STRUCTURAL HEALTH ASSESSMENT AND MONITORING OF TIMBER BUILDINGS

Special Topic WSE 599 (final designation WSE 526)

Instructor: Mariapaola Riggio
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office hours: 8:30 am - 16:30 pm

Texts
Various readings/scientific papers available via Canvas

Credits: 3
This course meets twice weekly for 80 minute class.

Term: Winter
Recurrence: every two years (from Winter 2019)
Schedule: TTh 2-3:20pm
Venue: Richardson Hall 243
Prerequisites: none

Course Summary:

This course will introduce you to holistic approaches for the evaluation of the performance of timber systems and structures in a building. A building can be compared to a living organism; during its service life it can experience changes, related to different factors, e.g. environment, loading history, maintenance and use. A specific focus on the performance and reliability of timber structures is relatively recent, and mainly motivated by the increasing use of engineered wood systems in large span structures. In the last decades, interest in conservation of the architectural timber heritage has also steadily increased. Structural health assessment and monitoring is often needed in situations where service-life and safety of a structure is uncertain because of the presence of apparent or suspected alterations or when there are uncertainties regarding the actual performance as related to the designed one. Monitoring is the chosen approach when information on time-dependent phenomena is needed. The aim of this course is to learn about the tools available to experts for different analysis purposes, and to understand how data acquired from different techniques can be analyzed and used to inform building management and maintenance, fabrication and construction practices, and future design. Peavy Hall will serve as a real-life, full-scale case study and learning scenario.

Course Objectives:

• Understand holistic approaches to structural health assessment and monitoring;
• Understand concepts of safety, serviceability, vulnerability, and risk applied to timber structures;
• Understand the relationship between various physical, mechanical and functional material parameters and performance of timber structures;
• Understand and relate scope of the assessment, information required and necessary
procedures;
• Understand and demonstrate applications of different non-destructive testing techniques for the assessment and monitoring of timber structures;
• Understand and apply techniques of data analysis for the assessment and monitoring of timber structures.

Measurable Student Learning Outcomes:
After successful completing of this course, you should be able to:
a. Describe and apply non-destructive testing (NDT) techniques for the on-site assessment and monitoring of timber structures;
b. Describe and apply criteria for the design of a hygrothermal monitoring plan in a timber building;
c. Analyze and understand data from different types of sensors;
d. Understand criteria for the dynamic and structural monitoring of a timber building.

Letter grades will be assigned as follows:
Your grade will be calculated based on the total number of points you have earned on your individual and group assignments plus any extra credit points divided by 1000.
Your grade will be based on the following scale:
A 93-100%; A- 90-92%; B+ 87-89%; B 83-86%; B- 80-82%; C+ 77-79%; C 73-76%; C- 70-72%; D+ 67-69%; D 63-66%; D- 60-62%; F <60%

The course assignments will consist in two site visit reports (200/1000 points each – assessment of LOs a, b, and c) a presentation (200/1000 points - assessment of LOs b, c, and d) and a technical paper (600/1000 points – assessment of LOs, b, c, d).

General Course Agenda:

<p>| Week 1 | 01.08.19 | Introduction to the course |
|        | 01.10.19 | Timber structures and systems |
| Week 2 | 01.05.19 | Scope of the assessment and monitoring. Operational categories |
|        | 01.17.19 | |
| Week 3 | 01.22.19 | Methods for physical/mechanical characterization of timber members |
|        | 01.24.19 | Methods for damage/defects/decay detection |
| Week 4 | 01.29.19 | Guest lecture: Ron Anthony. Anthony &amp; Associates |
|        | 01.31.19 | Lab demos |
| Week 5 | 02.05.19 | Climate, loads and the human factor |
|        | 02.07.19 | Guest lecture: Milan Vatovec. Simpson Gumpertz &amp; Heger |
| Week 6 | 02.12.19 | On site visit |
|        | 02.14.19 | |
| Week 7 | | Hygrothermal monitoring |</p>
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<td><strong>Week 8</strong></td>
<td>Structural monitoring (static)</td>
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<td><strong>Week 9</strong></td>
<td>Structural monitoring (dynamic)</td>
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<td>03.05.19</td>
<td>Lab demos: Polytec (to be confirmed)</td>
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<td><strong>Week 10</strong></td>
<td>Course wrap up and presentations</td>
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Course Policy

Discussion Participation
Students are expected to participate in all graded discussions, having prepared by studying the required readings and other resources.

Homework
Homework must be submitted on time for full credit. Late homework will be penalized at the discretion of the instructor.

Statement Regarding Students with Disabilities
Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at http://ds.oregonstate.edu. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Statement Regarding Religious Accommodation
As instructors we are required to provide reasonable accommodations for sincerely held religious beliefs. It is incumbent on you to make us aware of the request as soon as possible prior to the need for the accommodation. See the Religious Accommodation of Students Policy.

Respect for Diversity: It is my intention that all students will be well served by this course, that they feel safe and respected, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups.

Expectations for Student Conduct
Student conduct is governed by the university’s policies; see Student Conduct and Community Standards.

Academic Integrity
Students are expected to comply with all regulations pertaining to academic honesty. For further information, visit Academic or Scholarly Dishonesty, or contact the office of Student Conduct and Community Standards (SCCS) at 541-737-3656.

OAR 576-015-0020 (2) Academic or Scholarly Dishonesty:

a) Academic or Scholarly Dishonesty is defined as an act of deception in which a Student seeks to claim credit for the work or effort of another person, or uses unauthorized materials or fabricated information in any academic work or research, either through the Student’s own efforts or the efforts of another.

b) It includes:
(i) CHEATING - use or attempted use of unauthorized materials, information or study aids, or an act of deceit by which a Student attempts to misrepresent mastery of academic effort or information. This includes but is not limited to unauthorized copying or collaboration on a test or assignment, using prohibited materials and texts, any misuse of an electronic device, or using any deceptive means to gain academic credit.

(ii) FABRICATION - falsification or invention of any information including but not limited to falsifying research, inventing or exaggerating data, or listing incorrect or fictitious references.

(iii) ASSISTING - helping another commit an act of academic dishonesty. This includes but is not limited to paying or bribing someone to acquire a test or assignment, changing someone’s grades or academic records, taking a test/doing an assignment for someone else by any means, including misuse of an electronic device. It is a violation of Oregon state law to create and offer to sell part or all of an educational assignment to another person (ORS 165.114).

(iv) TAMPERING - altering or interfering with evaluation instruments or documents.

(v) PLAGIARISM - representing the words or ideas of another person or presenting someone else's words, ideas, artistry or data as one's own, or using one's own previously submitted work. Plagiarism includes but is not limited to copying another person’s work (including unpublished material) without appropriate referencing, presenting someone else's opinions and theories as one's own, or working jointly on a project and then submitting it as one's own.

c) Academic Dishonesty cases are handled initially by the academic units, following the process outlined in the University's Academic Dishonesty Report Form, and will also be referred to SCCS for action under these rules.