

ARCH-DES 597L-1, STRUCTURAL AND MECHANICAL SYSTEMS, FALL 2011

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Renovating, altering, and preserving buildings requires an understanding of the existing structure and systems. Engineers perform the actual design, but architects and builders are affected by the restrictions imposed by older materials and systems, and building owners and tenants are affected by those restrictions. Architects and builders may be familiar with modern construction, but may not understand the obsolete construction forms in familiar older buildings.

This course is a summary of the history of engineered buildings, including the reasons for technological developments in the context of architecture of the times. The distinctive properties of materials, methods of identification of obsolete construction, and the view of building-wide systems rather than isolated pieces are emphasized. Issues of general construction history, such as the role of scientific investigations and experimentation, are discussed using specific examples.

LECTURE 1

Overview of the relation of engineering design to architecture and the changes over time to that relation. Description of course scope: buildings only, concentrating on typical types, U.S. industrial revolution (1830s) to modern structural forms (1960s)

LECTURE 2

Structural aspects of traditional building construction using wood and masonry. Rules of thumb, basic rules of design, and early building code requirements.

LECTURE 3

The use of cast-iron in structure; pros and cons of the material and its role as the first "man-made" building material. Cast iron columns, beams, sidewalks, and facades. The role of major fires and fireproofing issues in cast-iron use. (1840s - 1900)

LECTURE 4

The use of wrought-iron and the rise of scientific experimentation in to determine design methods. The role of fires and fireproofing issues in ductile metal use. (1840s - 1895)

The development of steel, including standardization of steel shapes, material properties, design techniques, and building codes. (1880 - 1920)

LECTURE 5

Early fireproof floor systems: masonry, cinder concrete, and mass concrete. Code requirements and NY City Dept. of Buildings load and fire tests. (1870 – 1930)

LECTURE 6

Unreinforced masonry curtain walls with secondary structure for ornament. (1880 - 1930)
Glass, reinforced masonry, and alternate material curtain walls. (1930 – present)

LECTURE 7

Early concrete frames, including construction types and European precedents - why U.S. led in steel frame and lagged in concrete. (1890 - 1920)

LECTURE 8

Historic mechanical systems, including the introduction of industrial processes into ordinary buildings. (1800s-1940s)

GRADING

The final grade will be based on two essays (45% each) and class participation (10%).