ARCH 2614/5614 Building Technology I: Materials and Methods

"If one takes technique, utilitarian requirements, etc., as the point of departure, there is a risk of losing every chance of success, for intuition is then troubled by intelligence." -- Piet Mondrian

Course description: Building construction is examined from the following standpoints: life safety (including fire safety and zoning constraints on site planning); building service systems (plumbing, electrical, vertical transportation, security, fire protection); materials, sustainability, and life-cycle analysis; accessibility; technical documentation and outline specifications; building enclosure systems; and interior finish systems.

Architecture is both logical and expressive. The expressive function of architecture needs to be built upon an underlying logical base. Eschewing logic as a basis for expression is possible (see Mondrian quote above), but the buildings that result from such an attitude will have many problems. Life is hard enough as it is: resist the temptation.

Fall 2020
Online only, Mon-Wed 3:00 – 4:15 pm
Instructor: Jonathan Ochshorn

3 credit hours, required course for B.Arch and M.Arch students *revised 10/26/20*

Instructor: Jonathan Ochshorn
221W. Sibley Hall*, jo24@cornell.edu, 607 255-1194*

*I'm working from home this semester; use email to contact me,

Office Hours: 10:00 – 11:00 am Fridays — see:
https://jonochshorn.com/academics/officeHours/

Grading: Letter grade only for B.Arch and M.Arch students

I. Rationale:
Professional architecture students need to learn about building materials, methods of construction, and other aspects of building technology in order to properly design buildings.

II. Course Aims and Objectives:
Aims
The goal of this course is to provide students with an introduction to building technology.

Specific Learning Objectives:
The department is required by the National Architectural Accrediting Board (NAAB), as part of the accreditation process, to collect specific course material for each course taught.

B.3	**Codes and Regulations**	*Ability* to design sites, facilities, and systems that are responsive to relevant codes and regulations, and include the principles of life-safety and accessibility standards.
B.4	**Technical Documentation**	*Ability* to make technically clear drawings, prepare outline specifications, and construct models illustrating and identifying the assembly of materials, systems, and components appropriate for a building design.
B.7	**Building Envelope Systems and Assemblies**	*Understanding of the basic principles involved in the appropriate selection and application of building envelope systems relative to fundamental performance, aesthetics, moisture transfer, durability, and energy and material resources.*
B.8	**Building Materials and Assemblies**	*Understanding of the basic principles used in the appropriate selection of interior and exterior construction materials, finishes, products, components, and assemblies based on their inherent performance, including environmental impact and reuse.*
B.9	**Building Service Systems**	*Understanding of the basic principles and appropriate application and performance of building service systems, including ~~lighting, mechanical~~, plumbing, electrical, communication, vertical transportation, security, and fire protection systems.*
B.10	**Financial Considerations**	*Understanding of the fundamentals of building costs, which must include ~~project financing methods and feasibility, construction cost estimating, construction scheduling, operational costs, and~~ life-cycle costs.*

III. Format and Procedures:

Course is in lecture format.

IV. My Assumptions

Architecture is both logical and expressive. The expressive function of architecture needs to be built upon an underlying logical base. Eschewing logic as a basis for expression is possible (see Mondrian quote above), but the buildings that result from such an attitude will have many problems. Life is hard enough as it is: resist the temptation.

V. Course Requirements:

1. Attendance is required. Students with an excused absence (in general, this means illness, death in family, or other circumstances beyond one's control) may make arrangements to take make-up exams or turn in assignments late without penalty. Students in these circumstances should contact the professor as soon as possible. Projects due or extraordinary quantities of work assigned in other courses do *not* constitute an excuse for missing the midterm exam or turning in a late assignment.

2. Course readings:

(a) Required text: Edward Allen, *Fundamentals of Building Construction,* 6th edition, John Wiley & Sons, New York, 2013 (except where noted otherwise) – available through the Cornell library catalogue.

(b) Students should get a free subscription to the *Construction Specifier* by filling out an online form linked from the course website.

3. How many credits? 3

4. Additional requirements:

(a) Most assignments will have a drawing component; students will be asked to create plans, elevations, and sections; also axonometric or perspective views, using CAD/modeling software. Some simple mathematical skills are required when dealing with zoning, building code, movement, and thermal issues.

(b) Most assignments may be turned in on the Wednesday following the Monday due date without penalty (but try not to abuse this allowance). [**Updated 10/26/20:** For no grade penalty, turn in assignment no later than 3:00 pm (Ithaca time) on the Wednesday after the assignment is due. For one week *after* that Wednesday—i.e., until 3:00 pm (Ithaca time) on the Wednesday following the Wednesday after the assignment is due—assignments will be accepted and will be graded, but there will be a grade penalty. Beyond that time, assignments will not be graded, and students will receive no credit for that assignment.]

VI. Grading Procedures: Grades will be based on:

- **Assignments**, 8 total = 50% course grade
- **Midterm exam**, 15% course grade
- **Final exam**, 15% course grade
- **Attendance and class participation**, 20%

VII. Academic Integrity

The University Faculty Senate requires that the following statement be attached to each course syllabus:

"Each student in this course is expected to abide by the Cornell University Code of Academic Integrity. Any work submitted by a student in this course for academic credit will be the student's own work, except in the cases of projects that are specifically structured as group endeavors."

Circulating or Selling Class Materials

All materials of this course are copyrighted and it is prohibited to circulate or sell to commercial vendors the course materials, including syllabus, exams, lecture notes, images, presentations, and student papers. Such unauthorized behavior constitutes academic misconduct. Video and/or audio recording of class lectures and review sessions without my permission in advance is prohibited. If you have an accommodation letter from Student Disability Services or if you are interested in recording for your personal use as a study aid, please make an appointment, via youcanbookme (Links to an external site.), to meet in office hours before you record anything.

VIII. Diversity and Inclusion

We believe that design is a principal instrument of positive social change, and that progress and innovation are driven by a commitment to inclusion across race, class, ethnicity, gender, age, religion, ability and identity. For this reason, we explicitly confirm our resolute commitment to accelerate Cornell University's actions to be a diverse and inclusive institution. We embrace the responsibilities of ongoing internal critical reflection, dialogue, and action as individuals and as a community. We support the Cornell teaching community—our faculty, staff, and students—in their efforts to act with an ethos of inclusivism and antiracism in creating and sustaining diverse teaching and learning environments.

IX. Bias-related Incident Reporting System

Cornell University is committed to fostering a safe, respectful, and inclusive living, learning, and working environment for our entire community. The bias-related incident reporting system is one step toward promoting that we, as an institution, live out these values. The reporting system allows for you to safely and anonymously report an incident you may have experienced or witnessed, receive support, and explore options for resolution.

To report an incident, individuals can use one of the following methods:

- *By submitting an incident report online at https://www.biasconcerns.cornell.edu/ (non-emergency)*
- *By contacting the Cornell University Police Department (CUPD) at (607) 255-1111 or 911 for emergency assistance*

X. Academic Accommodations

The Center for Learning and Teaching recommends that the following statements be attached to each course syllabus:

"In compliance with the Cornell University policy and equal access laws, the faculty, teaching assistants, and teaching associates for this course are available to discuss appropriate academic accommodations that may be required for students with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances, so that arrangements can be made."

XI. Religious Holidays

Cornell University is committed to supporting students who wish to practice their religious beliefs. Students are advised to discuss religious absences with their instructors well in advance of the religious holiday so that arrangements for making up work can be resolved before the absence.

The New York State Legislature (since July 1, 1992) requires all institutions (public and private) of higher education not to discriminate against students for their religious beliefs. Accordingly, the pertinent parts of Sections 3 and 4 of the law state:

“3. It shall be the responsibility of the faculty and of the administrative officials of each institution of higher education to make available to each student who is absent from school, because of his or her religious beliefs, an equivalent opportunity to . . . make up any examination, study or work requirements which he or she may have missed because of such absence on any particular day or days…”

“4. If . . . classes, examinations, study or work requirements are held on Friday after four o’clock post meridian or on Saturday, similar or makeup classes, examinations, study or work requirements shall be made available on other days, where it is possible and practicable to do so.”

A list of religious holidays can be found here:
https://dos.cornell.edu/sites/dos.cornell.edu/files/curw/documents/Relgious%20Holidays%202016-2017.pdf

XII. Tentative Course Schedule

I. Life-Safety, Accessibility, Sustainability, and Technical Documentation

Week 1

- Mon., Aug. 31: no class

- Wed., Sept. 2: Systems, CSA Masterformat
- Assign. #1 issued

Week 2

- Mon., Sept. 7: Fire sprinklers and fire areas; construction types and occupancy
- Assign. #1 due l Assign. #2 issued

- Wed., Sept. 9: Area calculations, examples

Week 3

- Mon., Sept. 14: Mixed occupancies, barriers, and assemblies
- Assign. #2 due l Assign. #3 issued

- Wed., Sept. 16: Egress

Week 4

- Mon., Sept. 21: Accessibility
- Assign. #3 due l Assign. #4 issued

- Wed., Sept. 23: Introduction to sustainability

Week 5

- Mon., Sept. 28: Materials, life-cycle analysis, and life-cycle cost
- Assign. #4 due

- Wed., Sept. 30: Security systems

Week 6

- Mon., Oct. 5: Overview of technical docs, specs

- Wed., Oct. 7: Working drawings

Week 7

- Mon., Oct. 12: Midterm exam (material from weeks 1 – 6)

- Wed., Oct. 14: no class

II. Construction systems

Week 8

- Mon., Oct. 19: Structure, enclosure, and building systems
- Assign. #5 issued

- Wed., Oct. 21: Control layers

Week 9

- Mon., Oct. 26: Movement, joints, and flashing

- Assign. #5 due l Assign. #6 issued

- Wed., Oct. 28: Sealant joints

Week 10
- Mon., Nov. 2: Wall sections: foundations
- Assign. #6 due l Assign. #7 issued

- Wed., Nov. 4: Wall sections: brick and stone veneer (video)

Week 11
- Mon., Nov. 9: Wall sections: curtain walls and glazing systems
- Assign. #7 due

- Wed., Nov. 11: Wall sections: metal and precast panels

Week 12
- Mon., Nov. 16: no class (semi-final study day)

- Wed., Nov. 18: no class (semi-final exam day, not applicable for this class)

Week 13
- Mon., Nov. 23: no class (semi-final exam day, not applicable for this class)

- Wed., Nov. 25: no class (Thanksgiving Break)

Week 14
- Mon., Nov. 30: Wall sections: EIFS
- Assign. #8 issued

Wed., Dec. 2: Roofing

Week 15
- Mon., Dec. 7: Large-scale views (stairs, elevators, escalators)
- Assign. #8 due

- Wed., Dec. 9: no class

Week 16
- Mon., Dec. 14: Schedules and interior finishes, course evaluations

- Wed., Dec. 16: Plumbing and electrical systems

Final exam: Date and time to be determined

XIII. Additional Resource Readings

References on course reserve, Fine Arts Library

1 Allen, *Fundamentals of Building Construction, 6th edition* (electronic resource)

2 Allen and Rand, *Architectural Detailing* NA2840 .A38 2007

3 Allen, *The Architect's Studio Companion* NA 2750 .A42 A6 1995

4 Brand, *Architectural Details for Insulated Buildings* TH1715 B66x 1990

5 Brock, *Designing the Exterior Wall* TH2235 .B76 2005

6 Lstiburek, *Builder's Guide to Cold Climates* TH153 .L78x 2000

Basic construction references, Fine Arts Library

1 *Architectural Graphic Standards,* latest edition (permanent reserve)

2 USGBC, *Reference Guide v4* (permanent reserve: TH880 .G734 2013)

Internet sources

1 Construction products and systems: Sweet's online

2 Accessibility: ADA/ABA technical chapters | History of disability legislation

3 Sustainability: LEED | Green Globes | Brundtland Report (*Our Common Future*) | Indoor air quality | Architecture 2030 | Summary and critique of LEED 2009 reference guide | Critique of Milstein Hall

4 Specifications: Arcat | CSI | 4specs

5 Building failure: *Defects and deterioration in buildings* online

6 The perfect wall: *The Perfect Wall*

7 Attic ventilation: Find link to *Roof and Attic Ventilation Issues in Hot-Humid Climates*

8 Masonry details: *International Masonry Institute* Detailing Series

9 Materials of the future: 1952 Asbestos-Cement promotional film ("According to Plan") *Part 1* | *Part 2*

10 Building code: IBC and NYS Building Code links

11 Parametrics: Schumacher, "The Parametricist Epoch: Let the Style Wars Begin," 2010

12 Dew point calculator: Image Permanence Institute, Rochester Institute of Technology

13 Building technology calculators

14 Milstein Hall construction videos