COLUMBIA
GSAPP

AT4 Integrated Design - Building
Fall 2018

Syllabus

1. Course Description

AT4 Integrated Systems – Building is the *capstone* course of the Master of Architecture technical sequence. The course brings together key areas of previous coursework in life safety, fire protection, environmental systems, structure and enclosures. Knowledge, concepts and principles on these subjects learned in previous Tech courses are applied in a design-based project.

The construction of a building is essentially a part-to-whole problem. It involves the complex integration of tens of thousands of building components, systems and processes into a synthetic whole. Architects, engineers, fabricators and erectors work alongside of one another to develop each respective part. Architects also hold the key role in ensuring the successful synthesis of these multiple parts into the whole. Through a better understanding of all systems, architects are able to integrate systems more completely with greater economy, elegance and efficiency. A well-integrated building is an efficient one, a well-integrated building is an elegant one, and most importantly, a well-integrated building gets built.

The intent of the course is an intensive introduction into the application of technical systems through design, development and integration. The course objectives are to establish an understanding and experience in the construction of the technical aspects of architecture. Structural form, environmental systems, materials, construction methods and fire protection elements are developed systematically and integrated with one another. This is achieved through the development of analytic skills, basic principles and their applications.

This course takes a fresh look at each system of a building. What are the key drivers in planning each system? What techniques lead to rapid iteration around design ideas and strategies? This is not science, more a developed and applied understanding of how the parts of constructed form get put together. The course will start with key ideas around integration at the building scale. What drives the first decisions to be made on a project? Where do the first technical constraints appear in massing, egress, structure, mechanical systems? We will explore through lectures some fundamental ways of looking at the basic drivers for decision making and use of tools and support information to assist you in developing your future projects, including the project for this class.

AT4 forms the basis of a year-long exploration on integration across multiple scales in the built environment. While we will begin with building scale in the fall semester, the spring semester will build on this knowledge at the urban and city scale. Façade systems will be explored simultaneously in *A4113 Envelopes in Architecture* and work in this class will support the project work we will be doing in *A4114 Integrated Design: Urban Scale*.

2. Course Hours

Content	Date	Location
Lectures	Tuesdays 2-3pm	Wood Auditorium
Team Deskcrits	Tuesdays 3-6pm	Rooms 504, 505, 408, 409 & 412
BIM Primer	Saturday 9/8 & 9/9 10am-4pm	114
Reviews	SD – 10/2 2-6pm DD – 10/23 2-6pm Final – 11/27 2-6pm Innovation Award – 11/27 6pm	Rooms 504, 505, 408, 409, 412 300
Site Visits	9/28 11am 10/5 10/26	St. Ann's Warehouse Construction Site Construction Site
TA Office Hours	Monday 7-9pm	5th Floor Studio South

3. Instructors & Critics

Professor: Sarrah Khan, sk1286@columbia.edu
Teaching Assistant Admin: Min Chen, mxc2101@columbia.edu
Teaching Assistant Project: Sadie Dempsey, sd3081@columbia.edu
Revit Instructors: Brian Lee, brian.j.lee2@gmail.com
Jared Friedman jbf1212@gmail.com, Gui Talarico gtalarico@gmail.com

Technical Instructors:

Section H	Room #504	Arch	Joe Hand	SHoP Architects	jah@shoparc.com
		SE/C	Aaron Campbell	Bluezees Dev.	acampbell@bluezees.com
		MEP	Oliver Meade	Buro Happold	Oliver.meade@burohappold.com
		Encl	Ashley Reed	Eckersley O'Call.	

Section B	Room #409	Arch	David Burke	Grimshaw	David.burke@grimshaw.global
		SE	Amy Harrington	Silman	
		MEP/S	Ciaran Smyth	WSP	Ces2239@columbia.edu
		Encl	Tom Reiner	Talweg Studios	tomreiner@gmail.com

Section R	Room #408	Arch	Clementina Ruggieri	Space 4 Architects	cr@s4arch.com
		SE	Jason Stone	LERA	Jason.stone@lera.com
		MEP	Jonce Walker	Thornton Tomasetti	jwalker@thorntontomasetti.com
		Encl	Ryan Donaghy	SHoP	

Section P	Room #408 + #300	Arch	Stephan Potts	Stanev Potts	spotts@sparchs.com
		SE	Michelle Roelofs	Arup	Michelle.roelofs@arup.com
		MEP	Naill Cooper	Derive Engineers	Niall.cooper@deriveengineers.com
		Encl	Michele Busiri-Vici	Space4 Architecture	mbv@s4arch.com

Section D	Room #412	Arch	Nicole Dosso	SOM	nicole.dosso@som.com
		SE	Enrica Oliva	Werner Sobek	enrica.oliva@wernersobek.com
		MEP	Bob Kearns	Derive Engineers	bobnkearns@gmail.com
		Encl	Erik Verboon	Walter P Moore	EVerboon@walterpmoore.com

4. Course Content

a. Project Workshop — Tue 3-6pm

The primary focus of the course is the project workshop. Projects will be completed in small group learning "teams" of four students. Teams quickly develop the architectural concept of a building. The building type consists of a multi-program urban building, requiring careful consideration of access and exchanges (circulatory, visual and energy), between programs. Following the finalization of the architectural concept, systems of structural form, life safety, fire protection, environmental systems, and envelope design are carefully advanced. The project is also developed in terms of constructive processes and assembly.

The project deliverables are technical construction documents, developed through weekly small group crits. These weekly consultations are guided by a reviewing team of an architect, structural engineer, and an MEP engineer. The workshop will mimic the design process ranging from conceptual design to construction documents in typical project phases. This is an iterative design approach, refined through drawing and analysis. The project will begin with a scheme design in which environmental concept, structural system, egress, and construction systems are investigated. Through design development the building will be refined by sizing and integrating mechanical and structural system components as well as by developing the construction of the building envelope. Finally, in the construction documents students will develop details, budgets and assembly sequences.

Enclosures critics will join the DD review and outside critics will join the final review. Note, the AT4 project and team is the same as the Enclosures project and team.

b. Lectures — Tue 2-3pm

The project consultations are complimented by a series of lectures. Lectures present the disciplines of life safety, egress, fire protection, structure, mechanical, electrical and sustainability. The intent of the lectures is to foster the development and integration of each individual system. PDFs of the lecture will be available on Canvas, the use of laptops is strongly discouraged in lectures. Each lecture is taught through analysis, principles and analysis as follows:

- Design/Conceptual History and Development
- Cultural Context of Construction Topic
- Processes of Assembly, Performance and Materials
- Applications and Case Studies
- Direct Application to Project

c. Building Information Modelling Primer — 9/8 & 9/9 9.30am-4.30

Course deliverables, including Design Development and Construction Documents, are required in 3D Building Information Modelling (BIM) software. A weekend primer will introduce basic concepts of BIM through the use of the software Autodesk® Revit®. The weekend workshop is held September 8 & 9 from 9.30 – 4.30 pm.

The goal of the use of Revit® is to provide a tool for learning the relationship between architectural design intentions and material and building construction decisions. BIM software provides the flexibility to provide changes to the building model in response to changes in wall types, material choices, window and door types and dimensions, structural systems and materials, etc. Drawing output from the BIM models can also facilitate student learning by providing a faster and more thorough means to analyze, review, discuss and modify architectural / construction design relationships in the context of construction lab discussions.

Further training will be provided in Video Tutorials will provide a basic introduction to the tools necessary to complete each step for an assignment. Building Information Modelling (BIM) software (such as Revit®) is playing a larger and larger role in how architects design and communicate and share project information with other design professionals and consultants including structural and mechanical engineers, lighting consultants, acoustic consultants, cost analysis consultants, etc. As designers

entering into the architecture profession at this time, it is crucial to develop expertise with the organization and work-flow of BIM systems.

The weekend primer will include:

- Intro to BIM: value and opportunities, limitations (detailing, concepts) and complexities
- Revit Basics and Model Navigation
- Modeling: walls, floors, windows, stairs, taming unruly curves
- Structural and HVAC Systems for architects
- Production: plans, sections, elevations, renderings
- Future of BIM: Laser scanning; mobile devices; drone applications

d. Site Visits

Exposure to construction practices is a critical part of the architecture process. This class includes three site visits for projects currently under construction. These site visits will explore current class discussion areas and be an opportunity to share best (and not so best) building construction technology practices in the field today. The two to three site visits will be hosted on 9/28, 10/5 and 10/26. Students will need to make accommodations to ensure they can attend all site visits. Note: Construction attire is required for site visits, including thick-soled shoes, long sleeved shirts, no shorts or skirts. Access to jobsites is not allowed without appropriate attire.

5. Grading

In this course, every effort is made to grade impartially and to the best of our knowledge about performance. Since project development is a team effort, grades are assigned to teams. On rare occasions, individual grades may be awarded for exceptional or deficient performance within a group. Grading is based on the following criteria:

Criteria	Description	%
Technical Concept		15%
System Development	Architectural, Life Safety, Fire Protection	15%
	Structure and Assembly	10%
	Mechanical, Electrical and Sustainability	10%
Integration of Systems		10%
Deliverables	- Quality of drawing deliverables - Communication of concept and design in drawing form - Level of assembly drawn - Breadth of construction drawings achieved in drawing set - Presentations at reviews and desk crits (equal presentation by all group required)	30%
Process & Professionalism	- Team collaboration - Attendance - Punctuality	10%

	- Preparedness for weekly crits - Assignment completion - Sketches, project organization - Responsiveness to critic feedback	

Final grades are assessed based on the following %:

High Pass	>90%
Pass	60 – 90%
Low Pass	50 – 60%
Fail	<50%

At the end of the semester, Innovation Prizes will be awarded to exceptional projects.

6. Policies & Academic Integrity

- If you require an accommodation for a disability, please let me know as soon as possible. Some aspects of the course may be modified to facilitate your participation and progress.
- All students are held to the academic policies of the University.
- Plagiarism is knowingly presenting another person's ideas, findings, images or written work as one's own by copying or reproducing without acknowledgment of the sources. It is intellectual theft that violates basic academic standards. In order to uphold an equal evaluation for all work submitted cases of plagiarism will be reviewed by the individual faculty member and/or the Dean. Punitive measures will range from failure of an assignment to expulsion from the University.
- Students who miss deadlines due to valid extenuating circumstances may submit the required work at a later date, as agreed upon with the instructor. University regulations limit such circumstances to serious personal illness and death in the immediate family. Unexcused late projects will not be accepted, incomplete projects will be evaluated in relation to their degree of completion, and a student will be allowed to present such work only with instructor approval. Lectures and demonstrations cannot be repeated. There is no excuse for late submittals, late attendance at reviews or pin ups, due to printer or computer problems. You have to organize your output ahead of time or find other resources outside the college to complete your work on time. Late work will be accepted only at the discretion of the instructors and is subject to a 5% grade deduction for every 24 hours past the deadline.
- The final course evaluations are important to the quality of instruction. Please take the necessary time to critically and constructively evaluate the course as well as the instructor's quality of instruction and guidance in relation to your own participation in the course, engagement in the subject matter as well as your interaction with your peers and your instructor.

7. References

Reference excerpts from these texts will be provided for relevant class assignments and in support of lecture and crit materials. The reference books will be provided at the library. Some are very useful reference books and it is recommended that students purchase the texts for future reference in studio work.

- Building Code of the City of New York 2014 and Referenced Standards
- Detail Magazine
- Construction Manual Series, Bikhauser Edition
- Fundamentals of Building Construction, Allen and Iano.***
- The Architects Studio Companion, Allen and Iano.***
- Constructing Architecture: Materials, Processes, Structures, Deplazes.
- Heating, Cooling, Lighting. Lechner.
- Structures. Schodek, Daniel. Bechthold, Martin.
- Professional Practice of Architectural Working Drawings. Wakita, O et al.
- Building Systems Integration. Vassigh, S. and Chandler J.
- Integrated Buildings : Systems Basis of Architecture. Bachman,