

Title:

UM-SJTU Joint Institute International Winter School -
中国古建筑的结构之美 The Structural Beauty of Ancient Chinese Architectures

Instructor:

Dr. Yongxing Shen



Dr. Yongxing Shen earned his Bachelor's degree from Tsinghua University in 2003 and PhD degree from Stanford University in 2008, both in Materials Science and Engineering. He was a lecturer at Universitat Politècnica de Catalunya (Barcelona) before joining the UM-SJTU Joint Institute in 2014. Since 2015 he is also Associate Professor at the School of Materials Science and Engineering, SJTU.

Prof. Shen has broad interests in the field of computational mechanics, especially computational fracture mechanics. His interests range from designing numerical methods and analyzing their convergence properties, to discovering materials' fracture behaviors with numerical simulations, and to applying numerical methods to make an impact to practical engineering problems.

Course Description and Objectives:

The course gives an introduction to some key concepts of statics and dynamics towards applying them to analyze and appreciate ancient Chinese architectures, such as Zhaozhou Bridge, Baoguo Temple, Tiger Hill Pagoda, City Walls of ancient capitals, etc. We will see how to analyze the forces and moments between structural elements such as wooden beams connected with mortise and tenon. We will also examine the earthquake resistance of some wooden structures directly laid on the cornerstone without any connection. Formats of instruction include lectures and guided problem sessions.

Contact Hours:

45 contact hours (3 credits)

Prerequisite:

Requires knowledge of first-year calculus

Distribution of marks:

The course grade is composed of the following components:

- Attendance (10%)
- Lab (5%)
- Problem sessions (55%)
- Final presentations (30%)

Website:

<http://umji.sjtu.edu.cn/global/winter-school/#1499167565521-89ef42e1-d9e2>

Schedule:

As attached

The Structural Beauty of Ancient Chinese Architectures

Week 1

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00 --- 9:45	General principles	Force system resultants	Equilibrium of a rigid body;	Structural analysis of truss structures	Field trip 1: Baoguo Temple in Ningbo.
9:55 --- 10:40	Force vectors	Problem session 1	Friction, with Arrow Building as example	Lab: Building a Chinese pavilion model	
10:50 --- 11:35	Primer of ancient Chinese architecture	Connection with mortise and tenon	Dougong: An important element of Chinese architecture	Case study: Baoguo Temple	
13:00 --- 13:45	Orientation and Campus Tour	Chinese I	Chinese I	Chinese I	
13:55 --- 14:40					
14:50 --- 15:35					

Week 2

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00 --- 9:45	Internal loadings	Axial load; Torsion	Bending	Buckling	Field trip 2: Walking tour to the City Wall of Nanjing
9:55 --- 10:40	Internal loadings	Bending	Transverse shear	Problem session 4	
10:50 --- 11:35	Case study: Zhaozhou Bridge	Problem session 2	Problem session 3	Intro to city walls of ancient capitals and important cities	
13:00 --- 13:45	Chinese I	Chinese I	Chinese I	Chinese I	
13:55 --- 14:40					
14:50 --- 15:35					

Week 3

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00 --- 9:45	Free vibrations	Forced vibrations	Field trip 3: Tiger Hill Pagoda in Suzhou	Stress and strain	Final Presentations
9:55 --- 10:40	Damped vibrations	Principles of structure evaluation using waves		Mechanical properties of woods and stone	
10:50 --- 11:35	Problem session 5	Case study: Tiger Hill Pagoda		Problem session 6	
13:00 --- 13:45	Chinese I	Chinese I		Chinese I	Farewell
13:55 --- 14:40					
14:50 --- 15:35					