Course Information

- **Course number and title: CE 52200 Computer Applications in Construction**
- **Meeting day(s) and time(s), and location(s):**
  - TR 1:30-2:45
  - Jerry S Rawls Hall 1062
- **Instructional Modality:** In-person
- **Course credit hours:** 3 credits
- **Prerequisites:**
  - Background knowledge in construction engineering and management
  - Basic skills in using computers

Instructor(s) Contact Information

- **Name of the instructor: Prof. Hubo Cai**
  - **Office Location: 1235 CIVL**
  - **Office hours: TBA**
  - **Office Phone Number: (765) 494-0528**
  - **Purdue Email Address: hubocai@purdue.edu**

- **Name of the TA: Zirui Hong**
  - **Purdue Email Address: hong351@purdue.edu**
  - **Office hours: TBA**

Course Description

This course is part of a master study of the current computer usage in the construction industry; computer applications in construction; and commercially available software applications. Particularly, this course is designed for students who are interested in building information modeling (BIM) and its applications in construction. It provides essential knowledge and skills of the key concepts in BIM, namely object-oriented modeling, parametric modeling, and central database. It enables students to appreciate the benefits of BIM and understand how BIM changes the practice in the architecture, engineering, and construction (AEC) industry. It also prepares students to use commercial software packages for various construction management tasks. The three course modules as follows:

- Module 1: Fundamentals of Building Information Modeling
- Module 2: BIM in Construction
- Module 3: Computer Applications of Artificial Intelligence and e-Construction

Learning Resources, Technology & Texts

Textbook, Lecture Notes, and Reading:

The course will be set up in Brightspace, the learning management system that is currently being used at Purdue University.

- **Required texts:**
  - No textbook is required in this class.
  - Lecture notes and class readings will be posted the weekly modules and in the Course Readings module of the course.
  - Students will be required to conduct literature review outside the class.
- **Recommended textbook:**
  - Sacks, R., Eastman, C., Lee, G., and Teicholz, P. (2018). *BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers.* 3rd Edition, ISBN: 978-1-119-28755-1.
  - Available as e-book and hardcover on www.wiley.com. 1st edition of the book (2008) is available in the Purdue Libraries to Purdue students.
  - Visit Ask a Librarian to connect with helpful resources and services provided by the Purdue Libraries and School of Information Studies for course assignments and projects.
- **Computer and Software Packages:**
  - The Civil Engineering computer lab and ITAP labs shall have most of the required software packages that will be used in this class.
  - Students are expected to have their own laptops to install software packages if they choose to use them. *Note certain software packages only work on Windows operating system.*
- **Particular Software packages include:**
  - BIM authoring tools (e.g., Autodesk Revit)
  - BIM review and construction tools (e.g., Autodesk Navisworks)
  - Scheduling tools (e.g., Microsoft Project, Oracle Primavera)
    - (Right now, these tools only work on Windows machines)
  - Spreadsheet (e.g., Microsoft Excel)
    - MS Office is free for all students
- Note that the above software packages will be used in this class for demonstrations, hands-on activities, and assignments.
- **Brightspace learning management system:**
  - Access the course via Purdue's Brightspace learning management system.
  - Begin with the Start Here tab, which describes how the course Brightspace is organized.
  - It is strongly suggested that you explore and become familiar not only with the site navigation but with content and resources available for this course.
  - See the Student Services widget on the campus homepage for resources such as Technology Help, Academic Help, Campus Resources, and Protect Purdue.

Learning Outcomes

Each module has a set of Outcomes, they are as follows:

- By the end of the **Module 1**, you will be able to:
  - Explain the fundamental principles of BIM
  - List BIM applications in construction and their corresponding benefits
  - Create BIM models that include major building elements
  - Develop construction documents through BIM

- By the end of the **Module 2**, you will be able to:

- Explain the fundamental concepts of 4D and nD modeling, and clash avoidance and clash detection
- Conduct clash detection to review and analyze BIM models
- Create 4D, 5D, and nD models
- Conduct quantity takeoff and estimate cost
- Develop and analyze construction plans
- Use spreadsheet and scheduling tools

- By the end of the **Module 3,** you will be able to:
  - Create spreadsheet applications for construction project management tasks
  - Develop database applications for digital construction inspection
  - Develop programs in VBA (to work with Spreadsheet) and Python
  - Develop natural language processing and machine learning algorithms for construction applications.

Assessments

Assessment Type	Description	% of Final Grade
7 Assignments	• You will submit a technical report on the Task information presented in each homework relating to core concepts and necessary skills in BIM. • Please refer to the rubrics for performance expectations. • Due on Saturdays at 11:59 pm	20%
13 Lab Assignments	• Lab assignments to prove that you understand core concepts and have the necessary skills in the BIM practice. • Please refer to the rubrics for performance expectations. • Due on Saturdays at 11:59 pm	30%
14 Quizzes	• Weekly quizzes are multiple-choice, multi-answer and T/F questions. • The quizzes cover the material presented in each week and assess your understanding of the key concepts in BIM. • Due on Saturdays at 11:59 pm.	30%
1 Term Project	• The Term Project consists of two projects, with a three-phase approach. The first two phases focus on the first project. Phase 3 is dedicated to the second project. • Each phase has its own goal, objectives, deliverables (submissions), and due dates, and will be graded separately. • You will find a submission link in weeks 5, 10 and 15 for each specific phase due during those weeks. is assigned at the start of the course. • In this Term Project, you will: • Apply BIM concepts and skills learned in this class to develop a model for a two-story building.	20%

	• Develop communication skills: presentations and technical reports • Apply object-oriented modeling, parametric modeling, and BIM as a central database concept and use BIM authoring tool to complete the design of a building project • Please refer to the rubrics for performance expectations.	
Total		100%

Grading

Course Grades: (Approximate grading scheme, could be modified based on performance)		
A >92%	A- 89-92%	
B+ 86-89%	B 83-86%	B- 80-83%
C+ 77-80%	C 74-77%	C- 70-74%
D 60-70%	F <60%	

Feedback on Assignments, Labs, and Term Project:

- All Feedback will be based on the rubrics of each assignment, lab, and term project phase.
- Feedback will be returned to the student no later than the end of the course.

Course Schedule

Each module schedule has been placed in the Brightspace course and can be found at the top of each module page. Click on the module link located on the left in the navigation menu to open the module.

* Schedule and assignments subject to change. Any changes will be posted in the learning management system.

**Please reference the Purdue Academic Calendar and key University dates for the 2022-2023 school year.

Discussion Guidelines

Please follow the Discussion Guidelines when contributing to discussions in this course. Here are a few of the key points you should remember:

- Do not use offensive language. Present ideas appropriately.
- Be cautious in using Internet language. For example, do not capitalize all letters since this suggests shouting.
- Avoid using vernacular or slang language. This could possibly lead to misinterpretation.
- Do not hesitate to ask for feedback.
- Be concise and to the point.
- Think and edit before you push the “Send” button

Attendance

Attendance is expected. Bring a laptop/pad to class to access in-class quizzes.

Academic Integrity

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on our course Brightspace table of contents, under University Policies.

Purdue's Honor Pledge:

"As a Boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."

Nondiscrimination Statement

Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.

A hyperlink to Purdue's full Nondiscrimination Policy Statement is included in our Brightspace course under University Policies.

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Accessibility

In Brightspace under Student Help and Accessibility is a screenshot for your information of the Student Resources Widget that links to the Disability Resource Center. Additionally, Purdue's Web accessibility policy and the Accessibility Standards for Brightspace are provided.

Purdue University is committed to making learning experiences accessible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.

Mental Health/Wellness Statement

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try WellTrack. Sign in and find information and tools at your fingertips, available to you at any time. If you need support and information about options and resources, please contact or see the Office of the Dean of Students. Call 765-494-1747. Hours of operation are M-F, 8 am- 5 pm.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc. sign up for free one-on-one virtual or in-person sessions with a Purdue Wellness Coach at RecWell. Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is completely free and can be done on BoilerConnect. If you have any questions, please contact Purdue Wellness at evans240@purdue.edu.

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours.

Disclaimer

This syllabus is subject to change.