# Course Syllabus

Jump to Today

**Columbia University**

Graduate School of Architecture, Planning and Preservation

**Architecture A4634 – Advanced Curtain Wall**

Robert Heintges, Professor (adjunct)

with Dan Vos, Asst. Prof. (adjunct)

Spring 2020

**Enrollment (PLEASE READ):**

**Enrollment is limited. Students must have completed AT3 & 4 and must apply for enrollment in the course by submitting a one page (max.) statement of interest by email the week before the first day of class, but no later than Friday, Jan. 17.**

Statements of interest may include examples of the student's previous technical curriculum work. Please note that this class is offered in the M.Arch program. AAD students and students from other departments may apply but can only be accepted if space is available.

Submit applications directly to Prof. Heintges at rah11@columbia.edu, with **A4634** in subject line.

## Course Description

This course is the final offering in the GSAPP technology sequence, and offers an intense exposure to the custom curtain wall in a lecture/seminar and technical studio format. It is the intent of the course to provide graduating students with a comprehensive understanding of the technical concepts and specific skills necessary to undertake in actual practice the design, detailing, specification, and construction administration of the custom curtain wall.

Although the course will emphasize current and emerging technologies of the curtain wall, discussion of specific technical issues and methodologies will focus on those aspects that directly inform contemporary architectural design. Case studies of contemporary examples will be used throughout to illustrate the technical content of the course.

A key feature of the course is the **Technical Studio Design Problem** which is assigned at the beginning of the semester and concludes with a final formal review: in this exercise, students will develop detail drawings and prepare outline specifications for a unique curtain wall of their own design. The lecture and seminar content of the course is intended to inform the studio component and vice versa.

Specific technologies will be discussed in the context of the building enclosure as a technical system of component parts. These components can be defined in terms of five distinct categories: exterior materials, support constructions, performance materials, interior materials, and specialty components. Recent and emerging technologies, such as new glazing and cladding materials, double skin facades, interactive facades, cable-stayed and structural glass systems, etc., will also be presented and discussed.

Students will undertake a brief case study/research project on a topic (building, system, material, etc.) related to their design detailing projects, and will provide a written report and/or brief oral presentation to the class.

Finally, students will be introduced to the contract documentation and construction administration of the curtain wall/building enclosure. This will include a discussion of design documentation, forms of contract, the state of the industry both domestic and international, review of fabricators' submittals and shop drawings, testing, site inspection, etc. Some of the more esoteric aspects of the technology, such as wind tunnel testing, full-scale prototype performance testing, and blast testing of curtain walls will also be presented and discussed in detail.

Lectures will be illustrated with slide projection and supplemented by periodic hand-outs of additional technical information as required. One class will be held at Prof. Heintges's mid-town office in order to review material samples, mock-ups, etc. If the semester schedule permits, it is hoped that a field trip to manufacturing facilities and/or sites under construction can be arranged.

Students will also be required to pass two multiple choice quizzes, at mid-semester and at the end of the year which will cover the material presented in class. Class attendance is therefore essential. Class participation and attendance at formal pin-ups of your classmates are also important.

**Prerequisites:**

Completion of the required Building Technologies curriculum, all courses, including Architecture Technology 4 (formerly Building Systems II). No exceptions will be considered unless you have placed out of AT-4 to my satisfaction.

**Course Requirements:**

In addition to class attendance and participation, student performance will be assessed based on exams, and the curtain wall Design/Detailing Problem.

Participation will include in-class discussion of lecture topics, outside reading, and research assignments. Homework assignments may include a brief case study research project and presentation related to your design problem; short technical exercises; and calculations. Quizzes will be a combination of multiple choice and written questions, and may be in-class or take-home.

For the curtain wall Design/Detailing Problem, students will design and draw typical working drawing details for a specific curtain wall concept of their own design. This studio work will be ongoing throughout the semester and will be supported by individual desk crits, pin-up class reviews, and a final formal review.

Student performance and grades will be assessed as follows:

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| Class Attendance and Participation……. | 30% |

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| Design Detailing Problem……... | 40% |
| Home Work/Research/Case Study Project…….. | 10% |
| Mid-Term and Final Exams……. | 20% |

What does this mean??.... show up for class!

**Reading:**

Reading and research assignments will be highly technical, and may include excerpts from various publications, specifications, and manuals of the following organizations:

AAMA (Architectural Aluminum Manufacturers Association)

ASTM (American Society for Testing and Materials

NAAMM (National Association of Architectural Metal Manufacturers)

AA (Aluminum Association)

GANA (Glass Association of North America)

ASCE (American Society of Civil Engineers

In addition to these, many other books and references of interest will be available on reserve in the library, or as handouts. Students will also be provided with a comprehensive list of web sites and references.

**Professor Info:**

Robert Heintges is an adjunct Professor and has taught at the GSAPP for 25 years. Prof. Heintges is also an Architect and principal of the curtain wall consulting

firm Heintges Consulting Architects & Engineers www.heintges.com (Links to an external site.) Founded in 1989, the firm has consulted/collaborated on the design and construction of over 30 million sq.ft. of custom-designed curtain wall, cladding, specialty glazing and skylights around the world.

Architects with whom the firm has collaborated include Raimund Abraham, David Adjaye, Allied Works, Tadao Ando, Jun Aoki, ARO. Woods Bagot, BIG, Santiago Calatrava, Diller Scofidio+Renfro, Elkus Manfredi, Foster + Partners, Phil Freelon, FXFowle, Heatherwick Studio, Steven Holl, Ada Karmi, KPF, Studio Daniel Libeskind, Fumihiko Maki, Richard Meier, Rafael Moneo, NBBJ, I. M. Pei & Partners, Pei Cobb Freed, Pei Partnership, Perkins Eastman, Renzo Piano Building Workshop, Pelli Clarke Pelli, Polshek and Partners (Ennead), Christian de Portzamparc, Richard Rogers Partners, Rogers Partners, SHoP, Snøhetta, SOM, Robert A. M. Stern, Studio Gang, Yoshio Taniguchi, Weiss Manfredi, and many others.

Completed and current projects in New York City with which you may be familiar include the Museum of Arts and Design (Allied Works), Lincoln Center Expansion (DS+R and FxFowle), World Trade Tower 4 (Maki), Goldman Sachs Tower (PCF), MoMA (Taniguchi as well as DS+R expansion, World Trade) Center Transportation Center (Calatrava), Rose Center at the American Museum of Natural History (Ennead), LVMH Tower at 19 E. 57th St. (Portzamparc), Austrian Cultural Institute (Abraham), United Nations Headquarters Capital Master Plan Restoration (Harrison, Le Corbusier, Niemeyer et al.), Louis Vuitton Flagship at 1 East 57th Street (Aoki), the Whitney Museum Downtown (Piano), Hudson Yards, (KPF, BIG, et al), the Nike Flagship Store on 5th Ave in NYC, and many others. Other recent and ongoing projects outside of NY include The National Museum of African American History and Culture (Adjaye, Freelon, DBB, Smith Group), The Obama Library in Chicago (Tsien & Williams), First and Mission Street Towers in San Francisco (Foster), Uber Headquarters (SHoP), One Congress Tower in Boston (Pelli). The Mira Tower in San Francisco (Studio Gang) and many others.

Students should feel free to contact Prof. Heintges at any time to arrange office hours. Contact information is as follows:

Office Address: 440 Park Ave. South (30th St.) -15th Floor.

[By subway: # 1, 2, or 3 Train to 34th St., exit at southernmost exit and walk east on 32nd St., etc.]

Main Office Tel.: 212 652 2966

Prof. Heintges' Direct Line at Office (voice mail) Tel.: 212 652 2961

Email (A4634 in subject line): rheintges@heintges.com or rah11@columbia.edu

## Course Outline:

| Class No. | Date | Topic | Class Format/ Requirements |
|---|---|---|---|
| 1. | Jan 21 | Introduction to the Contemporary Curtain Wall: Concept through all phases of Design and Construction | Lecture-seminar; Design/Detailing Problem Presented/Assigned |
| 2. | Jan 28 | Forces on the Building Envelope; Review of Performance and Design Criteria; Principles and Concepts for Design of the Exterior Wall. | Lecture-seminar; Design/Detailing Problem Preliminary Concept Pin-ups |
| 3. | Feb 4 | Introduction to the Components of the Curtain Wall Systems 1: Support Constructions and Cladding Systems; Design Methodologies and Selected Case Studies | Lecture-seminar; Design Problem Individual Crits; Research Topics Assigned |
| 4. | Feb 11 | Components 1: Exterior Materials and Finishes: Glass, Stone, Aluminum and Steels. | Lecture-seminar; Design Problem Individual Crits |
| 5. | Feb 18 | Components 2: Exterior Materials and Finishes, Glass, Stone, Aluminum and Steels cont'd., New materials. | Lecture-seminar: at Mr. Heintges's office |

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| 6. | Feb 25 | Components 3, 4 & 5: System Performance Materials, Interior Materials and Specialty Components. | Lecture-seminar;<br>Design Problem Individual Crits |
| | | | Lecture-seminar;<br>(Mid-Term Quiz assigned) |
| 7. | Mar 3 | Design Documentation, Detailing and Specification of the Building Enclosure. | |
| | Kinne Trips & Spring Break | | No classes |
| 8. | Mar 24 | Design Documentation, Detailing and Specification of the Building Enclosure, etc., cont'd.; Systems 2: New Technologies. | Lecture-seminar;<br>Design Problem Individual Crits<br>(Mid-Term Quiz due) |
| 9. | Mar 31 | An Introduction to Wind Engineering and Wind Tunnel Testing; Mock-up Testing; Field Testing Case Studies | Lecture-seminar |

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| 10. | Apr 7 | Design Documentation, Detailing and Specification of the Building Enclosure, etc., cont'd. | Lecture-seminar;<br>Design Problem Individual Crits<br>Assign Specification problem |
| 11. | Apr 14 | New Technologies and Methodologies: Specifications and Implementation; The Architect's Review of Contractor's Shop Drawings. | Lecture-seminar; Crits as requested |
| 12. | Apr 21 Last Formal Class | Specifications and Implementation, cont'd. Plant and Site Inspection; Construction Administration of the Curtain Wall Sub-contract. | Lecture-seminar;<br>Final Individual Crits<br>(Final Quiz assigned) |
| | Week of April 27 | | Optional Additional Crits, TBD |
| 13. | May 4 to 5 | Final Design Problem Drawings and Specification Due.<br>Your Design Problem drawings will be red-marked by Profs. Heintges and Vos, and returned to you for correction and final completion. | ; |

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| 14. | Friday May 8 | Final Review of Design/Detailing Problem. Guest critics invited. |

PLEASE NOTE: class topics, format, quiz dates, etc. subject to change as class progresses.