

ARCH 1231 BUILDING TECHNOLOGY I
1 lecture hour and 4 lab/studio hours, 3 credits

Course Description: An introduction to basic materials of construction and the fundamental principals of hand drafting and system analysis. The coursework includes surveying existing conditions, development of plans, elevations, and sections, and basic details as well as the study of material properties and applications.

Course context: This course is positioned between the Intro to Architecture course and the higher-level building technology courses. This course will prepare you for further exploration of building technology, technical documentation, and understanding of structure, materials, and building assemblies.

Prerequisites: ARCH 1101 Introduction to Architecture

Required Texts:

Allen, Edward. *Fundamentals of Building Construction: Materials and Methods*, John Wiley & Sons, 2014.
Ching, Francis. *Building Construction Illustrated 5th Ed.* John Wiley and Sons, 2014.

Recommended Text:

Ching, Francis. *Architecture-Form, Space, & Order*. John Wiley and Sons, 2007.

Suggested Reference: See the City Tech Openlab for additional reference materials.

Attendance Policy: No more than 10% absences are permitted during the semester. For purposes of record, two late arrivals are considered as one absence. Exceeding this limit will expose the student to grade penalties at the discretion of the instructor due to lack of class participation and mastery of class material.

Academic Integrity: Students and all others who work with information, ideas, texts, images, music, inventions and other intellectual property owe their audience and sources accuracy and honesty in using, crediting and citation of sources. As a community of intellectual and professional workers, the college recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and is punishable by penalties, including failing grades, suspension and expulsion.

Course Structure: This course combines class discussions based on the readings, site investigations, and drawing labs. Students are required to maintain a combined notebook/sketchbook for all readings and site investigations. Students will learn to develop architectural drawings by hand as well as using digital tools.

Grading:

10%	Module 1
20%	Module 2
30%	Module 3
35%	Module 4
5%	Participation in Class Discussion

GRADING DETAILS: assignments with * require progress documentation and review by professor

MODULE 1: 100 pts

Drawing Assignments:

Line weight + Quality:	10 pts
Guideline Underlay*	9 pts
Floor Plan	10 pts
Projected Section Setup*	8 pts
Section 1	10 pts
Section 2	10 pts
Axon Setup*	8 pts
Axon	10 pts

Reading Notes:

Egress	4 pts
Stair Design	4 pts
Stair Requirements	4 pts
Stair Configurations	4 pts

Sketchbook Assignments:

Site Survey	4 pts
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Assessments:

Reading Drawings + Text	5 pts
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MODULE 2: 200 pts

Drawing Assignment:

Line weight + Quality	20 pts
Grid/Centerline Underlay*	20 pts
Guidelines + Dimensions	20 pts
Poche Layer	20 pts

MODULE 2 continued:

Stairs+Cutline/Up Arrow	20 pts
Windows/Doors	18 pts

Reading Notes:

Building Elements	4 pts
Forces	4 pts
Columns	4 pts
Beams Spans Trusses	4 pts
Frames Walls Plates	4 pts
Arches Vaults Domes	4 pts
Joints Connections	4 pts
Structural Units	4 pts
Structural Spans	4 pts
Structural Patterns	4 pts
Lateral Stability	4 pts
Stone	4 pts
Brick/CMU	4 pts
Wood	4 pts
Steel	4 pts
Concrete + Reinf.	4 pts

Sketchbook Assignments:

Site Investigation	6 pts
Structural Components	6 pts
Materials + Properties	6 pts

MODULE 3: 300 pts

Drawing Assignments:

Line weight + Quality:	25 pts
Grid Underlay*	25 pts
Axon Guidelines*	25 pts
Axon	25 pts
Structural Overlay	25 pts
Exploded Axon	26 pts
Calculations	27 pts
Annotations	27 pts
Component Sections	27 pts

Reading Notes:

Brick/CMU Bonding	4 pts
Wood Components	4 pts
Steel Shapes	4 pts
Reinforced Concrete	4 pts
Precast Concrete Flr Sys	4 pts
Brick Masonry	16 pts
Masonry Arches + Lintels	4 pts
Wood Beams + Joists	4 pts
Wood Subfloor, Decking	4 pts
Wood Plank and Beam	4 pts
Steel Beams	4 pts
Steel Open-Web Joists	4 pts
Metal Decking	4 pts
Reinfc'd Concrete Beams	4 pts

MODULE 4: 350 pts

Drawing Assignments:

Line weight + Quality:	30 pts
Layout Underlay*	20 pts
Axon Guidelines*	22 pts
Axon	30 pts
Plan/Elev/Sect Guidelines	30 pts
Plan Detail	30 pts
Elev Detail	30pts
Section Detail	30 pts
Annotations	23 pts
R-Value Calc	22 pts

Reading Notes:

Building Envelop	4 pts
Walls: Moist + Flashing	4 pts
Thermal Protection	4 pts
Designing Ext. Wall Sys	16 pts
CMU + Brick	4 pts
Stone	4 pts
Windows	4 pts
Masonry Wall Const.	16 pts
Windows and Doors	16 pts

Sketchbook Assignments:

Assemb. + Perform Walk	6 pts
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Assessments:

Reading Drawings + Text	5 pts
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CLASS PARTICIPATION **50 pts**

Discussions	25 pts
Site Walks	25 pts

General Education Learning Outcomes / Assessment Methods	
Learning Outcomes	Assessment Methods
Upon successful completion of this course the student shall be able to:	To evaluate the students' achievement of the learning objectives, the professor will do the following:
1. Develop Knowledge from the range of architectural disciplinary concepts presented in the course.	<ul style="list-style-type: none"> • Review student notebooks, observe student participation in class discussions, and review student applications of disciplinary concepts in drawing assignments.
2. Use the texts assigned in the course as well as background knowledge from within the discipline in order to Draw Inferences from the material.	<ul style="list-style-type: none"> • Use a pre and post written exam to assess students' development and achievement over the course of the semester.
3. Apply Information from the reading within the discipline.	<ul style="list-style-type: none"> • Review student applications of disciplinary concepts in drawing assignments.

National Architectural Accrediting Board (NAAB) Students Performance Criteria (SPC) / Assessment Methods	
Learning Outcomes	Assessment Methods
Upon successful completion of this course the student shall be able to:	To evaluate the students' achievement of the learning objectives, the professor will do the following:
4. Understand the fundamentals of formal ordering systems and the capacity to inform two- and three-dimensional design.	4. Review student drawing assignments with implementation of the organizing grid.
5. Understand some 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.	5. Review student notebooks and drawing assignments with application of material properties, rules of thumb, and performance analysis.

Course Specific Learning Outcomes / Assessment Methods	
Learning Outcomes	Assessment Methods
Upon successful completion of this course the student shall be able to:	To evaluate the students' achievement of the learning objectives, the professor will do the following:
6. Layout plan drawings by hand and with digital tools.	6. Review student plan assignments for accuracy and application of line weights and drawing conventions.
7. Understand and apply basic principles of structural characteristics of materials following rules of thumb.	7. Review student drawing assignments for accurate application of rules of thumb to sizing structural elements for a specific span.

Weekly Course Outline:

MODULE I	CLASS 1	<i>Activity/Assessment:</i>	Intro, Reading Texts, Reading Drawings
	CLASS 2	SITE VISIT: <i>Sketchbook:</i>	Measured Space Site Survey Measured Space Site Survey
	CLASS 3	<i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> Reading Notes: Additional Discussion:	Measured Space Arch Drawing / Orthographic Projection Measured Space Plan Guideline Underlay* Stairs + Egress (Reading #1) Note Taking + Reading
	CLASS 4	<i>Drawing Assignment:</i> <i>Discussion:</i> <i>Sketchbook:</i> <i>Drawing Lab:</i>	Measured Space Stairs + Egress (Reading #1) Egress, Configurations, Code, Design Stair Site Investigation (added to survey) Measured Space Plans w/Stairs
	CLASS 5	<i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i>	Measured Space Arch Drawing / Orthographic Projection Measured Space Section Setup*
	CLASS 6	<i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i>	Measured Space Arch Drawing / Orthographic Projection Measured Space Axon Setup*
	CLASS 7	<i>Assignment Review:</i> <i>Drawing Lab:</i> Reading Notes:	Measured Space Assignment Feedback Submission Prep Demonstration Building Elements (Reading #2)
	SUBMISSION	MODULE 1:	Measured Space Drawing Assignment Reading #1 Notes <u>Sketchbook Assignment</u> DUE DATE: Submit Formatted Drawing / Notes / Sketchbook Files by CLASS 9

MODULE 2

CLASS 8	SITE VISIT: <i>Discussion:</i> <i>Sketchbook:</i>	Case Study Building Site Building Elements (Reading #2) The Building, Space, Circulation, Stairs, Transparency Site Investigation Assignment
CLASS 9	<i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> Reading Notes: Additional Discussion:	Case Study Floor Plans Arch Drawing / Plan Layout Case Study Plan Grid/Centerlines Underlay* Structural Components (Reading #3) Note Taking + Reading
CLASS 10	SITE VISIT: <i>Discussion:</i> <i>Sketchbook:</i>	Structure Walk Structural Components (Reading #3) Forces, Columns, Beams, Spans, Trusses Frames, Walls, Plates, Arches, Vaults, Domes, Joints, Connections Structural Components Sketches
CLASS 11	<i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> Reading Notes:	Case Study Floor Plans Arch Drawing / Plan Layout Case Study Plan Guidelines/Geometry Structural Typologies (Reading #4)
CLASS 12	<i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> Reading Notes:	Case Study Floor Plans Structural Typologies (Reading #4) Structural Units, Spans, Patterns Lateral Stability, Relation b/w Structure + Space Case Study Plan Development Materials + Properties (Reading #5)
CLASS 13	SITE VISIT: <i>Discussion:</i> <i>Sketchbook:</i>	Materials Walk Materials + Properties (Reading #5) Stone, Brick, CMU, Wood, Concrete, Steel Materials + Properties Sketches
CLASS 14	<i>Drawing Assignment:</i> <i>Drawing Lab:</i>	Case Study Floor Plans Case Study Plan Development
CLASS 15	<i>Assignment Review:</i>	Case Study Floor Plans Feedback
SUBMISSION	MODULE 2:	Case Study Floor Plans Assignment Readings #2,3,4,5 Notes Sketchbook Assignments (3) DUE DATE: Submit Formatted Drawings/ Notes/Sketchbook Files by CLASS 17

MODULE 3

CLASS 16	<i>Drawing Assignment:</i> <i>Drawing Lab:</i> Reading Notes:	Case Study Axon + Structural Study Axon Grid + Guidelines* Material Modules (Reading #6)
CLASS 17	<i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i> Reading Notes:	Case Study Axon + Structural Study Material Modules Brick/CMU Bonding, Wood Components, Steel Shapes, Concrete Beams Axon Development Spans + Rules of Thumb (Reading #7)
CLASS 18	<i>Drawing Assignment:</i> <i>Discussion:</i> <i>Drawing Lab:</i>	Case Study Axon + Structural Study Spans + Rules of Thumb (Reading #7) Masonry Arches, Lintels, Wood Beams + Joists, Steel Beams + Joists, Reinforced Concrete Beams Structural Overlay on Axon
CLASS 19	<i>Drawing Assignment:</i> <i>Drawing Lab:</i>	Case Study Axon + Structural Study Structural Calcs + Sections
CLASS 20	<i>Drawing Assignment:</i> <i>Drawing Lab:</i>	Case Study Axon + Structural Study Structural Exploded Axon
CLASS 21	<i>Drawing Assignment:</i> <i>Drawing Lab:</i>	Case Study Axon + Structural Study Structural Exploded Axon
CLASS 22	<i>Assignment Review:</i>	Case Study Axon + Struct Study Feedback
SUBMISSION	MODULE 3:	Case Study Axon + Struct Study Assignment Readings #6,7 Notes DUE DATE: Submit Formatted Drawings/ Notes Files by CLASS 24

MODULE 4

CLASS 23	<i>Drawing Assignment:</i> <i>Drawing Lab:</i>	Masonry Exterior Wall Detail + Analysis Plan/Section/Elevation Detail Layout Underlay
	Reading Notes:	Assemblies + Performance (Reading #8)
CLASS 24	SITE VISIT: <i>Discussion:</i>	Assemblies + Performance Walk Assemblies + Performance (Reading #8) Building Envelop, Exterior Walls, Moisture Protection, Flashing, Thermal Protection Designing Exterior Walls
	<i>Sketchbook:</i> Reading Notes:	Assemblies + Performance Sketches Masonry Envelope Assemblies (Reading #9)
CLASS 25	<i>Drawing Assignment:</i> <i>Discussion:</i>	Masonry Exterior Wall Detail + Analysis Masonry Envelop Assemblies Masonry Cavity Walls, Brick Coursing, Stone Lintels, CMU Coursing + Bond Beam, Rigid Foam Insulation, Batt Insulation, Vapor Barrier, Interior Furring, Plaster on Lath, Drywall
	<i>Drawing Lab:</i>	Plan/Section/Elevation Detail
CLASS 26	<i>Drawing Assignment:</i> <i>Drawing Lab:</i>	Masonry Exterior Wall Detail + Analysis "Peel Away" Axon Guidelines
CLASS 27	<i>Drawing Assignment:</i> <i>Drawing Lab:</i>	Masonry Exterior Wall Detail + Analysis "Peel Away" Axon
CLASS 28	<i>Drawing Assignment:</i> <i>Drawing Lab:</i>	Masonry Exterior Wall Detail + Analysis Annotations
CLASS 29	<i>Assignment Review:</i>	Masonry Ext Wall Dtl + Analysis Feedback
CLASS 30	Activity/Assessments:	Activity, Reading Texts, Reading Drawings
SUBMISSION	MODULE 4:	Masonry Exterior Wall Detail + Analysis Readings #8,9 Notes DUE DATE: Submit Formatted Drawings/Notes/Sketches Files by CLASS 30 or on alt date required by professor

Learning Activities:

Course format will include a combination of any of the following activities:

- **Site Visits / High Impact Learning Practices:**
Site trips will look to visit existing buildings and construction sites, tour newly constructed buildings and urban spaces or visit institutions, including but not limited to museums, churches, or other colleges with discussions led by either the instructor or on-site experts in the field or the subject.
- **Discussions:**
Discussions will be led by a qualified instructor and if warranted invited guest lecturers or experts in the field or subject.
- **Activities:**
Students will participate in activities that provide them with the opportunity to apply what is learned in a given subject.
- **Research Activities:**
Students will be given directed readings and be required to correlate their readings with the lab exercises. Supplemental research will be encouraged to promote a greater analytical and critical understanding.
- **Presentations:**
Students will participate in written, oral and graphic presentation of course subjects and issues identified through their reading, writing, and lab work.

Contact Info:

Professor: Jason A. Montgomery, NCARB LEED AP
Email: jmontgomery@citytech.cuny.edu

Format Requirements for Submission:

All work submitted must be formatted as follows:

- Each reading topic and sketchbook assignment should be submitted as single pdf file (with multiple pages as required)
- Each component of a drawing assignment should be submitted as a separate pdf file.
- All images must be formatted using Adobe Illustrator per OpenLab templates
- All work must be scanned or photographed following professional standards and edited as required for clarity and resolution.
- Submitted file name for **reading notes** and **sketchbook assignments** must follow this format: Lastname_firstname_ARCH1231_readingtopic_YYMMDD.pdf
 - *Reading Notes Example:*
Montgomery_Jason_ARCH1231_buildingelements_20180817.pdf
 - *Sketchbook Assignment Example:*
Montgomery_Jason_ARCH1231_structure walk_20180817.pdf
- Submitted file name for **drawing assignments** must follow this format: Lastname_firstname_ARCH1231_assignment_drawingname_YYMMDD
 - *Drawing Assignment Example:*
Montgomery_Jason_ARCH1231_casestudyfloorplans_firstfloorplan_20180817.pdf
- **NOTE: Work submitted that does not meet above standards will not be graded and must be resubmitted.**

Class Submittals List: Following is a list of submittals that will be due throughout the course of the semester. They are subject to change:

Drawing Assignments:

Measured Space Assignment:

- Plan
- Sections (2)
- Axon

Case Study Floor Plans Assignment:

- First Floor Plan
- Basement Plan

Case Study Axon + Structural Study

- Axon
- Axon Overlay
- Exploded Axon
- Component Sections
- Calcs

Masonry Exterior Wall Details + Analysis

- Plan Detail
- Elevation Detail
- Wall Section
- Axon
- Analysis Diagram

Note: Grades for Incomplete Assignment Submissions will be pro-rated per % of missing drawings

Sketchbook Assignments:

- Measured Space Site Survey
- Case Study Site Investigation
- Structural Components Walk
- Materials + Properties Walk
- Assemblies + Performance Walk

Notebook Assignments:

Reading Notes and Sketches for readings #1-9 covering **all sections** of each reading.

READINGS:

#1 Stairs + Egress:	<i>Building Construction Illustrated</i>	Egress	A.10-A.11
		Stair Design	9.03
		Stair Requirements	9.04-9.05
		Configurations	9.06-9.07
#2 Building Elements:	<i>Building Construction Illustrated</i>	Building Elements	2.02-2.03
#3 Structural Components + Forces:	<i>Building Construction Illustrated</i>	Forces	2.11-2.12
		Columns	2.13
		Beams Spans Trusses	2.14-2.16
		Frames Walls Plates	2.17-2.18
		Arches Vaults Domes	2.25-2.26
		Joints Connections	2.30

#4 Structural Typologies:	<i>Building Construction Illustrated</i>		
	Structural Units	2.19	
	Structural Spans	2.20	
	Structural Patterns	2.21	
	Lateral Stability	2.22-2.23	
#5 Materials + Properties:	<i>Building Construction Illustrated</i>		
	Stone	12.10	
	Brick/CMU	12.06-12.07	
	Wood	12.11-12.12	
	Steel	12.08	
Concrete + Reinforcement	12.04-12.05		
#6 Material Modules:	<i>Building Construction Illustrated</i>		
	Brick/CMU Bonding	5.26-5.27	
	Wood Components	12.13-12.14	
	Steel Shapes	4.16, 5.37	
	Reinforced Concrete	4.04, 5.04-5.05	
	Precast Concrete Floor Systems	4.11-4.12	
	<i>Fundamentals of Building Construction</i>		
	Brick Masonry	Chapter 8	
	#7 Material Spans + Rules of Thumb:	<i>Building Construction Illustrated</i>	
		Masonry Arches + Lintels	5.20-5.21
		Wood Beams + Joists	4.26-4.27, 4.35
Wood Subfloor, Decking		4.32, 4.40	
Wood Plank and Beam		4.38-4.39	
Steel Beams		4.16-4.18	
Steel Open-Web Joists		4.19-4.21	
Metal Decking		4.22	
Reinforced Concrete Beams		4.04	
#8 Assemblies + Performance:		<i>Building Construction Illustrated</i>	
	Building Envelop	7.02	
	Walls: Moisture + Flashing	7.22, 7.28-7.29	
	Thermal Protection	7.39-7.47	
	<i>Fundamentals of Building Construction</i>		
	Designing Exterior Wall Systems	Chapter 19	
	#9 Masonry Envelop Assemblies:	<i>Building Construction Illustrated</i>	
		CMU + Brick	5.23-5.25
		Stone	5.33-5.34
		Windows	8.22-8.23, 8.27
<i>Fundamentals of Building Construction</i>			
Masonry Wall Construction	Chapter 10		
Windows and Doors	Chapter 18		