PURDUE UNIVERSITY | College of Engineering

Engineering Faculty Document
No.: [EFD #]
April 10, 2024

TO: The Engineering Faculty

FROM: The Faculty of the Lyles School of Civil Engineering

RE: New graduate course – CE 51901: Building Information Modeling for High Performance Buildings

The Faculty of the Lyles School of Civil Engineering has approved the following new graduate course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

FROM:

CE 59700 Architctr BIM High Perf Bldgs

Spring 2023 (21); Spring 2022 (11); Spring 2021 (8); Spring 2020 (21); Spring 2019 (18)

No Prerequisites

TO:

CE 51901: Building Information Modeling for High Performance Buildings

Fall or Spring

Three total credits

No Prerequisites

Description: The objectives of this course are: (1.) to introduce fundamental concepts of architectural engineering design to develop a deeper understanding of what constitutes our built environment; (2.) future of designing buildings: introduction to Building Information Modeling (BIM), BIM as a process, benefits and problems with a focus on interoperability and building performance-based simulations; (3.) to learn how to apply architectural engineering design and BIM principles towards obtaining high-performance buildings.

RATIONALE:

The course is an important component for graduate studies in the fields of architectural engineering and building science. The course has been offered 5 times to a total of 79 students: Spring 2019 (18 students), Spring 2020 (21 students), Spring 2021 (8 students), Spring 2022 (11 students), and Spring 2023 (21 students). It is scheduled to be offered again in Spring 2025. The course introduces fundamental architectural engineering design, BIM and high-performance building principles that are necessary to evaluate performance criteria of buildings. There exist

no other graduate courses at Purdue University that focuses on integration of architectural engineering design, BIM and high-performance aspects of building system design and operation.

Head/Director of the Lyles School of Civil Engineering

Link to Curriculog entry: https://purdue.curriculog.com/proposal:28268/form

CE 51901: BIM for High Performance Buildings Spring 2023, MWF: 14:30-15:20, ARMS 1109

Instructor: Dr. Nusrat Jung
Office: HAMP G233
E-mail: nusratj@purdue.edu
Office Hours: by appointment
Prerequisites: Graduate standing with an undergraduate degree in engineering or consent of instructor. Qualified undergraduate students may enroll with consent of instructor.

Textbook (Recommended):
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.

Course Materials: Purdue University Brightspace.

Course Objectives
The objectives of this course are: (1.) to introduce fundamental concepts of architectural engineering design to develop a deeper understanding of what constitutes our built environment; (2.) future of designing buildings: introduction to Building Information Modeling (BIM), BIM as a process, benefits and problems with a focus on interoperability and building performance-based simulations; (3.) to learn how to apply architectural engineering design and BIM principles towards obtaining high-performance buildings.

Course Outcomes
Upon completion of this course, students will be able to:
1. Understand architectural engineering design principles and their impact on choice of building systems, such as: form, space, organization, circulation, proportion, and scale.
2. Apply knowledge of BIM concepts and applications, BIM software (REVIT), and usage of BIM tools in architectural engineering.
3. Identify how BIM can support and improve multi-criteria assessment of high-performance buildings.
4. Evaluate the interoperability between BIM-based model and Building Performance Simulations (BPS).
5. Become conversant with language used by architects and BIM modelers to enhance collaboration and improve technical communication within large project teams in industry.

The learning process includes:
1. Readings: the textbook is a comprehensive source of information on fundamental BIM topics and applications. Selected readings from the peer-reviewed literature on architectural engineering design, BIM, and building performance simulations (energy and environmental issues) will engage you with leading academic research and industry applications.
2. Lectures and Computer lab sessions: supplement fundamental concepts from the readings. In-classroom examples will emphasize applications of architectural design, BIM, and high-performance building concepts in architectural engineering.

3. Homework Assignments: designed to reinforce the concepts presented during lectures. Students shall become familiar with parametric design methods (utilizing REVIT) and technical writing.
4. Course Project: students will have the opportunity to connect course concepts with a building-related topic of their personal interest (e.g., tied to their M.S. or Ph.D. research).

Grading
The overall course grade will be weighted as follows:
Homework Assignments (3): 40%
Course Project: 40%
Readings, Reflections & In-Class Discussions: 15%
Attendance: 5%

The plus/minus grading system will be used (e.g., 96.7% and up = A+; 93.3% to 96.7% = A; 90.0% to 93.3% = A-; 86.7% to 90.0% = B+; 83.3% to 86.7% = B; 80.0% to 83.3% = B-).

Homework Assignments
Three homework assignments will be assigned throughout the semester. The assignments will be structured as technical reports on building case studies. All assignments are due at the beginning of class for the assigned day. Homework assignments should be completed individually. Students must submit their assignment in the form of an electronic PDF (filename: LastName_FirstName_HW_No.pdf).

Course Project
You will work in teams of two students (COVID-19 permitting), otherwise individually to explore the integration of architectural design and BIM with a building performance topic of your interest. Deliverables will be submitted throughout the semester. A final written report will be due at the end of the semester. Everyone will give an oral presentation to their classmates during the last week of class.

Readings, Reflections & In-Class Discussions
Readings from the peer-reviewed literature on contemporary issues related to architectural design, BIM, and their application to high performance buildings will be assigned weekly. You will have one week to complete each reading and prepare a one-page reflection on the topic. In-class discussions will be held on Fridays. The aim of these assignments is to help you think more broadly about buildings.

Attendance
Regular attendance and participation are essential and expected. If you are unable to attend a lecture due to illness, personal or family emergency, university-sponsored activity, or observance of a holiday, please contact the instructor via e-mail in a timely manner.

You should stay home and contact the Protect Purdue Health Center (496-INFO) if you feel ill, have any symptoms associated with COVID-19, or suspect you have been exposed to the virus. In the current context of COVID-19, you still need to inform the instructor of any conflict that can be anticipated and will affect the submission of an assignment. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, you should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflict, when advance notification to an instructor is not possible, you should contact the instructor as soon as possible by e-mail or through Brightspace. When

you are unable to make direct contact with the instructor and are unable to leave word with the instructor's department because of circumstances beyond your control, and in cases of bereavement, quarantine, or isolation, you or your representative should contact the Office of the Dean of Students via e-mail or phone at 765-494-1747.

The use of cell phones during lecture is prohibited. Tablets or laptops with a stylus (e.g., iPad Pro or Microsoft Surface) are permitted for notetaking. There will be limited paper copies of course materials distributed during class to minimize surface contact transmission of COVID-19. All course materials will be shared electronically via Brightspace and e-mail. There will be no lectures on the following days: January 16th, 2023: Martin Luther King Jr. Day and from March 13th to March 18th, 2028: Spring Break

E-mail Communication
All e-mails directed to the instructor must be written in a professional manner.

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 that is submitted provides the greatest opportunity for the university to investigate the concern.

Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty" [Part 5, Section III-B-2-a, University Regulations]. Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest" [University Senate Document 72-18, December 15, 1972]. Incidents of academic misconduct in this course will be addressed by the course instructor and referred to the Office of Student Rights and Responsibilities (OSRR) for review at the university level. Any violation of course policies as it relates to academic integrity will result minimally in a failing or zero grade for that particular assignment, and at the instructor's discretion may result in a failing grade for the course. In addition, all incidents of academic misconduct will be forwarded to OSRR, where university penalties, including removal from the university, may be considered.

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

Protect Purdue Pledge
It is expected that you will comply with the required health and safety guidelines stated in the Protect Purdue Pledge. Required behaviors in this class include: staying home and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, properly wearing a mask in classrooms and campus building, at all times (e.g., mask covers nose and mouth, no eating/drinking in the classroom), disinfecting desk/workspace prior to and after use, maintaining appropriate social distancing with peers and instructors (including when entering/exiting classrooms), refraining from moving furniture, avoiding shared use of personal items, maintaining robust hygiene (e.g.,

handwashing, disposal of tissues) prior to, during and after class, and following all safety directions from the instructor.

Academic Guidance in the Event You are Quarantined/Isolated
If you become quarantined or isolated at any point in time during the semester, in addition to support from the Protect Purdue Health Center, you will also have access to an Academic Case Manager who can provide you academic support during this time. Your Academic Case Manager can be reached at acmq@purdue.edu and will provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Importantly, if you find yourself too sick to progress in the course, notify your academic case manager and notify me via email or Brightspace. We will make arrangements based on your particular situation. The Office of the Dean of Students (odos@purdue.edu) is also available to support you should this situation occur. Please note that, according to Details for Students on Normal Operations for Fall 2021 (applicable during Spring 2023) announced on the Protect Purdue website, "individuals who test positive for COVID-19 are not guaranteed remote access to all course activities, materials, and assignments."

Grief Absence Policy for Students
Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). GAPS Policy: students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for missing assignments or assessments in the event of the death of a member of the student's family.

Counseling and Psychological Services (CAPS)
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 support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 and http://www.purdue.edu/caps/ during and after hours, on weekends and holidays, or by going to the CAPS office of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

Students with Disabilities
Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let the instructor 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.

Emergencies
In the event of a major campus emergency, course requirements, deadlines, and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted on Brightspace or can be obtained by contacting the instructor via e-mail.

Diversity and Inclusion
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 own 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.

Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in Executive Memorandum No. D-1, which provides specific contractual rights and remedies. Any student who believes they have been discriminated against may visit
http://www.purdue.edu/report-hate to submit a complaint to the Office of Institutional Equity. Information may be reported anonymously.