

**Graduate Program in Historic Preservation
Stuart Weitzman School of Design, University of Pennsylvania**

**HSPV 555 *Conservation Science (or Science for Conservators)*
George Wheeler, Ph.D., FAIA, FIIC, FAAR'97**

Course Syllabus

Fall 2021

Lectures and Laboratories

Friday, 10:30-1:30

Communications

Office hours: By appointment

Telephone: By appointment

E-mail: Subject heading of e-mails should state "HSPV 555"

gwheeler@highbridgematerials.com; gwheeler@design.upenn.edu

Course Description

Conservation Science provides a fundamental understanding of architectural materials with respect to their composition, properties and performance and serves as the foundation for subsequent conservation courses such as HSPV738 – *Wood*, HSPV739 – *Masonry*, and HSPV740 – *Architectural Surface Finishes*, as well as, related courses such as HSPV551 – *Building Pathology* and HSPV552 – *Building Diagnostics and Monitoring*.

Beginning with a general discussion of mechanical properties such as strength, modulus, toughness, creep and fatigue of a wide range of architectural materials, the course moves to porous building materials such as stone, brick, terra cotta, concrete, cast stone and mortar and focuses on the identification through an exploration of composition and texture in hand specimen. Rounding out the discussion of inorganic architectural materials is the examination of the unique set of properties of metals including their identification in hand specimen.

The course then shifts to the important organic architectural materials such as wood and finishes and begins with an overview of basic organic chemistry and follows with a more in-depth exploration of the properties and performance of wood, adhesives and clear finishes for wood, and the chemistry of pigments and paint media.

Course Focus

HSPV 555 *Conservation Science* examines the fundamentals of the materials of architecture, including:

- Physical and mechanical properties
- Texture
- Composition
- Chemical properties

Course Format and General Responsibilities of Students

The format includes lectures, videos, demonstrations, and laboratories. Students will be expected to carry out readings, view videos and consult other supplementary materials in preparation for class, complete exercises

and assignments, attend all classes and participate in discussions, and complete verbal and written tests of knowledge. Some assignments will be carried out outside of class time.

Learning Objectives

- Understand the primary properties of building materials, *i.e.* why and how are they used;
- Learn to recognize and name the general groups of buildings materials in hand specimen;
- Understand and be able to select and perform laboratory techniques for the identification of material type

Information Sources

Texts and in some cases instructional videos are provided for each class and are posted to the course website. Students are expected to read texts and view videos that support the learning objectives for each class.

Additional on-line databases that survey and abstract the conservation literature are:

The Bibliographic Database of the Conservation Information Network:

<https://www.bcin.ca/home.app?lang=en>

Art and Archaeology Technical Abstracts:

https://www.getty.edu/conservation/publications_resources/aata/index.html

Cameo Conservation Material Database

<https://cameo.mfa.org>

While you are a student at the University of Pennsylvania you have free access to thousands of journals and databases. One of the most important for this course is the ASTM (American Society for Testing and Materials) database of standards and associated literature. **You should take full advantage of this FREE access during your time in the program.**

Student Responsibilities

Students are expected to **attend all classes**, participate in discussions, and ask questions that assist in clarifying subject matter. Such engagement is carried out in a way that exhibits respect for all participants: professors, guests, and fellow students.

Readings are assigned to assist and deepen students' understanding of the concepts and ideas presented in class. These **readings are required**, and, on occasion, students will be queried in class as to their knowledge of the readings. Readings are posted to the course website.

Students are required to engage in **written and oral laboratory exercises** that support the overall learning objectives of the class and serve as a means to evaluate student performance.

Discussions between and among students is encouraged as a means to clarify and deepen understanding of the concepts and ideas presented in the class. However, with respect to assignments and written exercises, **students are responsible for their own work.**

Evaluation of Student Performance

- Preparation and Participation in Class 40%
- Oral and Written Assignments and Exercises 60%

At the instructor's discretion, grades will be adjusted for unexcused, late submission of assignments and exercises.

Class Schedule and General Description

3 September		Health and Safety Orientation
10 September	Lecture	Mechanical properties of architectural materials with a focus on strength, modulus, ductility-malleability-brittleness, toughness, creep and fatigue
	Laboratory	Hand specimen assessment of mechanical properties of building materials
17 September	Lecture	Composition, texture and identification of porous building materials I: common building stones
	Laboratory	Hand specimen characterization and identification of common building stones
24 September	Lecture	Composition, texture and identification of porous building materials II: cast stone and concrete
	Laboratory	Hand specimen characterization and identification of cast stone and concrete
1 October	Lecture & Laboratory	Polarizing Light Microscopy of Minerals, Rocks, Cast Stone, Concrete and Mortars
8 October	Lecture	Composition, texture and identification of porous building materials IV: brick and terra cotta
	Laboratory	Hand specimen examination, characterization and identification of brick and terra cotta
15 October	Lecture	Architectural metals I: Sourcing and production of common metals and their alloys
	Laboratory	Hand specimen characterization of mechanical properties of metals
22 October	Lecture	Architectural metals II: Metal typologies, properties and performance
	Laboratory	Hand specimen identification of metals
29 October	Lecture	General organic chemistry I

5 November	Lecture	General organic chemistry II
12 November	Lecture	Architectural wood I: Properties and performance of wood
	Laboratory	Densities and mechanical properties of wood
19 November	Lecture	Architectural wood II: Extraction, Shaping, Historical Use Adhesives for Architectural Materials
3 December	Lecture	Paint Media and Pigments
10 December	Lecture	Final Review
14-18 December exam period		