



## “The Art of Spanish Bridge Design”, a New Course Promoting the Holistic Learning of Structural Engineering

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### Abstract

A new course was developed that teaches structural engineering with an integration of societal concerns and aesthetic sensitivity through a studio-based learning environment. In addition to rigorous engineering analyses, the course includes a week-long field trip and the creation of an exhibition and website designed for a general audience, which is an opportunity for students to learn communication skills for a non-technical audience. Course evaluations demonstrate the significant value of this form of teaching, which not only instructs but also inspires.

**Keywords:** pedagogy, studio, exhibition, website, structural analysis, Structural Art

## 1 Introduction & Course Objectives

Traditional education on structural engineering has focused on the scientific and technical components of the profession. But engineering is much more than that; engineering is multi-dimensional as engineering works are connected to and reflect the ideals of the society and they have an important symbolic component. This paper describes a new course at Princeton University that teaches structural design in a ‘multi-dimensional’ aspect. The course is taught every two years and each edition focuses on a different topic (e.g., Fazlur Khan’s tall buildings in 2010, German shells in 2012, The Art of Spanish Bridge Design in 2014). In all editions, the activities, format, and pedagogical objectives are the same: (1) develop a sense for implicit knowing by studying precedents; (2) learn how to communicate complex technical issues with peers and laymen; (3) develop spoken, written, pictorial,

analytical and numerical proficiency; (4) reflect critically upon social, political and historic influences of past successful structural designs.

## 2 Course Content

To reach these goals, the course focuses on selected examples of engineering works. Using “The Art of Spanish Bridge Design” theme of 2014 course components are discussed next. More detailed information on the course is given in [1] and in <http://spanishbridges.princeton.edu/>.

### 2.1 Format & Lectures

The class meets two times a week for a total of 6 hours in a studio-based learning environment. Most of that time is spent in group work, but some of the time lectures are given. These lectures were given by the instructors, designers of the Spanish bridges that the students were studying, and also by a Professor of Spanish