

Engineering Faculty Document 108-23
February 6, 2023
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To: The Engineering Faculty
From: Construction Engineering & Management
Re: CEM 40100

The Construction Engineering and Management department has approved the following new undergraduate course. This action is now submitted to the Engineering Faculty with a recommendation for approval

- 1) **Critical Thinking in Construction Engineering**
- 2) CEM 40100
- 3) 3 credit hours, lecture
- 4) This course introduces the concepts of critical thinking and why acting in our ‘comfort zone’ can result in discomfort. Students will explore a number of simulated and actual problems that challenge understanding of the situation and require additional investigation or analysis. Problems will cover the entire building life-cycle from development of a project plan, through design, project risk analysis for bidding, controlling the project, project recovery, and project handover. Guest speakers will present examples of projects where critical thinking was applied to resolve project issues or avoid a significant error.
- 5) This course represents one of several technical electives available to Construction Engineering and Management students. There are two (6 credit hours) technical electives required for graduation with a BSCNE.

Reason: This course provides exposure to rational and logical approaches to construction projects and utilization of data to make better recommendations and decisions in a professional setting.

Enrollment History: Spring 2020 (6), Spring 2021 (13), Spring 2023 (9)

Makarand Hastak

Head of CEM

CEM 40100-001
CRITICAL THINKING IN CONSTRUCTION
CRN 24241
Spring Semester 2023

Professor: Theodore J. Weidner, Ph.D., PE, RA, NCARB, CEF, DBIA
Office: HAMP 1245
Telephone: 765-494-2250
Email: tjweidne@purdue.edu
Office Hours: Wednesday, 9:00 – 11:00, other times by appointment

TIME	PLACE	CREDITS
Tuesday & Thursday 3:00 – 4:15 PM	HAMP 2118	3 Credits

ABSTRACT

This course introduces the concepts of critical thinking and why acting in our ‘comfort zone’ can result in discomfort. Students will explore a number of simulated and actual problems that challenge understanding of the situation and require additional investigation or analysis. Problems will cover the entire building life-cycle from development of a project plan, through design, project risk analysis for bidding, controlling the project, project recovery, and project handover. Guest speakers will present examples of projects where critical thinking was applied to resolve project issues or avoid a significant error.

TEXTS

Rutherford, Albert, **Models for Critical Thinking**, 2018 (required)

Holm, Len, **101 Case Studies in Construction Management**, Routledge, New York, 2019 (required)

Various readings from ASCE and other publication sources; additional material will be available via Brightspace.

Kahneman, Daniel, **Thinking, Fast and Slow**, Farrar, Straus and Giroux, New York, 2011 (optional)

DESCRIPTION

The course is will be conducted in a seminar style which means it will be discussion focused and require active participation by every student. Reading assignments are required and students will be expected to participate in discussions about the reading and to contribute insights learned from each reading assignment. Students will be assigned topics to lead class discussions including identification of how critical thinking can be applied to different construction project conditions. The students will learn:

- How to identify the essential information to determine data necessary for problem solution
- Discuss different solutions to the same problem and evaluate advantages and disadvantages
- Solve complex construction problems where the solution may be found through re-design
- Distinguish between correlation and causation when evaluating data
- Critique potential solutions and be able to identify options and arrive at a conclusion
- Develop a complete analysis of a construction situation with a recommendation

OBJECTIVES

Students will be able to describe the complex nature of construction through the schematic nature of design and the physical realities of construction sequences and processes. Students will analyze different approaches to accomplishing the same goal and design solutions. Students will learn from several case studies where solutions may appear obvious but where the better solution is less obvious. Professional writing and presentation skills are required. Students will be assigned a specific construction case to evaluate in depth and to report on their findings and recommended approach.

Class Participation

All students are expected to participate in class discussions through relation of personal experiences or observations regarding the subject of the day. Learning from discussion of critical thinking theory and observations of practical applications is an essential component of learning; discussion and questions will be encouraged.

In addition, individual students will be assigned a topic or case study to lead class discussion. Classroom leadership will require preparation, development of questions and issues, and management of discussion. While one student is required to lead the discussion, all students are expected to have read the topic or case study and be prepared to discuss.

Exam

There are two **exams** in the course. The exam will cover material discussed in the readings and classroom discussion. There will be **no final exam** for this course.

GRADING

The breakdown of the total grade is:

• Classroom discussion & leadership	25 %
• Quizzes	10 %
• Critical thinking case study report	25 %
• Exams (2)	<u>40 %</u>
Total:	100 %

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.”

In addition to the Purdue Honors Pledge, students are expected to reflect the ethical standards of professional engineers as defined by the American Society of Civil Engineers and the National Society of Professional Engineers; copies of these documents are available with other course material.

OTHER RESOURCES

CAPS – Counseling and Psychological Services, 765-494-6995, <http://purdue.edu/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. Counselors are located in the Purdue University Student Health Center (PUSH) during business hours.

DRC – Disability Resource Center, 765-494-1247, <http://purdue.edu/drc/> , students may present a “Letter of Accommodation” identifying any required accommodations. The professor requests this be done as early in the semester as is practical.

Course Material Use Statement

All course materials represent educational work product that may not be posted to the world wide web, uploaded/posted to other sites outside the Blackboard course, or otherwise shared/used/distributed for purposes outside of their intended use for individuals currently registered in this course. Sharing materials for purposes outside of course registration needs is explicitly prohibited.

Emergency Preparedness

The Purdue Emergency Preparedness website http://www.purdue.edu/ehps/emergency_preparedness/ has detailed information. A summary appears below.

All Hazards Sirens – Shelter-In-Place or shelter in designated location (e.g. tornado)

Fire Alarm – Evacuate the building. Emergency Assembly Area is the Lawson Building (building across University St., to the west). In bad weather we will assemble in the building. The secondary location is Elliott Hall of Music (to the east).

All emergencies – call 911 via campus phone or cell phone.

Academic Guidance in the Event a Student is 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.

Classroom Guidance Regarding Protect Purdue

The Protect Purdue Plan, which includes the Protect Purdue Pledge, is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. 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.

Students who are not engaging in these behaviors (e.g., wearing a mask) will be offered the opportunity to comply. If non-compliance continues, possible results include instructors asking the student to leave class and instructors dismissing the whole class. Students who do not comply with the required health behaviors are violating the University Code of Conduct and will be reported to the Dean of Students Office with sanctions ranging from educational requirements to dismissal from the university.

Any student who has substantial reason to believe that another person in a campus room (e.g., classroom) is threatening the safety of others by not complying (e.g., not wearing a mask) may leave the room without consequence. The student is encouraged to report the behavior to and discuss next steps with their instructor. Students also have the option of reporting the behavior to the [Office of the Student Rights and Responsibilities](#). See also [Purdue University Bill of Student Rights](#).

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 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. More details are available on our course Brightspace table of contents, under University Policies.

Accessibility

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 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. More details are available on our course Brightspace under Accessibility Information.

1. Purdue also has assistance available to help you make learning materials accessible. Some examples include:
 - Information from Innovative Learning on [Universal Design for Learning](#)
 - Guidance from Innovative Learning on [creating accessible documents](#)
 - [Workshops on accessible materials](#) suggested by the DRC
 - Contact innovativelearningteam@purdue.edu with questions.

Mental Health 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 of the second floor of the Purdue University Student Health Center (PUSH) during business hours.

NOTES

1. The course description and course schedule handouts provide the general framework for the course. However, the instructor reserves the right to make any modifications or changes to the course, depending on the class progress, or on any special circumstance that may arise during the semester.
2. ***All submissions (assignments, exams, quizzes) must be turned in typed or emailed in .pdf format.*** Assignments that deviate from these instructions (photos of torn spiral binder paper, etc.) will not be accepted.
3. Problems and questions should be re-stated or paraphrased. Neat sketches (use of computerized drafting is encouraged) should be used whenever appropriate.
4. References should be footnoted or listed in a separate section of the final report.
5. Assignments should be turned in with name, course number, assignment number, and page number on each sheet (either in a header or footer). Neatness and presentation are important and will be considered when grading assignments.
6. All verbal presentations (written and oral) should be organized in a logical manner representative of good technical writing; see The Purdue OWL (Online Writing Lab) for assistance.
7. There will be no curve for the final grade, only straight averages. The grading policy for this course is as follows:

X = Cumulative student score for the semester

<u>Student Score</u>	<u>Grade</u>
$X \geq 90$	A
$90 > X \geq 80$	B
$80 > X \geq 70$	C
$70 > X \geq 60$	D
$60 > X$	F