

## 4.481 Building Technology Seminar – Syllabus

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| Term:              | Fall 2026                                                                                                                                                                                                                                                                                                                                                                                               |
| Department:        | Architecture                                                                                                                                                                                                                                                                                                                                                                                            |
| Instructors:       | Caitlin Mueller ( <a href="mailto:caitlinm@mit.edu">caitlinm@mit.edu</a> ), Coordinator<br>John Ochsendorf ( <a href="mailto:jao@mit.edu">jao@mit.edu</a> )<br>Christoph Reinhart ( <a href="mailto:reinhart@mit.edu">reinhart@mit.edu</a> )<br>Holly Samuelson ( <a href="mailto:hollysam@mit.edu">hollysam@mit.edu</a> )<br>John Fernandez ( <a href="mailto:fernande@mit.edu">fernande@mit.edu</a> ) |
| Administrator:     | Juliana Berglund-Brown ( <a href="mailto:jbbrown@mit.edu">jbbrown@mit.edu</a> )                                                                                                                                                                                                                                                                                                                         |
| Time and Location: | Thursdays 3pm - 5pm<br>W41-5510 (BT Conference Room)                                                                                                                                                                                                                                                                                                                                                    |
| Prerequisite:      | Permission of instructor, required subject for all entering graduate students in the Building Technology Program                                                                                                                                                                                                                                                                                        |
| Credits:           | 2-0-1                                                                                                                                                                                                                                                                                                                                                                                                   |

### Course Description

The Building Technology Seminar introduces the research process and supports the development of a research agenda for incoming students in the program. This seminar is organized around readings, building analyses, and student and faculty presentations. Topics of the seminar are drawn from a range of ongoing research interests, including thermal comfort, building systems analysis and control, building energy and materials, structural analysis and design and urban systems and dynamics.

The seminar offers an opportunity for students to understand the landscape for research in building technologies while developing their own interests and research agenda in a methodical manner. The seminar also offers the opportunity for incoming students to become familiar with the nature of building technology research in the Department of Architecture at MIT including aspects of the overall process, pacing, logistics, collaborative opportunities etc. Specific aspects of the research process including the development of a research question, the identification and alignment with a research community, and thought process and logistics involved in preparing and publishing a peer reviewed scientific document. In addition, the communication of your interests, your research statement and intended results will be addressed and evaluated. Oral communication in particular will be a focus of the seminar.

### Learning Objectives

The course aims to help incoming Building Technology students to:

- Start developing a research agenda for their time at MIT
- Develop relationships with the other members of the BT community
- Apply Building Technology research methods to an architectural space

- Practice presenting your work to a scientific audience
- Understand the mechanics and inner workings of scientific publishing

## **Assignments Overview**

Assignments are described below. First, you will be asked to study a space in terms of a diverse set of performance attributes. This brief exercise is independent of the development of your research topic, although it could be related if you wish. The majority of your activities will be focused on the development of your research agenda. Doing so will entail both written and oral work.

Written work and presentation slides should be submitted to Canvas by the due dates specified below. You will be receiving feedback from your BT Advisor. If you do not have a BT Advisor, feedback will be provided by the coordinating instructor.

### *Architectural space and building system study*

The goal of this assignment is to practice the use of experimental building technology methods to evaluate the environmental or resource performance of a study space. The analysis may include measurements, either spot or extended over time, of variables related to thermal comfort (temperature, relative humidity, air speed and radiant temperature), daylight, acoustics, electrical plug loads. Other possible modes of evaluation, which could be applied to building materials and structures as well as topics associated with measurements, include observations, occupant surveys and/or simulations.

We ask you to identify a specific performative question to answer for an architectural space that you have access to. Define a scope of study that isolates a set of physical and/or non-physical attributes and relates these attributes to specific building systems or other elements of the architecture. The intent is to focus on the relationship between the use and performance of existing spaces in light of the design and engineering that went into their creation. You may choose a successful space and outline the ways in which it serves occupants, or you may decide to study a space in which the architecture, building systems, occupant use or another element has led to a somewhat unsuccessful outcome.

Performance can be determined by defining a variety of goals, general and specific. These goals may be quantitative and qualitative. Meeting the specific goals of the architectural and engineering intent of the space may occur during short periods of time; hourly, daily or weekly, or at much longer periods of the lifetime of the building or even city. It is up to you to define the attributes of performance and the time period within which this performance is to be evaluated. The assignment is to be completed in two stages. First, find a space, define the attributes that you wish to study and outline a procedure for analysis. Second, perform your analysis and reach conclusions that you will present to the seminar.

### Assignment Deliverables:

- September 24: One-page synopsis of the scope of the study including identification of the space or building and description of the analysis to be undertaken.

- October 29: Completed analysis of architectural space and building system. Present your findings orally in a 7-minute visual presentation using a PowerPoint, PDF, or Google Slides (please note that there is no written component of this assignment).

### *Research Agenda Development*

Develop an agenda for the research that you intend to accomplish at MIT. This is the central mission of the seminar. You will arrive at this agenda in stages. Seminar discussions, presentations, and assignments will support the regular meetings you will have with your advisor. The final product of the seminar will serve as the statement of research goals and agenda for your activities in research in the Building Technology Program.

### Assignment Deliverables:

- Oct 1: One-page synopsis of the scope of your research interests. Specify the context for your work, the community that it serves and the importance of the research question that you are posing.
- October 8: First oral research presentation: Your presentation should introduce your research topic, provide some background, motivate your work and outline the methodology that you are intending to use along with some preliminary results (if applicable). Five minutes in length.
- October 22: Annotated literature review: commented list of relevant references Notes: To be discussed with advisor. General guidelines: Commented list of relevant references/articles (minimum 6, usually about 10-5 references); for each, provide a synopsis of a few lines and why it is relevant to your work, accounting for suggestions provided during research project presentation.
- November 12: One-minute video on your research project
- December 3: Research agenda completed. General guidelines: 1) Abstract that briefly describes the thesis subject and context; 2) Literature Review: Critical presentation of state of the art and context of research, problem to be answered put in context with commented relevant references (updated/extended), major issues to be addressed; 3) Scholarly reference list. This document should be carefully organized and well written; it forms the basis of a thesis proposal for SM students and may serve as the required qualifying paper for PhD students.
- December 10: Final oral research presentation, seven minutes in length.

## Weekly Overview

| <i>Date</i> | <i>Content</i>                                                                | <i>Assignment due</i>                              | <i>Faculty and guests</i>                 |
|-------------|-------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------|
| Sept 10     | Course Introduction                                                           |                                                    | All                                       |
| Sept 17     | Faculty research overview                                                     |                                                    | Mueller                                   |
| Sept 24     | Faculty research overview                                                     | One page space study synopsis                      | Reinhart                                  |
| Oct 1       | Faculty research overview                                                     | One page draft research interest                   | Fernandez                                 |
| Oct 8       | Student research presentation 1                                               | First oral presentation                            | All                                       |
| Oct 15      | Scientific publishing: Library resources; bibliographies, DSpace, attribution |                                                    | Kai Alexis Smith, Arch+Planning Librarian |
| Oct 22      | Faculty research overview                                                     | Annotated literature review                        | Samuelson                                 |
| Oct 29      | Space study presentation                                                      | Space study presentation                           | All                                       |
| Nov 5       | Meeting with senior BT students<br>Research videos                            |                                                    | Only students, no faculty                 |
| Nov 12      | Equity and environmental justice in the built environment                     | Upload a one-minute video on your research project | All                                       |
| Nov 19      | Faculty research overview                                                     |                                                    | Popescu                                   |
| Nov 26      | No class (Thanksgiving)                                                       |                                                    |                                           |
| Dec 3       | Scientific publishing                                                         | Research agenda                                    | All                                       |
| Dec 10      | Student research presentation 2                                               | Second oral presentation                           | All                                       |

Please familiarize yourself with MIT's Academic Integrity expectations at <http://web.mit.edu/academicintegrity/>.