

## Faculty of Environmental Design Course Outline (Draft)

### Building Information Modeling

Monday and Wednesday 12:20 – 13:50, Room PF 3160

David Burch

[drburch@ucalgary.ca](mailto:drburch@ucalgary.ca) (c:/txt 403-830-5218)

EVDS 683.10 Q

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### Introduction

This course explores the Building Information Model (BIM) as both 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 stages, through design development, analysis, fabrication, and construction. The BIM itself can carry on in parallel with the Building Life Cycle, and BIM recently has become a centrepiece for the owners long-term strategy for the facility. BIM is introduced as an enabling technology platform that can relate 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 maintaining scope while reducing litigation and conflict. This can form the basis of a more effective project process for the entire team.

Today, BIM has become the usual means of project 3d coordination from projects medium-sized and larger. Also, BIM can leverage Parametric design technologies such as DYNAMO and Adaptive components which allow for the rapid “iteration” of solutions to specific program challenges.

### Objectives – Course Learning Outcomes

Students will learn about the essential concepts and methods associated with executing BIM projects, the various ways in which BIM has been used currently 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 are focusing on the Autodesk platforms, the underlying concepts are applicable to BIM projects regardless of technical platform.

This class will examine the relationship between disciplines in the 3D / BIM 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 for positive project results.

We will look closely at the transformation from a Conceptual Design Model to constructible building design and explore the variety of means, using REVIT tools and methods, such as parametric and adaptive components to achieve complete designs. 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 REVIT LOD 100 Model*
3. *Create areas of the model in LOD 300 Plus, through sections and 3D exploded details.*
4. *Understand Data relationship to BIM Projects.*
5. *Understand the MODEL relationship to 2D documentation.*
6. *Gain an appreciation of Practice concepts of building construction and analysis.*
7. *Understand basic 3D coordination concepts using Navisworks.*
8. *Introductory understanding of Key International Technical Standards driving BIM adoption worldwide.*
9. *Adaptive concepts – Dynamo, Adaptive components. Parametric to drive design concepts.*
10. *Looking into the relationship of Dynamo to drive both Data and Design integration*
11. *DBLINK to make connections with External spreadsheets.*
12. *Review of various sized BIM projects to understand the BIM strategy used..*

### Teaching Approach

The course will have both the seminar and the workshop/LAB format. Students will be using primarily their own hardware for the LABS. Although we will have several collaborative examples, LABs will be focused on this method.

Assess general REVIT competency in the class, to assist with specific baseline topics that will be introduced through WEB based Training from Global E-Training.

Monday class meetings will be devoted mostly to lectures or discussions of assigned readings; there will be a number of guest lectures in the second half of the term by leading professionals in the industry.

In general, Wednesday meetings will consist of LAB Time, demonstrations of essential concepts and modelling techniques in Revit and other software, which is freely available to students through Autodesk's website. During the course, students will develop an enhanced BIM+ (i.e. Geometry plus Data information) of either their studio project from the Comprehensive Design Studio or a project provided by the instructor.

The Developed BIM will be used for Technical analysis using Navisworks. Strategies in 3D coordination will be explored, and several test conditions will be resolved using the appropriate workflow.

Each student will present the BIM project in the last week of the class. Also, each student will submit a short, two-page paper (1,000 words) addressing, in critical fashion a BIM-related issue that should emerge out of seminar discussions. This paper may be selected for a published document pending student's selection and approval for use.

### Content: Topic Areas & Detailed Class Schedule

Monday – Lab , Wednesday – Lecture (Calendar Updated)

There will be potentially 2 Optional site trips.

**(NOTE: The specific dates must be adjusted for the current calendar. Guest lectures need to be confirmed.)**

## JANUARY

- 1/14 Introduction to BIM / Getting Started
- 1/16 BIM Concepts and Methods
- 1/21 Model Organization Strategy
- 1/23 Creative BIM (TBC - Branko Kolarevic)
- 1/28 Parametric Concepts
- 1/30 Advanced Concepts and Data

## FEBRUARY

- 2/4 Families
- 2/6 Advanced Massing
- 2/11 Fabrication / Construction: TBC Hammad Chaudhry - Ellis Don
- 2/13 Dynamo and Adaptive components
- 2/18 Reading Week
- 2/20 Reading Week
- 2/25 Dynamo and Adaptive components
- 2/27 3D Coordination – Navisworks and VR/AR

## MARCH

- 3/4 Dynamo and adaptive components
- 3/6 Project consultations
- 3/11 Discussion of Families
- 3/13 Work-in progress presentations
- 3/18 Guest Lecture (TBC)
- 3/20 Project consultations
- 3/25 Project consultations
- 3/27 Project consultations

## APRIL

- 4/1 Project consultations
- 4/3 Final project presentations
- 4/8 Final project presentations
- 4/10 Final project presentations

## Means of Evaluation

The final grade is based on the following

Completion of GET REVIT Assigned Classes	(10%
Active participation in discussions and Labs	(10%).
Project presentation at the end of the term	(20%)
Two-page paper	(20%)
BIM project's development	(20%)
Project outcome	(20%)
<b>Total</b>	<b>100%</b>

Note that this weighting may not be changed during the session or at the time of grade reporting.

Also note that as per FGS and U of C regulations, students shall have been informed by their instructors of the grades \*currently earned\* by one week before the withdrawal deadline in all courses.

## 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.

**Studio Courses: include notes as appropriate, edit as per guidelines sent with this template:** Students are expected to complete all course assignments on time. There will be no final exam. Students must obtain an overall passing grade to pass this course, however, if a student fails any phase of the course worth X% or more they will fail the course. A student who feels that a piece of graded term work (term paper, essay, test, etc.) has been unfairly graded may have the paper re-graded. The student shall discuss the work with the instructor within **fifteen days** of being notified about the mark or of the item's return to the class. More information can be found in the Graduate Calendar: <http://www.ucalgary.ca/pubs/calendar/grad/current/gs-o.html>

## Readings

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

LOD Specification. - 2018

BIM Terms – Canada BIM Council.

(Other materials available on Black Board)

## APPLICATIONS:

Mandatory:

1. REVIT 2019
2. Navisworks Manage 2019
3. ETransmit plugin

Optional:

4. Dynamo 1.X
5. Sketch Up
6. DB LINK Plugin

## Notes:

1. Written work, term assignments and other course-related work may only be submitted by e-mail if prior permission to do so has been obtained from the course instructor. Submissions must come from an official University of Calgary (ucalgary) email account.
2. Academic Accommodations. Students who require an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to their Instructor or the designated contact person in EVDS, Jennifer Taillefer ([jtaillef@ucalgary.ca](mailto:jtaillef@ucalgary.ca)). Students who require an accommodation unrelated to their coursework or the requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Vice-Provost (Student Experience). For additional information on support services and accommodations for students with disabilities, visit [www.ucalgary.ca/access/](http://www.ucalgary.ca/access/)
3. Plagiarism - Plagiarism involves submitting or presenting work in a course as if it were the student's own work done expressly for that particular course when, in fact, it is not. Most commonly plagiarism exists when:(a) the work submitted or presented was done, in whole or in part, by an individual other than the one submitting or presenting the work (this includes having another impersonate the student or otherwise substituting the work of another for one's own in an examination or test),(b) parts of the work are taken from another source without reference to the original author,(c) the whole work (e.g., an essay) is copied from another source, and/or,(d) a student submits or presents work in one course which has also been submitted in another course(although it may be completely original with that student) without the knowledge of or prior agreement of the instructor involved. While it is recognized that scholarly work often involves reference to the ideas, data and conclusions of other scholars, intellectual honesty requires that such references be explicitly and clearly noted. Plagiarism is an extremely serious academic offence. It is recognized that clause (d) does not prevent a graduate student incorporating work previously done by him or her in a thesis. Any suspicion of plagiarism will be reported to the Dean, and dealt with as per the regulations in the University of Calgary Graduate Calendar.

4. Appeals: 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:  
<http://www.ucalgary.ca/provost/students/ombuds/appeals>
5. Information regarding the Freedom of Information and Protection of Privacy Act  
(<https://www.ucalgary.ca/legalservices/foip>)
6. Emergency Evacuation/Assembly Points  
(<http://www.ucalgary.ca/emergencyplan/assemblypoints>)
7. Safewalk information (<http://www.ucalgary.ca/security/safewalk>)
8. Contact Info for: Student Union (<https://www.su.ucalgary.ca/contact/>); Graduate Student representative(<https://gsa.ucalgary.ca/about-the-gsa/gsa-executive-board/>) Student Union Wellness Centre: <https://www.ucalgary.ca/wellnesscentre/>; Library Resources: <http://library.ucalgary.ca/> and Student Ombudsman's Office (<http://www.ucalgary.ca/ombuds/>).