem – both pseudo-scripting and grasshopper / Ladybug, for example.

Learning Objectives

-Develop understanding and show ability to research environmental factors and match with appropriate material attributes that then contribute to the design translation of passive environmental principles

-Develop understanding and show ability with prototype material detail modelling and testing that contributes to the performance of an assembly

-Develop an understanding of building performance scales from assembly detail to overall comprehensive design

Admun Design + Construction Studio

Integration with other Courses

This course coincides with the second Design Studio in the graduate program, occurring in the fall term. The last assignment allows the student an opportunity to use content from the Design Studio as a basis for the Microclimate Design exercise (for options see below). As such it offers students an opportunity to work on a particular topic of design related to sustainable building: using Microclimate design to develop performance goals for responsive material assemblies. This process is useful as a form of design research contributing to sustainable, comprehensive design.

Assignment Description

The main assignment is a process logbook that accumulates the term's work consecutively over the term's four units. As a guide for content, Exercises and Readings will be given for each Unit on a weekly or bi-weekly basis. The process log is a format document (to match your portfolio size) that captures the term's activities. All included material should be clearly and concisely labeled so that the document is self-explanatory. Annotation that reflects on the exercises and big-picture applications are a requirement. Further Assignment description will be given with the Introduction of each Unit, including any Instructions for formatting and any more detailed rubrics for grading. Readings, lectures and course notes will be posted on the MS Teams site, on a regular basis. The option to record seminars is available by request.

Unit 1A - Material Strategies and Passive Principles -
In this unit, we will be examining a number of materials for their carrying capacity, their temporal variability, and usefulness for modifying microsystems. Students will examine and define a set of local environmental microclimate characteristics, and possible adaptions.

Unit 1B - Material Attributes and Selection -
This unit will be based on the work of Ashby and material selection tables. Each student will investigate inter-related factors of heat capacity, moisture transport, and filtering porosity for a number of materials; toward creating a composite material approach for a microclimate.

Unit 2 - Composite Materials creation and testing -
Together with guest instructor Rory MacDonald, this unit will focus on an experiment stacking or laminating materials with different attributes together, that will be effective in modifying microclimatic conditions. There will be a consideration of bio-materials as interstitial layers. Simple testing protocols will be defined and utilized; this will be a small-group project.

Unit 3 - Material and Microclimate Design –
The final unit will synthesize work from the previous units in the design of an assembly to effectively modify a local microclimate. The student will define the existing microclimate, the material selection attributes and arrangement, the architectural assembly, and predict the microclimate outcomes. The student may choose whether to integrate this with studio design work or examine a separate case design. The Unit 3 assignment will be presented in the last class of term along with Information from the previous units (to support the design work in Unit 3 will be mandatory for the last presentation.

Unit 4 Final Portfolio reflection -
The Portfolio Reflection will be a written reflection of the term and identifies research directions based on the individual portfolio of work. The portfolio review will be submitted on the last day of weekly classes, providing a coherent document for the term's investigations

Class Format

A MS Teams site for shared information and daily co-ordination; a hybrid between in-class seminars in room HA18 and digital tools (Zoom and Conceptboard) for tutorials, experiments, and reviews. Brightspace for official announcements, assignment submissions, and grading.

Equipment and Supplies

Materials required for the course will be common: from recyclable items (like cereal boxes) or local stores.

Weekly Hours

For this three credit-hour course, an average of nine hours per week is expected for all course-related activities, including classes. If most of the students are spending substantially more time, please notify the instructor.

Schedule

Class times: Wednesday morning, 9.30am – 12.30pm (Atlantic time) Note: classes referred to as studio will include in-class working time, to differentiate from seminars.

Units 1A + 1B	*Topic*
Week 1 – 11 Sept 24	Course Introduction, Material Strategies and Passive Principles *seminar*
Week 2 – 18 Sept 24	Key factors - scheme - microclimate site definition + tools, *studio*
Week 3 – 25 Sept 24	Key factors - palette - material attributes definition + tools, *studio*
Assignment 1A+ B due:	02 Oct, 9am - Brightspace dropbox
Week 4 – 02 Oct 2	Review and Unit 2 Intro

Unit 2	*Topic*
Week 5 – 09 Oct 24	Material Attributes and Selection, *seminar*
Week 6 – 16 Oct 24	Composite materials palette, research findings, proposal seminar / studio
Week 7 – 23 Oct 24	Key factors - composite materials creation *seminar / studio*
Week 8 – 30 Oct 24	Key factors – composite layers and test data, *studio*
Assignment 2 due:	06 Nov, 9am - Brightspace dropbox
Week 10 – 06 Nov 22	Review and Unit 3 Intro
note: week 11study week	

Unit 3	*Topic*
Week 12 – 20 Nov 22	Material and Microclimate, Architectural Design, *seminar*
Week 13* – 27 Nov 22 SLEQ	Key factors – material and assembly, microclimate outcomes, *studio*
Assignment 3 due:	04 Dec, 9am - Brightspace dropbox

Week 13- 05 Dec, 9.30am	Unit 3 / Final Review

Assignment 4 due:	Final Portfolio Review 06 Dec, 11.59 pm Brightspace dropbox

*Student Learning Evaluation Questionnaires (SLEQs) will be scheduled during the last class in Week 12, prior to the last review.

General Reading

(list will be specified with assignment hand-outs, and checked for availability with the Sexton Library)

Passive Principles and Microclimate

DeKay, Mark, and G.Z. Brown. 2014. *Sun, Wind, and Light: Architectural Design Strategies.* Hoboken, NJ: Wiley.

Ford, Brian, Rosa Schiano-Phan, and Juan A. Vallejo. 2019. *The Architecture of Natural Cooling.* Second Edition. New York: Routledge.

Hausladen, G., M. Saldanha, and P. Liedl. 2012. *Building to Suit the Climate: A Handbook.* Basel: Birkhauser.

Moe, Kiel, 2010. *Thermally Active Surfaces in Architecture.* New York: Princeton Architectural Press.

City of Copenhagen Report on Cloudburst proofing – Natural Drainage strategies

Materials, System and Structure

Bachman, Leonard. 2003. *Integrated Buildings: The Systems Basis of Architecture*. New York: Wiley.

Garcia, Mark, ed. 2014. *Future Details of Architecture; AD* (July/August). London: John Wiley and Sons.

General

Moe, Kiel. 2013. *Convergence: An Architectural Agenda for Energy*. New York: Princeton Architectural Press.

McCullough, Malcolm. 2005. *Digital Ground: Architecture, Pervasive Computing, and Environmental Knowing.* Cambridge, MA: MIT Press.

Assessment

Components and Evaluation

A short description of components and their weights that will count toward the final grade.
For each component, details will be provided in the separate assignment outline.

Assignment 1a: Material Strategies and Passive Principles	10%	individual	evaluated by instructor
Assignment 1b: Material Attributes and Selection	15%	individual	evaluated by instructor
Assignment 2: Composite Materials creation and testing	40%	group	evaluated by instructor
Assignment 3: Material and Microclimate Design	25%	individual	evaluated by instructor
Assignment 4: Portfolio Review	10%	individual	evaluated by instructor

Attendance or Participation Requirements

Except by prior permission or SDA, attendance in each class is mandatory. There will be a brief meeting at the beginning of each class session for student feedback. Participation in all reviews is mandatory.

Mid-term Standing

Oral feedback will be delivered with assignment reviews; the student is expected to take notes and review with the instructor. Written feedback will be delivered if a student is borderline or failing at that point.

Guidelines for Citing Sources
Chicago Manual of Style: Humanities Style (Author-Date Style). For details, see:
Chicago quick guide: http://tinyurl.com/chicago-quick-guide
Chicago Manual full guide: http://tinyurl.com/chicago-full

Solar Cooking Stations
David Wilson MIT, 2013

Submission of Assignments
For each assignment, a PDF of the work is to be submitted to the corresponding Brightspace folder.

Criteria and Standards for Assessment
Standards will rely on the general descriptions in "University Grade Standards" below, unless otherwise stated in the assignment description. Criteria for grading is encompassed in the Brightspace rubrik as follows:

- criticality of written work and insightfulness of commentary to material design work
- clear, sequential development of investigations and testing of the material issues
- analysis and design work demonstrating a developing understanding of the study issues

Group Assignments
The third assignment will be a group assignment. All members of the group will receive the same grade.

Grading Format
The Course Instructor will review the final portfolio, after the assignments are reviewed and graded. Final comments on the coursework will be given by request. Assignment grades will be issued privately to students through Brightspace, not posted.

University Standards for Individual Assignments

Graduate Grade Standards for the Course

Letter	Grade point	Percent	Definition
A+	4.3	90–100%	
A	4.0	85–89%	
A–	3.7	80–84%	
B+	3.3	77–79%	
B	3.0	73–76%	
B–	2.7	70–72%	
F	0.0	0–69%	
INC	0.0		Incomplete
W	neutral; no credit obtained		Withdrew after deadline
ILL	neutral; no credit obtained		Compassionate reasons, illness

Other, exceptional grades are noted in the graduate calendar.

Calculation of Final Grades

Numerical grades for the assignments (through Brightspace), will be multiplied by their weight, added, then converted to a final letter grade

COURSE-SPECIFIC POLICIES

Due Dates and Late Submissions

Deductions for late submissions encourage time management and maintain fairness among students.

	Due date	Is a late assignment accepted?	If so, what is the deduction per weekday?*	Is there a final deadline for a late submission?	What happens after that?
Assignment 1a+b	Oct 2	yes	1.5%	Dec 09	receives 0% and no comments
Assignment 2	Nov 6	yes	1.5%	Dec 09	receives 0% and no comments
Assignment 3	Dec 4	yes	1.5%	Dec 09	receives 0% and no comments
Assignment 4	Dec 6	yes	1.5%	Dec 09	receives 0% and no comments

* For example, if an assignment is evaluated at 75% before applying a 1.5%-per-weekday deduction, it would receive 73.5% for being 1–24 hours late; 71% for being 25–48 hours late. Note: less than 69% is a failing grade in the graduate school.

Note:
The following University or School policies take precedence over course-specific policies:

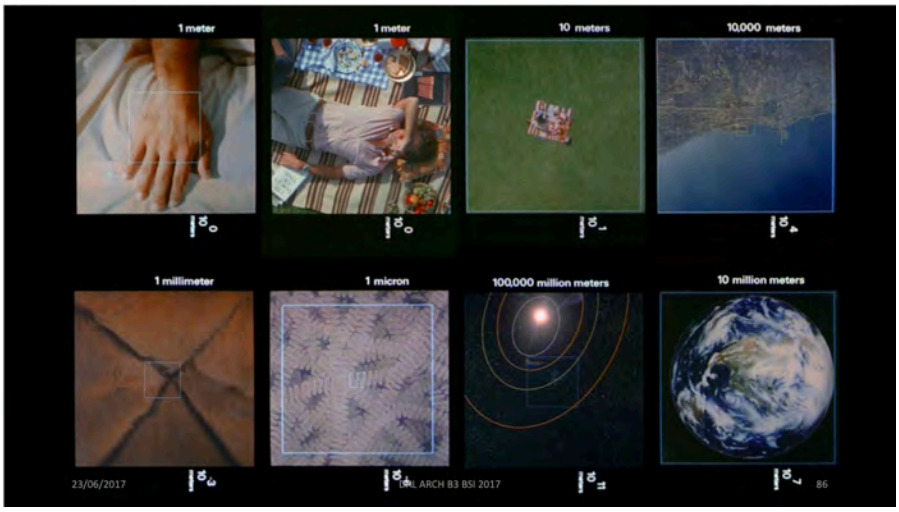
- No late assignments are accepted after the last day of weekly classes (the Friday before review week).
- With a Student Declaration of Absence (maximum two per course), an assignment may be submitted up to three weekdays late without penalty. An SDA cannot be used for the final assignment.
- With a medical note submitted to the School office, a course assignment (including a final assignment) may be submitted more than three weekdays late without penalty. The number of weekdays depends on how long you were unable to work, as indicated in the medical note. If more than one course is affected, you should consult with the Undergraduate/Graduate Coordinator to set a new schedule of due dates.
- A student with an accessibility plan that allows for deadline extensions does not need to submit an SDA.

Academic Integrity
Students are expected to submit original work. If there is a reason to expect plagiarism, detection software may be utilized.

Faculty Policy

Equity, Diversity and Inclusion
The Faculty of Architecture and Planning is committed to recognizing and addressing racism, sexism, xenophobia and other forms of oppression within academia and the professions of architecture and planning. We, the faculty, are working to address issues of historic normalization of oppressive politics, segregation, and community disempowerment, which continues within our disciplines today.

Charles and Ray Eames, Powers of Ten



UNIVERSITY STATEMENTS

Territorial Acknowledgement
The Dalhousie University Senate acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.

The Dalhousie University Senate also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Internationalization
At Dalhousie, “thinking and acting globally” enhances the quality and impact of education, supporting learning that is “interdisciplinary, cross-cultural, global in reach, and oriented toward solving problems that extend across national borders.”

Academic Integrity
At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect. As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Accessibility
The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion please contact the Student Accessibility Centre (for all courses offered by Dalhousie with the exception of Truro). Your classrooms may contain accessible furniture and equipment. It is important that these items remain in place, undisturbed, so that students who require their use will be able to fully participate.

Conduct in the Classroom - Culture of Respect
Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect
Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2).

Code of Student Conduct
Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don’t follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can’t be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Fair Dealing Policy
The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie.

UNIVERSITY POLICIES, GUIDELINES, AND RESOURCES FOR SUPPORT

Dalhousie courses are governed by the academic rules and regulations set forth in the Academic Calendar and the Senate.

• _https://academiccalendar.dal.ca/catalog/viewcatalog.aspx
• _https://www.dal.ca/dept/university_secretariat/university_senate.html

University Policies and Programs

• _Important Dates in the Academic Year (including add/drop dates) ○ https://www.dal.ca/academics/important_dates.html

• _Classroom Recording Protocol ○ https://www.dal.ca/dept/university_secretariat/policies/academic/classroom-recording-protocol.html

• _Dalhousie Grading Practices Policy ○ https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

• _Grade Appeal Process ○ https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html

• _Sexualized Violence Policy ○ https://www.dal.ca/dept/university_secretariat/policies/human-rights---equity/sexualized-violence-policy.html

• _Scent-Free Program ○ https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html

Learning and Support Resources

• _Academic Support - Advising https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html ○ https://www.dal.ca/campus_life/academic-support/advising.html

• _Student Health & Wellness Centre ○ https://www.dal.ca/campus_life/health-and-wellness.html

• _On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond) ○ https://www.dal.ca/campus_life/academic-support/On-track.html

• _Indigenous Student Centre and Indigenous Connection ○ https://www.dal.ca/campus_life/communities/indigenous.html
○ https://www.dal.ca/about-dal/indigenous-connection.html

• _Elders-in-Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803.

• _Black Student Advising Centre ○ https://www.dal.ca/campus_life/communities/black-student-advising.html

• _International Centre ○ https://www.dal.ca/campus_life/international-centre.html

• _South House Sexual and Gender Resource Centre ○ https://southhousehalifax.org/about-us

- _LGBTQ2SIA+ Collaborative ○ https://www.dal.ca/dept/vpei/edia/education/community-specific-spaces/LGBTQ2SIA-collaborative.html
- _Dalhousie Libraries ○ https://libraries.dal.ca/
- _Copyright Office ○ https://libraries.dal.ca/services/copyright-office.html
- _Dalhousie Student Advocacy Service (DSAS) ○ https://www.dsu.ca/dsas
- _Dalhousie Ombudsperson ○ https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html
- _Human Rights & Equity Services ○ https://www.dal.ca/dept/vpei.html
- _Writing Centre ○ https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html
- _Study Skills/Tutoring ○ https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Safety

- _Faculty of Architecture and Planning: Work Safety ○ https://www.dal.ca/faculty/architecture-planning/current-students/inside-building/work-safety.html

Brian Lilley
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