



ARCH 680.4 L 12

Building Information Modeling

H (1.5, 1.5T)

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Office Hours: By appointment

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Wednesdays 9:00 – 10:30 *Sessions are in person in PF 3177 unless otherwise indicated.*

Fridays 9:00 – 10:30

Introduction

This course explores Building Information Modeling (BIM) as both a form and process involving the generation and management of digital virtual representation(s) of a building design. The resulting building information model becomes a shared resource to support decision-making about a building design from the earliest conceptual stage through design development, analysis, fabrication, and construction. The BIM allows design and other information to be extracted for all possible needs throughout the life cycle. BIM is introduced as an enabling technology platform related to integrated project delivery (IPD).

BIM encourages all professionals, firms and organizations in a construction project to work cooperatively to create better buildings, faster delivery times, lower costs, and maintain scope while reducing litigation and conflict. This cooperation can form the basis of a more effective project process for the entire team.

Objectives

Students will learn about the essential concepts and methods associated with executing BIM projects, the various ways BIM has been used in the building industry, and its broader implications for the profession. Also, students will acquire practical skills in using Revit (and related tools), software made by Autodesk, which is widely used in the industry today. Although we focus on the Autodesk platforms, the underlying concepts apply to BIM projects regardless of the technical platform.

The course will also examine the relationship between disciplines in the virtual 3D environment and how to maximize these relationships at a project level. In the class, we will explore the various technical means of allowing teams to work efficiently together and how to focus those efforts on positive project results.

We will look closely at the transformation from a conceptual design model to a constructible building design and explore the variety of means using REVIT tools and methods, such as parametric and adaptive components. We will explore the opportunities for data connectivity for better decision-making.

1. Understand REVIT concepts that are related to executing BIM Projects.
2. Convert an existing Design project to a REVIT LOD 300 Model
3. Understand Data relationship to BIM Projects

4. Gain an appreciation of Practice concepts of building construction and analysis.
5. Understand basic 3D coordination concepts using Navisworks.
6. Understand the importance of International Technical Standards.
7. Review of various sized BIM projects understanding the approach.

Teaching Approach

The course will have both the seminar and the workshop/LAB format. During the course, students will work on 2 projects and one final project focusing on critical thinking and the development process of enhancing BIM (i.e. producing geometry plus data information). Accordingly, technical strategies in 3D coordination will be explored using Revit in conjunction with other software, and several test conditions will be resolved using appropriate workflow. Each student will present the final BIM project in the last week of the class.

Course Schedule

Topic Areas, Assignments and Due Dates

Week 1

September 7 Introduction to the course and the projects
 September 9 LAB - Autodesk REVIT– Revit Essentials 1, **Zoom**
 Beginning of Project 1

Week 2

September 14 Introduction to BIM
 September 16 LAB - Revit Essentials 2, **Zoom**

Week 3

September 21 BIM Concepts and Methods
 September 23 LAB - Revit Essentials 3, Project 1 Submission, **Zoom**
 Beginning of Project 2

Week 4

September 28 LAB - Revit Essentials 4 & Project Consultation, **Zoom**
 September 30 No Class, National Day for Truth and Reconciliation

Week 5

October 3 - 7 SAPL Fall Block Week / No classes

Week 6

October 12 Model Organization
 October 14 LAB – Adaptive Components, **Zoom**

Week 7

October 19 Professional Practice & Project Coordination (Guest Lecture: Stantec)
 October 21 From conceptual model to constructible building

Week 8

October 26 Professional Practice & Project Coordination (Guest Lecture: Stantec)
 October 28 Project 2 Submission and Presentation, Beginning of Project 3

Week 9

November 2 LAB – Introduction to Dynamo and Navisworks, **Zoom**
 November 4 Presentation of Proposals

Week 10

November 7 – 11 Term break / No classes

Week 11

November 16 Work in Progress Presentations & Consultation

November 18 Guest Lecture (Life Cycle Assessment & Energy Analysis, Penn State University), Project Consultation

Week 12

November 23 Guest Lecture (CanBIM), Project Consultation

November 25 Project Consultation

Week 13

November 30 Guest Lecture (Digital Twin & BIM), **TBD**

December 2 Final Project Presentation

- *The date of lectures by guest lecturers may change - to be confirmed*

Means of Evaluation

The course evaluation will be based on the assignments completed during the course, including the final project presentation. In the case of group assignments, participants will be asked to describe their contribution to the assignment. There will be no final examination.

| | |
|--|------|
| Project 1 - BIM practice development | 10% |
| Project 2 - BIM practice development | 20% |
| Project 3 - BIM project's development (progress) | 30% |
| Project 3 - final presentation | 10% |
| Outcome | 20% |
| Participation in seminars and LABs | 10% |
| Total | 100% |

Note: A passing grade in all assignments is required to pass the course as a whole.

Policy for Late Assignments

Assignments submitted after the deadline will be penalized with the loss of a grade (e.g., A- to B+). For late submission after one week but not more than 2 weeks, the loss will be two grades, e.g., A- to B. Assignments will not be accepted after 3 weeks.

Guidelines for Zoom Sessions in Online Classes

This course will take place **hybrid** as a combination of in-person and remote synchronous. The online sessions are via Zoom meetings. Students are expected to participate actively in all Zoom sessions and to turn on their webcam. Please join our class in a quiet space that will allow you to be fully present and engaged in the Zoom sessions. Students must behave in a professional manner during the session. Students, employees, and academic staff are also expected to demonstrate behaviour in class that promotes and maintains a positive and productive learning environment. If unable to participate live due to unforeseen circumstances, inform the instructor in advance to work out an alternative

participation activity (e.g., watch the recordings, submit a brief reflection, and actively contribute to the follow-up online discussion).

Zoom is a video conferencing program that will allow us to meet at specific times for a "live" video conference, so that we can have the opportunity to meet each other virtually and discuss relevant course topics as a learning community. To help ensure Zoom sessions are private, do not share the Zoom link or password with others, or on any social media platforms. Zoom links and passwords are only intended for students registered in the course. Zoom recordings and materials presented in Zoom, including any teaching materials, must not be shared, distributed or published without the instructor's permission.

The use of video conferencing programs relies on participants to act ethically, honestly and with integrity; and in accordance with the principles of fairness, good faith, and respect (as per the [Code of Conduct](#)). When entering Zoom or other video conferencing sessions (such as MS Teams), you play a role in helping create an effective, safe and respectful learning environment. Please be mindful of how your behaviour in these sessions may affect others. Participants are required to use names officially associated with their UCID (legal or preferred names listed in the Student Centre) when engaging in these activities. Instructors/moderators can remove those whose names do not appear on class rosters. Non-compliance may be investigated under relevant University of Calgary conduct policies (e.g. [Student Non-Academic Misconduct Policy](#)). If participants have difficulties complying with this requirement, they should email the instructor of the class explaining why, so the instructor may consider whether to grant an exception, and on what terms. For more information on how to get the most out of your zoom sessions visit: <https://elearn.ucalgary.ca/guidelines-for-zoom/>

If you are unable to attend a Zoom session, please contact your instructor in advance to arrange an alternative activity for the missed session (e.g., to review the recorded session). Please be prepared, as best as you are able, to join class in a quiet space that will allow you to be fully present and engaged in Zoom sessions. Students will be advised by their instructor when they are expected to turn on their webcam (for group work, presentations, etc.).

The instructor may record online Zoom class sessions for the purposes of supporting student learning in this class – such as making the recording available for review of the session or for students who miss a session. Students will be advised before the instructor initiates a recording of a Zoom session. These recordings will be used to support student learning only and will not be shared or used for any other purpose.

Technology requirements (D2L etc.):

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security and malware updates;
- A current and updated web browser;
- Webcam (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Broadband internet connection.

Most current laptops will have a built-in webcam, speaker and microphone.

Software Requirements

Autodesk Revit, Autodesk Navisworks, Dynamo, and Plugins relevant to the projects.

Required readings, textbooks and learning materials:

Required (and recommended) textbooks, readings, and materials, including electronic resources, will be announced during the class.

| Grading Scale | | | | |
|---------------|-------------------|---------------|----------|---|
| Grade | Grade Point Value | 4-Point Range | Percent | Description |
| A+ | 4.00 | 4.00 | 95-100 | Outstanding - evaluated by instructor |
| A | 4.00 | 3.85-4.00 | 90-94.99 | Excellent - superior performance showing comprehensive understanding of the subject matter |
| A- | 3.70 | 3.50-3.84 | 85-89.99 | Very good performance |
| B+ | 3.30 | 3.15-3.49 | 80-84.99 | Good performance |
| B | 3.00 | 2.85-3.14 | 75-79.99 | Satisfactory performance |
| B- | 2.70 | 2.50-2.84 | 70-74.99 | Minimum pass for students in the Faculty of Graduate Studies |
| C+ | 2.30 | 2.15-2.49 | 65-69.99 | All final grades below B- are indicative of failure at the graduate level and cannot be counted toward Faculty of Graduate Studies course requirements. |
| C | 2.00 | 1.85-2.14 | 60-64.99 | |
| C- | 1.70 | 1.50-1.84 | 55-59.99 | |
| D+ | 1.30 | 1.15-1.49 | 50-54.99 | |
| D | 1.00 | 0.50-1.14 | 45-49.99 | |
| F | 0.00 | 0-0.49 | 0-44.99 | |

Notes: A student who receives a "C +" or lower in any one course will be required to withdraw regardless of their grade point average (GPA) unless the program recommends otherwise. If the program permits the student to retake a failed course, the second grade will replace the initial grade in the calculation of the GPA, and both grades will appear on the transcript.

University of Calgary Policies and Supports

COVID-19 PROCEDURE FOR SICK STUDENTS: <https://ucalgary.ca/risk/sites/default/files/Covid-19%20Folder/COVID-19-Procedure-for-Sick-Students.pdf>

ACADEMIC ACCOMMODATION

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The Student Accommodations policy is available at <https://ucalgary.ca/student-services/access/prospective-students/academic-accommodations>. Students needing an accommodation based on disability or medical concerns should contact Student Accessibility Services (SAS) in accordance with the Procedure for Accommodations for Students with Disabilities (<https://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities.pdf>). Students who require an accommodation in relation to their coursework based on a protected ground other than Disability should communicate this need in writing to their instructor.

SAS will process the request and issue letters of accommodation to instructors. For additional information on support services and accommodations for students with disabilities, visit www.ucalgary.ca/access/.

ACADEMIC MISCONDUCT

Academic Misconduct refers to student behavior which compromises proper assessment of a student's academic activities and includes: cheating; fabrication; falsification; plagiarism; unauthorized assistance; failure to comply with an instructor's expectations regarding conduct required of students completing academic assessments in their courses; and failure to comply with exam regulations applied by the Registrar.

For information on the Student Academic Misconduct Policy and Procedure please visit:

<https://ucalgary.ca/policies/files/policies/student-academic-misconduct-policy.pdf>

<https://ucalgary.ca/policies/files/policies/student-academic-misconduct-procedure.pdf>

Additional information is available on the Academic Integrity Website at <https://ucalgary.ca/student-services/student-success/learning/academic-integrity>.

COPYRIGHT LEGISLATION:

All students are required to read the University of Calgary policy on Acceptable Use of Material Protected by Copyright (www.ucalgary.ca/policies/files/policies/acceptable-use-of-material-protected-by-copyright.pdf) and requirements of the copyright act (<https://laws-lois.justice.gc.ca/eng/acts/C-42/index.html>) to ensure they are aware of the consequences of unauthorised sharing of course materials (including instructor notes, electronic versions of textbooks etc.). Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy (<https://www.ucalgary.ca/pubs/calendar/current/k.html>).

INSTRUCTOR INTELLECTUAL PROPERTY

Course materials created by instructors (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the instructor. These materials may NOT be reproduced, redistributed or copied without the explicit consent of the instructor. The posting of course materials to third party websites such as note-sharing sites without permission is prohibited. Sharing of extracts of these course materials with other students enrolled in the course at the same time may be allowed under fair dealing.

FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY

Student information will be collected in accordance with typical (or usual) classroom practice. Students' assignments will be accessible only by the authorized course faculty. Private information related to the individual student is treated with the utmost regard by the faculty at the University of Calgary.

SEXUAL VIOLENCE POLICY

The University recognizes that all members of the University Community should be able to learn, work, teach and live in an environment where they are free from harassment, discrimination, and violence. The University of Calgary's sexual violence policy guides us in how we respond to incidents of sexual violence, including supports available to those who have experienced or witnessed sexual violence, or those who are alleged to have committed sexual violence. It provides clear response procedures and timelines, defines complex concepts, and addresses incidents that occur off-campus in certain circumstances. Please see the policy available at

<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>

UNIVERSITY STUDENT APPEALS OFFICE: If a student has a concern about the course, academic matter, or a grade that they have been assigned, they must first communicate this concern with the instructor. If the concern cannot be resolved with the instructor, the student can proceed with an academic appeal, which normally begins with the Faculty.

<https://www.ucalgary.ca/secretariat/student-appeals>

OTHER IMPORTANT INFORMATION

Please visit the Registrar's website at: <https://www.ucalgary.ca/registrar/registration/course-outlines> for additional important information on the following:

- Wellness and Mental Health Resources
- Student Success
- Student Ombuds Office
- Student Union (SU) Information
- Graduate Students' Association (GSA) Information
- Emergency Evacuation/Assembly Points
- Safewalk