ARCH A4124 **Structures Systems & Materials**
Avery 115 (Wednesday) and 114 (Friday) **Wednesdays & Fridays 9:00-11:00 AM**
George Wheeler, Norman Weiss, Richard Pieper, Dan Allen, John Childs, Chris Gembinski, Theo Prudon
Fall 2014

Description
This course surveys historic architectural materials and building systems and structures. The first part focuses on traditional building materials such as stone, brick, terra cotta, metal, concrete, cast stone, mortar, and wood) and explores sourcing and production of the materials, identification, use in the fabrication of architectural elements, basic properties that limit or allow their use and performance as architectural materials. This part of the course also serves as the foundation for most of the subsequent material-based conservation courses such as: 1. Architectural Metals, 2. Concrete, Cast Stone and Mortar, 3. Brick, Terra Cotta and Stone, and 4. Wood.
The second part of the semester surveys historic structures and systems and approaches the building not from its constituent materials and their properties but as an assembly of particular materials and building elements. It studies the design, detailing and material together to understand how materials interact and assess their collective performance. The question will not be the condition of the individual material but are the design, detailing and material the right solution for the visual and technical performance required. The latter will take into account also such issues as environmental, public health and fireproofing considerations, which played an important role throughout the 19th and 20th centuries.
This part of the course is itself is divided into sections. The first is dedicated to an examination of more traditional building technologies and focuses on primarily load bearing wall systems. The second part will examine fundamental changes that occur in the building trades as a result of the Industrial Revolution. It deals with more developed building technologies as they began to emerge by the middle or the end of the 19th century with steel or concrete structural framing systems and their exterior cladding of masonry, glass and metal curtain wall systems or concrete and stone panels.
At all times not only will the historic technology be presented but also how it performs and what types of failures may be anticipated will be integral to the part of the discussions.

Readings and Assignments
Readings are posted to the *Shared Files* folder in *CourseWorks*. Students should be prepared to answer questions on the readings during class.

Grades

Attendance & class participation	20%
Assignments	30%
Examinations	50%

Schedule

3 September	Introduction to Course and Field Trip	Faculty Team
5 September	Stone: extraction, production and historical use	Wheeler
10 September	Stone: properties and identification and Field Trip	Wheeler

	Assignment 1, due 17 September	
12 September	Brick and Terra Cotta: raw materials and production	Weiss
17 September	Brick: properties, historical use, classification, bond	Weiss
19 September	Terra Cotta: properties and historical use and Field Trip Assignment 2, Due 26 September	Weiss/Allen
24 September	Lime, Gypsum and Cement: raw materials and production	Weiss
26 September	Concrete, Mortar and Plaster: production and historical use	Weiss
1 October	Concrete and Cast Stone: properties & performance & Field Trip Assignment 3, Due 8 October	Weiss
3 October	Metals: raw materials, production, identification	Pieper
8 October	Metals: properties, performance & historical use & Field Trip Assignment 4, Due 15 October	Pieper
10 October	Wood: extraction, production and historical use	Childs
15 October	Wood: properties performance and identification Assignment 5, Due 22 October	Childs
17 October	IN CLASS MIDTERM EXAMINATION	
22 October	Foundations: introduction to early foundation technologies and their use	
24 October	Wall Systems: evolution of wall and partition systems in the 19^{th} and early 20^{th} centuries	
29 October	Floor Structures and Systems: the evolution of flooring systems taking into account such issues as span, fireproofing and sound transmission as early considerations	
31 October	Windows and Doors: openings, windows and doors are essential parts of wall. Admitting light and air, their configuration, size and operation underwent considerable changes through the last two centuries	
5 November	Wood Framing and Cladding	
7 November	Roofing and Roofing Structures: with the increase in building size	

	and span the development of new structural systems and spanning methodologies because necessary. A gradual understanding of engineering requirements and the introduction of new materials new forms and techniques developed.
12 November	Introduction to High Rise Framing Technology: with the arrival of the industrial revolution and the demand for different and larger structures, building technology and building construction processes underwent significant changes
14 November	Steel and Concrete: steel and concrete technologies were important factors in the evolution of buildings in both height and span
19 November	Steel and Concrete: continuation of steel and concrete framing discussion
21 November	Masonry Cladding - Brick and Terra Cotta: with the increase in technology for high framing also came the need to find different technologies. After an initial transfer of loadbearing technologies, new systems developed.
27 November	NO CLASS: Thanksgiving Vacation
3 December	Masonry Cladding – Stone, Cast Stone and Pre-Cast: aside from using traditional material technologies, new cladding systems developed using traditional materials
5 December	Curtain Wall – Metal and Glass
12 December	IN CLASS FINAL EXAMINATION