Instructor:  
**Dr. Mario Santana Quintero**  
e-mail: Mario_santana@carleton.ca  
ph. +1 (613) 520-2600 x 3093, Canal Building, Office 5207 (5th floor)

Lecture class: Thursday 8:35 am to 11:25 am. **Synchronous weekly class forums will start at 10 am to 11 am.**  
Recurrent ZOOM link: https://us02web.zoom.us/j/81743062844?pwd=a1RFVFNiQzFXR2Z2OVp5QU9NS25Wdz09 Meeting ID: 817 4306 2844 - Passcode: 484968

Labs:

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<td>A1</td>
<td>Fri</td>
<td>11:35 am – 2:25 pm</td>
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Teaching Assistants:

Definitions: **Building Pathology** is a term “used to define a holistic approach to understanding buildings. Such an approach requires a detailed knowledge of how buildings are constructed, used, occupied, and maintained, and the various mechanisms by which their structural, material and environmental conditions can be affected. It is, by necessity, an interdisciplinary approach and requires a wider recognition of the ways in which buildings and people respond and react to each other.” David Watt, *Building Pathology, Principles and Practice*, 1999

**Rehabilitation** is the “action or process of making possible a continuing or compatible contemporary use of an historic place, or an individual component, while protecting its heritage value.” Parks Canada, *The Standards and Guidelines for the Conservation of Historic Places in Canada*, 2011.

Description: **Building Pathology and Rehabilitation** is a core course of the Bachelor of Engineering (BEng) and Architectural Studies (BAS) with a Major in Architectural Conservation and Sustainability. It is taught in the 4th year of the programme, after students have been
introduced to basic conservation and sustainability principles and fundamentals of building materials, assemblies and structures. Building on the Architectural Technology courses taught throughout the BAS and BEng, and making use of basic documentation techniques learned in the Historic Sites Recording course, students will become familiar with the skills required to investigate and address the conservation and sustainability issues of historic and modern buildings. While focused on the building technologies of Eastern Canada’s existing building stock, the discussion and analysis will include examples of buildings from all types, sizes and locations.

Learning Outcomes: Working individually and in teams, students will be able to:

- Explain/assess historic and modern building envelope and structural systems, assemblies and materials and their patterns and causes of decay and deterioration.
- Formulate a methodology for the assessment of the physical condition and performance of buildings in support of assessment and performance evaluation and design;
- Identify, analyze and recognize historic construction materials, assemblies and structures;
- Recognize the roles of architects, engineers, materials conservation specialists, building scientists, architectural/building historians, traditional building trades and other disciplines;
- Design a rehabilitation treatment option based on the visual inspection and analysis of physical conditions, taking into consideration conservation principles and other criteria (health and safety, cost, accessibility, etc.)
- Describe specific issues of historic and modern building rehabilitation, including preserving patina, addressing inherent vice, locating substitute materials, using modern technologies and identifying appropriate skilled labour.

One of the underlying objectives is to help interpreting the connection between conservation and sustainability, as well as, sustainable conservation strategies: Critical to the development of an integrated sustainable conservation project is the understanding of the history of the building’s construction and use, its inherent environmental features, past and current performance patterns, and the types and causes of deterioration of its specific materials, assemblies and structures. Effective affordable and respectful means of maintaining and repairing important and well-crafted built features should continue to offer years of use – thus sustaining our built heritage and reducing the impact of new construction on the environment.

References: Through the use of a diverse range of paper and web-based references, students will also become familiar with the extent of Canadian and international resources available for working on historic/existing buildings. There is no required textbook, but a wide range of critical texts are on reserve at the library.

A list of books on reserve and Internet resources is provided below. In addition, a list of weekly readings on specific topics will be provided at the first class.

Format: This is a blended course, which involves a mixture of synchronous meetings at scheduled time and asynchronous activities available online. Most of the lectures and tutorials will be available online a week ahead of the schedule. Students are expected to be available during the synchronous meeting times (weekly forums). When possible, some site investigation and documentation will be conducted. Also, discussion of case
studies, readings and research, essay and report writing are expected. The first weeks include a 3-hour lecture period and 3-hour lab led by the instructor and Teaching assistants. The blended lecture period will include teaching modules, discussion of assigned readings and presentation or review of assignments. Lab time will be used for fieldwork, to work on the assignments 2 to 5, described at the end of the outline and or to meet the instructor and/or teaching assistants. Lectures/field visits may include guest speakers. Students are encouraged to participate in analytical discussions and make links with other courses, projects and experiences.

Preferable use a good internet connection: ethernet not WIFI, also do not use smartphones or tablets to access synchronous activities. Get a good headset, webcam and microphone to participate in the synchronous activities.

Grading:

There are 4 online class quizzes (20%) and an online take home exam (20%) dealing with in class online content, including lectures and readings. There will be five assignments, worth 50%. The description of each assessment follows the detailed course description below. The grading of the five assignments will be as follows:

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<tr>
<th>Assignment</th>
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<tr>
<td>Assignment 1</td>
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<td>Assignment 2</td>
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<td>Assignment 3</td>
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<td>Assignment 4</td>
<td>5%</td>
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<tr>
<td>Assignment 5</td>
<td>25% (this includes a dossier - 15% and a group presentation submissions – 10%)</td>
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<tr>
<td>Course Quizzes</td>
<td>20%</td>
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<tr>
<td>Take Home Exam</td>
<td>20%</td>
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The remaining 10% of the final mark is discretionary based on online synchronous forum attendance, including participation, punctuality, and technical compliance. Please show respect for all by utilizing a stable internet connection, use a good microphone, headset and switching on your camera, muting yourself while others talk is very important to prevent background noise. Eventually, depending on the progress of the sources, a bonus assignment worth 5% in total of additional grades might be implemented.

Attendance in the first class is required, and there will be no make-up time for students who join after the term has begun. Attendance at labs is also obligatory unless the instructor designates it otherwise at the time.

Concise and accurate technical writing is important in professional work; student written and verbal work will be assessed on language (grammar, spelling, structure, style) as well as content. Only referenced peer-review academic publications will be accepted as bibliographical support, this should be presented using appropriate academic citation styles, for this you are recommended to consult: https://library.carleton.ca/help/citing-your-sources.

See also below for more general information.

Emails: Emails will be answered within 24 hours. Except for during the 30 minutes after class, meetings outside class hours will be by appointment only.

Revised – 21 December 2020
OVERVIEW OF COURSE CONTENT: Modules

1. Introduction
2. Characterization of buildings
3. Building pathology
4. Materials, assemblies and structures:
   a. Wood
   b. Masonry
   c. Metals
   d. Concrete
5. Building Envelope & Introduction
   a. Wood
   b. Masonry
   c. Metals
   d. Concrete
6. Building rehabilitation
7. Sustainable rehabilitation

DETAILS ON EACH TOPIC

INTRODUCTION

- Learning objectives, methodology, definitions
- The conservation process and values-based decision-making
- Bridging between conservation and sustainability
- Principles and practices
- The role of documentation
- Overview of principal references
- Overview of all assignments and student evaluation process
- BP&R skills assessment

CHARACTERIZATION OF BUILDINGS

1: Introduction:
   - The importance of understanding/ being able to ‘read’ buildings for pathology
   - Three types of characterization: construction, functional types and performance
   - Sources of information: primary (site, archival documents) / secondary research

2: Construction types:
   - Structural systems (masonry, timber, steel, concrete, hybrid)
   - Assemblies (roofs and roof related elements, exterior walls and foundations, windows and doors, interior features and finishes)
   - Materials (wood, stone, brick, metals, glass, plaster, stucco, tile, etc)
   - Comfort and service systems (heating, ventilation, lighting, elevating, etc.)

3: Functional types:
   - Residential, commercial, institutional, cultural, religious
   - Issues due to scale, number and location of buildings

4: Performance and climate
   - Standards and performance measures: comfort, security, acoustics, air quality
   - Code requirements for existing buildings: fire protection, egress, accessibility
   - Performance expectations: service life, obsolescence and life cycle
   - Workmanship and design quality
   - Site-specific, regional and climate-based conditions
Inherent / historic environmental features: site, orientation, massing, materials, durability, natural daylight, ventilation

BUILDING PATHOLOGY

1: Building deterioration: defects, damage and decay
- Definitions: defects, damage, decay
- Extrinsic versus intrinsic causes of deterioration
- Understanding of weather and climate
- Natural causes: water, wind, sun, freeze/thaw, fire, earthquakes, vegetation, insects
- Human-made causes
- Short-term deterioration (disasters)
- Long-term deterioration (weathering or lack of maintenance)

2: Investigation: condition and performance assessment
- Step-by-step procedures of investigation and diagnostics
- The investigation team: architect, engineer, technologist, builder/craftperson
- Principles and proven methods
- Tools and resources
- Health and safety considerations
- The roles of building historians, materials conservators, conservation scientists, building science specialists, and traditional trades in an assessment
- Destructive and non-destructive testing
- Performance assessment tools and methods: thermal, seismic, comfort, etc
- Climate change considerations (impact assessment and mitigation)

3: Diagnostics: criteria and analysis
- Step by step: the process of analysis
- Review of applicable codes, standards and guidelines
- Evaluation of previous repairs and alterations
- Historic codes, standards and repair approaches
- Ageing and patina
- Durability and service life
- Inherent vice and design "flaws"
- Monitoring and testing
- Establishing priorities

MATERIALS, ASSEMBLIES AND STRUCTURES

1: Building Envelope: Roofs, Walls, Windows
- Building envelope characteristics, objectives and typical problems or deterioration
- Roofs and rainwater controls: types, components and problems of sloped and flat roofs
- Exterior walls including foundations, cladding, curtain walls: types, components and problems
- Windows and doors, including glazing materials, frames and hardware: types, components and problems
- Key sustainability issues and typical conservation strategies
2: Introduction to the Materials, Assemblies and Structures (MAS) modules
• Overview of the MAS modules. Each MAS module will address the specific:
  • Examples of character-defining elements in Canadian buildings
  • Key developments in the technology’s history
  • Material and assembly/ structure properties
  • Typical deterioration and defects
  • Testing for identification of materials and assessment
  • Performance issues and sustainability
  • Conservation guidelines
  • Analysis and treatment options (Maintenance, Repair, Replacement)
  • Available references

3: Wood materials, assemblies, and structures
• Including timber, wood, engineered wood products

4: Masonry materials, assemblies, and structures
• Including natural stone, brick and terra cotta

5: Metal materials, assemblies, and structures
• Including iron, steel(s), copper and alloys, and aluminum

6: Concrete materials, assemblies, and structures
• Including cast stone, terrazzo and mortar

BUILDING REHABILITATION

1: Planning the repair approach
• Criteria for treatment selection (e.g. heritage, health/safety, cost, sustainability)
• Level of intervention: minimum intervention in addressing causes of deterioration
• Principles of conservation repair / values-based decision-making
• Integration of performance improvement objectives
• Prioritization of proposed work
• Modern repair technologies
• Use of substitute materials, re-use of heritage materials, sourcing materials
• Integration of specific treatments in an overall conservation plan

2: Addressing performance issues
• Upgrades to meet changes to codes and standards
• Addressing seismic, security & accessibility requirements
• Improving thermal performance and other sustainability upgrades
• Fire protection
• Removal and encapsulation of toxic materials
• Replacement of poor original materials or addressing poor design
• Development of integrated treatment / upgrade options
• Options analysis and recommendations

3: Planning repair work and upgrades
• Step by step project planning (in public and private practice, for generalists and specialists).
• Specifications for conservation and sustainability: reduced VOCs, embodied energy, durability, local materials and waste management
• Site specific issues
• Role of mock-ups
• Identifying appropriate skilled labour
• Pre-qualification of contractors
• Cost estimation
• Contracting considerations

SUSTAINABLE REHABILITATION

1: Sustainable conservation strategies
General & specific principles for integrating conservation and sustainability, including
• Integrated design process and community consultations
• Assessment of current conditions and performance
• Understanding of historic environmental design principles and features
• Application of common principles of minimal intervention (repair before replacement)
• Using appropriate new or historic technologies
• Designing for durability, compatibility and reversibility
• Planning for long-term use, growth and change

2: Sustainable conservation examples
• Case studies of successful integration of conservation and sustainability, including appropriate alterations of site, building envelope, systems and interiors
• Discussion of how to use environmental rating systems in the context of rehabilitation

REFERENCES

Readings will be identified from online sources and the final take home examination will include selected questions from these readings:

• Eric Arthur, Thomas Ritchie, *Iron: cast and wrought iron in Canada from the seventeenth century to the present*, University of Toronto Press, 1982 (Available online through Carleton Library’s HathiTrust Access)
• Thomas F. McIlwraith, *Looking for Old Ontario, Two Centuries of Landscape Change*, University of Toronto Press, 1997 (Available online through Carleton Library)
• Richard Oxley, *Survey and Repair of Traditional Buildings, A Sustainable Approach*, Donhead, 2003 (Available online through Carleton Library’s HathiTrust Access)
• John Rempel, *Building with Wood, and Other Aspects of Nineteenth-century Building in Central Canada*, University of Toronto Press, 1980 (Available online through Carleton Library’s HathiTrust Access)
• Thomas Ritchie, *Canada Builds, 1867-1967*, University of Toronto Press, 1967 (Available online through Carleton Library’s HathiTrust Access)

In addition, the following references are available online:

  NB. In addition, the bibliography includes references from provincial heritage departments and organizations across the country.
  Online damage-expert for monumental buildings system [http://mdcs.monumentenkennis.nl](http://mdcs.monumentenkennis.nl)
• *APT Bulletin* articles (through Jstor) - [www.apti.org/bulletin-index/](http://www.apti.org/bulletin-index/)
• *USA National Parks Service Preservation Briefs and Tech Notes* - [www.nps.gov/tps/how-to-preserve/briefs.htm](http://www.nps.gov/tps/how-to-preserve/briefs.htm) [www.nps.gov/tps/how-to-preserve/tech-notes.htm](http://www.nps.gov/tps/how-to-preserve/tech-notes.htm)
• *USA GSA HP Technical Procedures* - [http://www.gsa.gov/portal/hp/hpc/category/100371/hostUri/portal/searchBy/ALL](http://www.gsa.gov/portal/hp/hpc/category/100371/hostUri/portal/searchBy/ALL)

• National Institute of Building Sciences – Whole Building Design Guide
  www.wbdg.org/design/historic_pres.php
  www.wbdg.org/design/sustainable.php
  www.wbdg.org/resources/sustainable_hp.php?r=historic_pres

• Historic England publications
  https://www.historicengland.org.uk/images-books/publications
  https://www.climatechangeandyourhome.org.uk

**Tentative schedule**

The lectures and activities might change over the course of the weeks, given the availability of guest lecturers and the unprecedented effect of COVID could have in the course progress.

<table>
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<tr>
<th>Week</th>
<th>Tutorial</th>
<th>Class</th>
<th>Contents and tasks</th>
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| 1    |          | Jan 14| Watch lecture 1: Introduction to Building Pathology & Rehabilitation  
Watch lecture 2: Course Introduction, Outline and available Historic Sites  
Watch lecture 3: Characterization of buildings; construction types; functional types; inherent environmental features  
Watch lecture 4: Guest lecture: Carleton Library Resources (Kristof Avramsson)  
Watch video 5: Introduction of Assignment 2  
Jan 14-15| Watch Tutorial 1: Preparing Site Reconnaisance |
| 2    |          | Jan 21| Watch lecture 5: Building deterioration: Defects, damage and decay  
Watch lecture 6: Investigation: Condition & Performance Assessment  
Watch lecture 7: Values centered assessments  
Review suggested readings at CU Learn  
Submit Assignment 1 due January 21 (5pm)  
Jan 21-22| Going to sites – Session 1: Site Visits|
| 3    |          | Jan 28| Watch lecture 8: Diagnostics, Criteria & Analysis  
Watch lecture 9: Repairs: Planning the conservation approach  
Watch lecture 10: Building Sciences and site assessment: Kelley Murchison  
Review suggested readings at CU Learn  
Quiz 1 on Building Pathology concepts starts at 8 am and finishes at 5 pm  
Jan 28-29| Going to sites – Session 2: Site Visits|
| 4    |          | Feb 4 | Watch lecture 11: Preparing a Statement of Significance in Canada (L. Smith)  
Watch lecture 12: Introduction to Materials  
Watch lecture 13: Masonry materials, assemblies, and structures (J. Marrs)  
Watch Introduction to Assignment 3 and 4  
Review suggested readings at CU Learn  
Feb 4-5| Going to sites – Session 3: Site Visits|
| 5    |          | Feb 11| Watch lecture 14: Metal materials, assemblies, and structures  
Watch lecture 15: Hygrothermal Properties and Performance of Masonry (M. Gultland)  
Review suggested readings at CU Learn  
Quiz 2 on Masonry starts at 8 am and finishes at 5 pm  
Feb 11-12| R01: (A2 and A1): Review A01 Draft with TA |

Reading Week (Feb 15-19)
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<tr>
<td>6</td>
<td>Feb 25</td>
<td>Watch lecture 15: Earthen Architecture conservation</td>
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<td>Watch lecture 16: Case Study: Kasbah of Taourirt, Morocco</td>
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<td>Review suggested readings at CU Learn</td>
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<td>Feb 25-26</td>
<td>Watch Tutorial 2: Preparing an essay for Building Pathology relevant to</td>
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<td>Assignment 2</td>
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<td>Submit Assignment 2 due Feb 14 (5pm)</td>
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<td>7</td>
<td>Mar 4</td>
<td>Watch lecture 16: Energy Modelling for Existing Buildings (L. Ide)</td>
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<td>Watch lecture 17: Wood materials, assemblies, and structure (S. Ross)</td>
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<td>Watch guest lecture by Joe Kallas about Recording and condition</td>
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<td>assessment of Beirut’s heritage after the devastating explosion</td>
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<td>Watch Introduction to Assignment 3 and 4</td>
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<td>Review suggested readings at CU Learn</td>
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<td>Quiz 3 on topics covered until Feb 25 starts at 8 am and finishes at 5 pm</td>
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<td>Mar 4-5</td>
<td>Working session on Assignment 3 and 4 (Tutorial on Photogrammetry)</td>
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<td>8</td>
<td>Mar 11</td>
<td>Online visit to the Delegation of the Ismaili Imamat Building</td>
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<td>Review suggested readings at CU Learn</td>
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<td>Mar 11-12</td>
<td>Working session on Assignment 3 and 4 (Tutorial on condition</td>
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<td>assessment and values assessment)</td>
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<td>Submit Assignment 3 due Mar 12 (5 pm)</td>
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<td>9</td>
<td>Mar 18</td>
<td>Watch lecture by Guest Practitioner: John Cooke</td>
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<td>Review suggested readings at CU Learn</td>
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<td>Mar 18-19</td>
<td>Working session on Assignment 3</td>
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<td>10</td>
<td>Mar 25</td>
<td>Watch lecture 18: Concrete materials, assemblies, and structures</td>
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<td>Watch lecture 19: Sustainability of Historic Buildings</td>
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<td>Review suggested readings at CU Learn</td>
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<td>Quiz 3 on topics covered until March 18 starts at 8 am and finishes at 5 pm</td>
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<td>Mar 25-26</td>
<td>Working session on Assignment 4 and 5 Task 1</td>
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<td>11</td>
<td>Apr 1</td>
<td>Submit Assignment 5 Task 1 - Presentation online (5 PM)</td>
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<td>Apr 1-2</td>
<td>Working session on Assignment 5 Task 2</td>
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<td>12</td>
<td>Apr 8</td>
<td>Synchronous discussion about Assignment 4 presentations</td>
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<td>Key messages</td>
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<td>Final Exam – Take home exam using CU Learn – it will open at 8 am</td>
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<td>until April 15 at 8 am (30 minutes duration)</td>
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<td>Submit Assignments 4 and 5 due April 17 (5 pm) but late submissions</td>
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<td>until April 20 (5 pm) will not be penalized</td>
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**ONLINE CLASS QUIZZES**

Students are expected to read class readings, as they provide useful and important information about illustrating the performance, condition and potential conservation strategies for historic buildings. Four class quizzes (Q1: 5% and Q2: 5%) will be conducted during the term of the course. Questions will cover essential issues; the instructor will indicate potential topics throughout the course.

**ASSIGNMENTS**

Part of the evaluation of student work will be based on the following four assignments. For final details see the instruction sheets provided when the assignment is introduced. The schedule for submission will be described in the draft course schedule. An assignment handed in late will be deducted 10% per day from the assessed grade.
Assignment 1: Introduce Yourself and Logistics Compliance:

Individually submit a personal introduction (see CU Learn for details). Also, include the following statement at the end of your post: “I (insert name), confirm that I have read and understood the entire syllabus for this course. If I have questions about the course, I promise to check the syllabus, the online material (assignment guides, tutorials, examples, etc.), before emailing the Professor Santana and/or Teaching Assistants

Furthermore, fill the following forms and submit answers: (1) Student Consent to Publish and (2) Informed Consent agreement

Assignment 2: Building characterization – 5 pages minimum (11 x 17) survey

Each group of student selects a building from a list of buildings and prepares a visual survey / building characterization sheet, which provides an overview of its character-defining elements, its construction and functional types, and identifies inherent environmental features. Due to COVID-19 restrictions the scope will be limited to the external envelop of the building. Students are able to use files provided by the professor’s dataverse dataset to make this assignment, as well as, the GIS data available at MacOdrum Library.

A group template will be developed/ provided based on models for inventories that have one page of text in point form, one overall photograph and one plan 10% of total mark. This building (or site) will be used during the entire class as case study.

At the end of the course, you are expected to submit all supporting material, please follow the digital files format and naming protocols provided on CU Learn under the course outline.

Assignment 3: Conservation technology – 1500-word essay on issues

Each student selects a type of (historic or modern) building material, assembly or structure from the site being studied and will write a brief essay on this technology. The essay should provide a brief history of the technology’s development and use in Canada. Identify 2 pathological conditions or issues that affect this technology and 2 interventions that can enhance sustainability (ex. improved energy efficiency or life-cycle impact).

For each pathological condition:
1. briefly describe what the condition is (ex. identification and cause of the problem);
2. why it is important to repair this condition (ex. what are the benefits);
3. how to repair this condition;
4. concerns about repairs, if applicable (ex. a solution that works in one climate may not be suitable in another climate);
5. additional information about why this repair is sustainable.

For each sustainable intervention:
1. briefly describe what the intervention is;
2. what are the benefits of this intervention;
3. how to implement this intervention;
4. concerns about this intervention, if applicable (ex. a solution that works in one climate may not be suitable in another climate);
5. additional information about why this intervention is sustainable.
6. In a table, state whether this intervention improves each of the following: insulation, air-tightness, ventilation, solar-heat gain/shading, daylighting, thermal mass, durability, repairability/ease of maintenance, embodied energy, end-of-life disposal.

Topics are generally based on Eastern Canadian building technologies but topics from other regions or countries will be allowed with prior approval. The essay should be submitted in two-sided letter format with a cover page and may include up to five illustrations with credits. Only scientific peer-review articles will be permitted to use as bibliographical references found on or accessed electronically through the MacOdrum Library or class-readings.

**Assignment 4: A surface condition report – 2 pages, including a Measured Drawing and 400-word report**

This is an assignment that is conducted in groups of two or three members of each team; it built on the Assignment 4, which is submitted by the entire. The purpose of this exercise is to reinforce the use, benefits, and constraints of recording techniques, in this case photogrammetry or rectified photography (learned on CIVE3207) to prepare an elevation drawing, as well as, to prepare a surface condition representation.

Each sub-team will prepare a measured drawing of at least one elevation using files provided by the professor’s dataverse dataset, used the data provided to produce a photogrammetric models to prepare an ortho-corrected image. This is conducted using specialized software. This software allows users to produce corrected images from 3D models. Main features of the element should be drawn from the resulting ortho-image using CAD overlay (e.g. Windows, doors, pediment, etc). Equally, each sub team will identify construction materials (eg. stone type 1, stone type 2, brick type 1, etc) and deterioration patterns (eg. cracks, missing material, biological growth). 5% of total mark

For the submission of supporting material, please follow the digital files format and naming protocols provided on CU Learn under the course outline.

**Assignment 5: Conservation Investigation – field notes and report**

This is the main course assignment and it is developed in two task submissions. It includes site visit(s) (depending on permissions and limited to the external envelope), investigation and recording of observed conditions, analysis of the causes of deterioration and recommendations for repair of the envelope and interiors of an Ottawa-area building (or site) used during the semester. The assignment will be reviewed and discussed according to: field notes, draft report, class presentation (during labs). A typical report table of contents will be provided.

Task 1: the online presentation, groups are expected to produce a recording of 5 minutes video uploaded into youtube or Carleton Mediaspace underlying the conservation investigation outcomes and contents of the dossier to be submitted later.

The online presentation link and a PDF copy of the slides should be handed on April 1 at 5 PM ahead of the April 8 discussion. Each group will also provide one question to their fellow teams.

Task 2: the final report: consists of a letter-size double-sided manuscript with maximum 12 pages of text and 8 pages of photos. 10% is assigned to the group presentation and 15% of the report submission (total 25%). Students are required to use the Nara Grid and the online damage-expert for monumental buildings system (http://mdcs.monumentenkennis.nl) to prepare this report.
For the submission of supporting material, please follow the digital files format and naming protocols provided on CU Learn under the course outline. A dropbox upload link will be provided to submit this supporting material.

Technical Prerequisites

To be able to take the course and produce assignments students are required to:

- Laptop / Desktop computer minimal configuration (recommended):
  - CPU: Intel VT-x 64bit Processors - i5/i7/i9 7th Gen or more (minimum)
  - Memory: 8GB RAM (minimum) Strongly recommend 16GB or more
  - Drive: 256GB or Larger SSD (Solid State Drive)
  - GPU: Nvidia Quadro, GeForce GTX, Radeon Pro, (>2GB Graphics Card)
  - Networking: WIFI (AC or AX) Recommend a 1Gig or Faster Ethernet Port or Adapter (Use a USB 3.0 to ethernet adapter so you do not need a physical ethernet port on your laptop)
  - Audio & Video: Camera, Microphone & Speaker

Software: the following software should be installed on students’ laptops or desktops prior to the course:

- Get AutoCAD 2018 through 2020 and Autodesk Recap (latest version). Free copies of AutoCAD and Recap release are available for download by registering at the Autodesk Education Community (http://students.autodesk.com). AutoCAD is also available at the computer lab in the event that you do not have a laptop computer.
- Get the latest ArcGIS Pro license from the Carleton University Library, read: https://library.carleton.ca/services/arcgis-student-edition. Alternatively, students can use Quantum GIS, which is an open source and free GIS package available at http://www.qgis.org.
- Get Bentley Context Capture (version v10.15.0.76), also bear in mind that an update of Bentley CONNECTION Client (to v10.0.19.27) is needed and
  - an update of the NVIDIA GTX 1050 Ti video card driver (to 451.48 “standard”), a tutorial will be organized to install and get a license from Carleton to use this software.

Students are also expected to know the two-dimensional drawing features of Computer-Aided Design (CAD) application. For tutorials, Carleton offers free access to LinkedIn Learning https://carleton.ca/learninganddevelopment/linkedinlearning/ here you can find CAD and other digital tools tutorials. Limited classroom instruction in the elements of CAD may be offered, depending on demand, but will not occur during course time.

It is highly recommended for the course to complete the following trainings:

- Learning AutoCAD (2h) Shaun Bryant
- AutoCAD 2020 Essential Training (3h 25m) Shaun Bryant
- AutoCAD: Construction Drawings (3h 18m) Shaun Bryant
- Learning FARO: Laser Scanning (39m) Dustin Manning
- 3D Scanning with a Camera (57m) Kacie Hultgren
- ReCap Workflow for Reality Capture (2h 52m) Paul F. Aubin

To access these trainings, read https://students.carleton.ca/services/linkedin-learning/ and they are also listed in CU Learn. Also, Students are expected to know the two-dimensional drawing features of
Computer-Aided Design (CAD) application. Depending on permissions, to be provided by the Department of Civil and Environmental Engineering:

- A camera tripod;
- Hand recording kits (measuring tape, Disto (electronic distance meter (EDM)), plumb bob and string;
- DSLR digital cameras: Nikon D5300 + 18-55 mm Nikkor Lens;
- Laser level;
- Total Station kit with tablet;

**TAKE HOME EXAM**

A take home exam will cover basic understanding of material performance, condition and potential conservation strategies for maintenance of historic buildings, it builds up on the two quizzes conducted during class. This exam will be launched online the last day of class and it will be available for 5 days to answer, it is worth 30%. It will consist of one questions related material conditions, one questions about performance and one question about a potential conservation strategy. When starting the online session, the length to answer 10 questions will be 30 minutes.

**BIOGRAPHICAL SKETCH OF INSTRUCTOR**

Mario Santana-Quintero, is a professor on Architectural Conservation and Sustainability at department of Civil and Environmental Engineering Carleton University. He is also the Director of the NSERC Create program “Engineering Students Supporting Heritage and Sustainability (HERITAGEENGINEERING)” based at the Carleton immersive Media Studio Lab (CIMS). He has an architectural degree, holding a master in conservation of historic buildings and towns and a PhD in Engineering from the R. Lemaire International Centre for Conservation (University of Leuven, Belgium). He is also a guest professor at the Raymond Lemaire International Centre for Conservation (University of Leuven). These past years he has been teaching also at the Universidad Central de Venezuela, Universidad de Guadalajara (Mexico) and Universidad de Cuenca (Ecuador). In the past, he was a Professor at the University College St Lieven and lecturer at the University of Aachen RWTH and the Historic Preservation Programme at the University of Pennsylvania between 2006 and 2011. Along with his academic activities, he serves as Secretary General of the International Council of Monuments and Sites (ICOMOS) and he is the past president of the ICOMOS Scientific Committee on Heritage Documentation (CIPA). Furthermore, he has collaborated in several international projects in the field of heritage documentation for UNESCO, The Getty Conservation Institute, ICCROM, World Monuments Fund, UNDP, Welfare Association, and the Abu Dhabi Department for Culture and Tourism.

**INTELLECTUAL PROPERTY, COPYRIGHT AND FAIR DEALINGS**

As a condition of participating in the course and for the purpose of academic evaluation, students will be required to upload in-progress and completed work to the instructor’s desired online platform(s). It is expressly understood that any such records or copies of student work will be used for nonprofit presentation and for the purposes of this authorization, nonprofit presentation includes showing, screening, publication and releases or presentation as a public service by internet distribution, commercial broadcasting or publication in furtherance of course specific and institutional learning objectives.

For reasons of intellectual property and copyright, please under no circumstances download course documents or presentations for distribution without first acquiring written permission of the author/instructor.
ACADEMIC ACCOMMODATIONS

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

Pregnancy obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see link below

Religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see link below

Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally scheduled exam (if applicable).  
https://devsite.carleton.ca/equity/accommodation/academic/course-outline-wording/

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and survivors are supported through academic accommodations as per Carleton’s Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, 
https://carleton.ca/sexual-violence-support/

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist.
For more information on academic accommodation, please contact the departmental administrator or visit: students.carleton.ca/course-outline

Student Wellness Resources

- General (All Resources Available): https://students.carleton.ca/wellness/
- Mental Health and Wellbeing: https://students.carleton.ca/services/mental-health-wellbeing-website/
• International SOS: https://students.carleton.ca/services/international-sos/
• Therapy Assisted Online (TAO): https://students.carleton.ca/services/therapy-assisted-online/

ACCESSIBILITY

Students with disabilities requiring academic accommodation in this course must register with the Paul Menton Centre for Students with Disabilities (PMC) for a formal evaluation of disability-related needs. Documented disabilities could include but are not limited to mobility/physical impairments, specific Learning Disabilities (LD), psychiatric/psychological disabilities, sensory disabilities, Attention Deficit Hyperactivity Disorder (ADHD), and chronic medical conditions. Registered PMC students are required to contact the PMC, 613-520-6608 every term to ensure that instructor receives your Letter of Accommodation no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. If you only require accommodations for your formally scheduled exam(s) in this course, please submit your request for accommodations to PMC by the deadlines published on the PMC website:

https://carleton.ca/pmc/
https://carleton.ca/registrar/registration/dates-and-deadlines/

STUDENT CONDUCT

Please refer to https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/ for specific information regarding Student Conduct and Academic Integrity standards.

STUDENT RESPONSIBILITY

https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/student-responsibility/

CONDUCT DISCRIMINATION AND HARRASSMENT

https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/academic-integrity-and-offenses-of-conduct/

ACADEMIC INTEGRITY

The University has adopted a policy to deal with allegations of academic misconduct. This policy is expressed in the document Carleton University Academic Integrity Policy, found here: https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/academic-integrity-and-offenses-of-conduct/

SECURITY AND SAFETY

Avoid Working Alone After Hours · In Case of Emergency, Dial Extension 4444 from any campus phone
APPENDIX 1: DIGITAL FILES FORMAT AND NAMING

The following guidelines pertain to the creation and manipulation of digital files for the historic site recording assessment course, the purpose is to provide a framework for appropriate storage, retrieval and provenance of files prepared during the course. The data produced in the course will be stored for posterity on Carleton’s dataverse system: https://library.carleton.ca/services/dataverse. This will make it available to the university community.

Digital Images

File Name

Image files should be named according to the following format:
AC_ SITE# _ YEAR _ PHOTO# . EXTENSION

The following explains each site within this file naming convention:
AC: Letter “AC” precedes SITE# to indicate ARCN/CIVE course.
SITE#: 3-digit acronym, which indicates the acronym assigned to each of groups in the course. This suffix will be decided by your group on Assignment 1, for example Bytown museum can be BTM or Mayfair building could be MFB.
YEAR: 4 digit number indicating year in which photo was taken (i.e., created).
INITIALS: 3-digit acronym, indicating the name of the author taking the photograph (i.e., MSQ).
PHOTO#: 4 digit number assigned to the photo to distinguish it from other photos of the same site created in the same year. If the number is less than 4 digits, then it should be preceded by an appropriate number of 0’s.
EXTENSION: The file type, such as JPG.
The following is an example of an image file name following this convention:
AC_MFB_2016_ARCH0002.jpg

File Format

It is recommended that image files be in the JPG format to minimize file size.

File Size

It is recommended that image files be no larger than one megabyte (12 MB) in size.

Description Information

The following information should be recorded to describe the photograph in the accompanying spreadsheet:

- Specific date photo taken/created (in the following format): YEAR (4 digit number) MONTH (3 digit alphabetic abbreviation) DAY (2 digit number; if date is only 1 digit, then precede with a 0);
- Photographer name (in the following format): SURNAME, GIVEN NAME
• Image copyright holder: indicate name of institution(s) or individual(s) holding image copyright; if copyright no longer held (e.g., expired) then indicate “no copyright”, in most cases indicate Carleton University.
• Site name: indicate the site primary name in agreement with instructors.
• Subject of photograph: indicate the subject of the photograph, which should describe the reason for taking the photo; the following are examples:
  • Context photography: interior and exterior (e.g. Situating the site in its environment, west facade, general exterior view, etc)
  • Character defining elements (e.g. Ornamentation, hardware, etc)
  • Condition photography (e.g. Disturbances, threats, decay).

CAD drawings, point clouds and other electronic files

File Name

AutoCAD files should be named according to the following format:
AC _ SITE# _ YEAR _ DRAWINGNAME#. EXTENSION

The following explains each site within this file naming convention:
AC: Letter “AC” precedes SITE# to indicate ARCN /CIVE course.

SITE#: 3-digit acronym, which indicates the acronym assigned to each of groups in the course. This suffix will be decided by your group on Assignment 1, for example Bytown museum can be BTM or Mayfair building could be MFB.

YEAR: 4 digit number indicating year in which photo was taken (i.e., created).

DRAWINGNAME#: 4 digit number assigned to the drawing to distinguish it from other drawings of the same site created in the same year. If the number is less than 4 digits, then it should be preceded by an appropriate numbers of 0’s.

EXTENSION: The file type, such as DWG.
The following is an example of an image file name following this convention:
AC_001_2012_0002.DWG

Description Information

The following information should be recorded to describe the photograph in the accompanying spreadsheet:

• Specific date when the drawing was last updated (or created) (in the following format): YEAR (4 digit number) MONTH (3 digit alphabetic abbreviation) DAY (2 digit number; if date is only 1 digit, then precede with a 0);
• Author name (in the following format): SURNAME, GIVEN NAME
• Drawing copyright holder: indicate name of institution(s) or individual(s) holding image copyright; if copyright no longer held (e.g., expired) then indicate “no copyright”, in most cases indicate Carleton University.
• Site name: indicate the site primary name in agreement with instructors.
• Subject of the drawing: describe the context and contents of the drawing (eg. Plan section: level 1: condition assessment)
Guidelines for the layer naming and structure will be discussed during the class and agreed for submission of the assignments.

**Other electronic files’ submission**

Students are expected to submit all the files used to produce the different assignments and course report in digital format. Please consider using similar naming guidelines as provided for digital images and CAD drawings to name and organize all your files. The provenance information of your files is crucial for the storage, management and retrieval of these files in the future.