

**ENE 50600-001: Content, Assessment and Pedagogy:  
An Integrated Engineering Design Approach  
Spring 2019  
Fully Asynchronous Online**

**INSTRUCTIONAL TEAM:**

*Professor*

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Office Hours: Mondays, 10:00 am -1:00 pm ET

**COURSE DESCRIPTION:** Content, Assessment and Pedagogy is designed to help participants build a foundation of knowledge, skills, and habits of mind or modes of thinking that facilitate the alignment of content, assessment, and pedagogy for curriculum design. Rather than treat each of these areas separately, we strive to help the participants consider all three together in a systematic way. Our approach is essentially an engineering design approach, that is, we start with requirements or specifications, emphasize metrics, and then focus on the preparation of prototypes that meet the requirements.

The course provides a “community of practice” culture in which students have opportunities to form their own intellectual neighborhood as well as participate within the broader community of engineering education via engagement in our practices, methods, and beliefs.

**LEARNING OBJECTIVES:**

- *Apply the principles of backwards design to the design of a course, module, workshop or other instructional unit.*
- Articulate an evidence-based rationale for your curriculum design decisions.

**COURSE ACTIVITIES:**

- Explore content, assessment and pedagogy – via textbooks, journal articles and archival research – and through reflection, writing, and dialogue.
- Reflect on and discuss the alignment of content, assessment and pedagogy
- Develop a written argument for an integrated curriculum design project (i.e., the Project Paper described on pages 4-6).

**READINGS:**

We will use the following **texts** that we think would be a valuable contribution to your personal library:

- Hansen, E.J. (2011). *Idea-based learning: A course design process to promote conceptual understanding*. Sterling, VA: Stylus.
- Perkins, D. N. (2009). *Making learning whole: How seven principles of teaching can transform education*. San Francisco, CA: Jossey-Bass.
- Svinicki, M. D. (2004). *Learning and motivation in the postsecondary classroom*. San Francisco, CA: Jossey-Bass.

We will also use several articles that will be made available on Blackboard.

- Anderson, L. R. and Krathwohl, D. W. (2001). Chapter 1. Introduction. In *A taxonomy for learning, teaching, and assessing: A revision of Bloom’s taxonomy of educational objectives* (pp.3-11). Boston, MA: Allyn & Bacon.
- Chi, M.T.H. (2009). Active-Constructive-Interactive: A conceptual framework for differentiating learning activities. *Topics in Cognitive Science, 1*, 73-105.

- Fink, L. D. (2003). A self-directed guide to designing courses for significant learning. Notes based on *Creating significant learning experiences: An integrated approach to designing college courses*. San Francisco: Jossey-Bass. Posted with author's permission.
- Pellegrino, J. W. (2006). *Rethinking and redesigning curriculum, instruction and assessment: What contemporary research and theory suggests*. Paper commissioned by the National Center on Education and the Economy for the New Commission on the Skills of the American Workforce. <http://www.skillscommission.org/commissioned.htm>
- Pellegrino, J.W., Chudowsky, N., & Glaser, R. (Eds.). (2001). Chapter 2. The nature of assessment and reasoning from evidence. In *Knowing what students know: The science and design of educational assessment* (pp. 37-56). Washington, DC: National Academy Press.
- Smith, K. (2018). Notes on cooperative learning. Posted with author's permission.
- Streveler, R.A, Smith, K.A., & Pilotte, M. (2012). Aligning course content, assessment, and delivery: Creating a context for outcomes-based education. In Khairiyah Mohd Yusof, Shahrin Mohammad, Naziha Ahmad Azli, Mohamed Noor Hassan, Azlina Kosnin & Sharifah Kamilah Syed Yusof (Eds.). *Outcome-based science, technology, engineering and mathematics: Innovative practices* (pp. 1 – 26). Hersey, PA: IGI Global.
- Svinicki, M.D. & McKeachie W. J. (2011). Chapter 7. Assessing, testing, and evaluating: Grading is not the most important function. In *McKeachie's teaching tips: Strategies, research, and theory for college and university teachers, Thirteenth Edition* (pp. 72-82). Belmont, CA: Wadsworth.
- Wiggins, G. & McTighe, J. (1998). Chapter 1. What is backward design? In *Understanding by design* (pp. 7-19). Alexandria, VA: ASCD.

**Students will develop an individual reference list for their respective curriculum design project.**

**COURSE REQUIREMENTS AND GRADING:** This is a graduate level class with a strong focus on the design of learning environments. It is our hope that by being transparent with our design philosophies and practices, you will learn about content and ways of teaching and assessing. It is our belief that through engaging in this learning environment you will master the content, draw connections to personal research interests, and push yourself to a higher level of thinking in engineering education.

Two deliverables will be assessed to determine your final grade for this course.

1. **10%** of your grade will be determined by your participation in our asynchronous class discussions.
2. **10%** of your grade will be earned through your presentation of a poster that summarizes your project to the class.
3. **80%** of your grade will be earned by writing a **final project paper**. See pages 4-6 for a detailed description of the elements that must be part of your paper. Only the final draft of the project paper will be graded. You will receive detailed formative feedback (ungraded) on two (optional but **HIGHLY** recommended) drafts. Each section of the final paper will be assessed on the following three criteria: *clarity, evidence, and alignment*.

**LEARNING ENVIRONMENT:**

The research is clear: long-term learning takes place only when accompanied by **deliberate, distributed practice**. To accomplish that end, this class is structured so that there is opportunity for reflection and iteration. Detailed feedback will be provided as you develop your ideas. Our philosophy is that:

- Successful learning is fostered by clear objectives and expectations.
- Learning is a social activity, and you will be encouraged to “think together” with your classmates by forming an intellectual neighborhood.
- Reading and writing are essential parts of the thinking process and you will be asked to use writing to **DEVELOP** your ideas (not only to document your “final” project).

We expect that you will:

1. Approach this asynchronous online course with the same focus that you treat all of your classes. The fully online environment can be an adjustment if you've never taken an online course before, and planning out your workload for this course will help in that adjustment.
2. Fully engage in this class, watching course lecture videos and reading all assigned reading early in the week. Full engagement also requires reading and reflecting on all assigned materials by the assigned due dates, actively participating in class discussions and activities, and completing quality work. Full engagement in an online environment also means developing a habit of checking the online course several times throughout the week to stay on top of the coursework.
3. Develop your final paper throughout the semester by keeping a design notebook, participating in class exercises that apply course material to your project, and submitting first and second drafts of your project.
4. Identify classmates who will be part of your intellectual neighborhood and help each other think about and refine your individual projects. These intellectual neighbors may also include peers from the face-to-face version of this course.
5. Behave in alignment with the Purdue Honor Pledge (<https://www.purdue.edu/provost/teachinglearning/honor-pledge.html>) and follow the scholastic conduct policy: <https://www.purdue.edu/odos/osrr/academic-integrity-brochure/>. Students may report incidents of suspected dishonesty to the Office of the Dean of Students ([purdue.edu/odos](http://purdue.edu/odos)), by calling 765-494-8778 or emailing [integrity@purdue.edu](mailto:integrity@purdue.edu).
6. Complete and submit a thoughtful online course evaluation.

You can expect that we (the instructional team) will:

1. Provide a supportive learning environment that fosters your success.
2. Create assignments and exercises that are meaningful to you.
3. Provide detailed, constructive formative feedback on your project drafts.
4. Honor and respect your interests.

From our experience teaching this course several times, we have found that the most **successful students**:

1. Create early drafts that are thoughtful and complete.
2. Think deeply about the target domain of their course project.
3. Are open to new ways of thinking about curriculum design and the target domain of their project.

**ONLINE ETIQUETTE:**

Online courses provide an excellent opportunity for students to freely share ideas with each other—in fact, many students who are uncomfortable speaking up in a traditional face-to-face classroom find that they prefer the online experience, because they can ask questions without feeling intimidated. However, sometimes this sense of freedom can be abused, and lead to rudeness or disrespect in digital interactions. Online courses do afford us relative anonymity, which sometimes emboldens us to write things that we would not say to someone in person.

We expect that you all will respect your classmates and their opinions. Flaming and/or trolling will not be tolerated in this course; if you engage in a disrespectful way towards your classmates or instructor, it will negatively affect your grade. It is important to be concise, informative, and polite when communicating with your colleagues in this course, and with your instructor.

**PROJECT PAPER**

The principal assignment for the course is an **individual project paper** that is **due** 12:00 noon Monday, **April 29, 2019**. The production of this final curriculum design project paper will occur in a series of stages:

1. A first draft that begins to show the development of your ideas for the content and assessment sections. (Due February 26)

2. A second draft that further develops your ideas. Ideally, this draft will contain all sections of your final paper. (Due April 2)
3. A poster presentation of your project. (On April 15 or 22)
4. A final draft that integrates all the stages and incorporates feedback from previous drafts. (Due April 29) Only the final draft will be assigned a grade. You will receive ungraded formative feedback to improve your final draft on your first and second drafts and at the poster presentation.

Note that the **decisions you make about your curriculum design project** should be **supported with evidence**. This is *particularly* important in the sections marked below with \*.

Evidence may come from:

1. Discipline-based education research literature.
2. General research on learning (such as the Svinicki book).
3. Expert opinion about the content (for example from textbooks or statements written about what is important in that area).
4. Examples of similar courses from other institutions (which can be considered as ‘prior art’).
5. Your own experience learning or teaching the content.

For the purposes of this assignment, the list above is ranked from strongest (discipline-based education research) to weakest (your experience). The reasoning behind this judgment about evidence is to encourage learners in this course to break out of their assumptions about “the way things are” regarding a particular content area.

**The final paper will include the following areas:**

Title: A **title** for your project that identifies your “target domain” and the educational setting.

Section 1: Introduction

1.1 Description of the setting for the curriculum project

1.1.1. Salient characteristics of the *institution* or sponsoring organization where the instruction is intended to take place

1.1.2 Other important contextual issues especially any external constraints placed on the instruction. (Examples might be – a particular textbook must be used, course is used as a prerequisite for other courses, limited educational resources available, etc.)

1.2 Your motivation for selecting this target domain

1.3.1 Your own expertise in the area

1.3.2 How this might be useful to you in your career

Section 2. Content

Knowledge-centered subsection, 2.1

2.1.1 What are the (i) big ideas, (ii) guiding concepts and (iii) essential questions for your target content? Write items (i), (ii), and (iii) as full sentences rather than a word or phrase.

2.1.2 A visual picture of the relationship between the concepts.

2.1.2.1. Create a graphic such as a concept map that illustrate the **relationships** among the curricular priorities listed in 2.1.2 . Use color-coding or a table to demonstrate how your concept map aligns with your curricular priorities.

2.1.2.2 Describe your concept map in words.

2.1.3. What is your evidence-based rationale for your curricular decisions?\*

Learner-centered subsection, 2.2

Description of the salient characteristics of the *intended learners* of this instruction

- 2.2.1 What is their prior knowledge in the target domain?
- 2.2.2 What is their age or developmental level?
- 2.2.3 Other important issues to consider. (Examples might be: commuter students, working adults with many responsibilities, weak educational background, children with special needs).
- 2.2.2 What are the **Curricular Priorities** for your target domain?
  - 2.2.2.1 What are the *enduring outcomes*?
  - 2.2.2.2 What is *important to know*?
  - 2.2.2.3 What is *good to be familiar with*?

Intersection for knowledge-centered and learner-centered part of your design, 2.3

- 2.3.1 What difficult concepts, misconceptions, or threshold concepts have been identified in your target domain?\*
- 2.3.2 **Why** are the difficult concepts you have identified so difficult? What is your *theory of difficulty*? See Perkins' ideas about reasons for difficulty on pages 89-105 of *Making Learning Whole*.

### Section 3. Assessment

#### 3.1 Learning objectives

- 3.1.1 Create a list of **all** learning objectives for the instruction.
- 3.1.2 Mark the learning objective(s) that will measure if students have learned concepts you have listed as difficult concepts, misconceptions or threshold concepts in section 2.3.1.
- 3.1.3 Describe in words or in a table how the learning objectives listed in 3.1.1 align with the *curricular priorities* listed in 2.2.2.
- 3.1.4 Create a table that shows how **all** of the learning objectives referred to in 3.1.1 fit into your chosen *taxonomy of learning objectives* (Anderson and Krathwohl, Fink, or another taxonomy of your choosing).
- 3.2 Create one **Assessment Triangle** for a learning objective that you have marked in section 3.1.2.
- 3.3 Create an **Assessment Worksheet** for each of three learning objectives that measure mastery of enduring outcomes, difficult conceptions, misconceptions, or threshold concepts.
- 3.4 Select one assessment listed in one of the Assessment Worksheets and explain how this assessment meets the six criteria for an **authentic assessment** listed by Hansen (on p.87).
- 3.5 Create a **rubric** for evaluating (grading) the authentic assessment listed in 3.4

### Section 4: Pedagogy

Include a **syllabus** that has the following sections:

- 4.1.1 Curricular priorities and learning objectives [These should be the same as those listed in sections 2.2.2 and 3.1.1].
- 4.1.2 Criteria for grading and grading standards. [Be sure this aligns with your Assessment section].
- 4.1.3 Specific criteria for each graded assignment.
- 4.1.4 Description of what the class will be like, including a description of and rationale for your teaching methods. [Be sure this is consistent with your Pedagogy section].
- 4.1.5 Statement describing what students can expect from you as their instructor.
- 4.1.6 Advice on how students can be successful in the class, including:
  - 4.1.6.1 Clear guidelines detailing how students are to prepare for and behave during a class session. (e.g. read the assignments BEFORE class, come on time, participate in discussion, etc.).
  - 4.1.6.2 Advice on how to best read/approach the materials for this class.
  - 4.1.6.3 Advice on how to study for quizzes and exams (if applicable).
  - 4.1.6.4 And/or other statements about the behaviors of successful students.
- 4.1.7 A schedule of material to be learned each time the students meet (e.g. at every class meeting).

4.2 Include a **lesson plan** for one section of instruction (for example, for one class period) that addresses an enduring outcome you listed in 2.2.2.1.

4.2.1 List the learning objective(s) this class session is addressing

4.2.2 Be explicit about the enduring outcome

4.2.3 A list of activities – be sure that these activities are *constructive* or *interactive* exercises

4.2.4 A timeline

4.3 How will your instruction address **each** of the seven principles listed in *Making Learning Whole*?

For each principle: (1) provide at least one *specific* example of how each principle will be used.

For example, don't just say: "I will have students work in teams." Instead, discuss how the groups will be formed, what specific activities the teams will accomplish, and how the learning environment will foster teamwork.

And (2) explain *why* your example will address the principle.

For example, for the principle *Making the Game Worth Playing*, why does the activity you have listed increase motivation? Support your example by referring to class readings and other literature.

### Section 5. Overall synthesis

5.1 Provide a narrative on how your design exemplifies the alignment of content, assessment and pedagogy. One way to do this is to (1) identify your most important enduring outcome, (2) discuss how this outcome will be assessed and (3) how will you provide opportunities for the learners to engage in deliberate distributed practice of that enduring outcome.

### References

Include a reference section using correct APA format.

#### **Notes on format:**

Your project paper should be submitted in **MS Word**, be written in 12 point font, be double-spaced, and use APA format for your references. Examples projects from past classes are posted on Blackboard. However, project requirements have changed from time to time, so be sure to use *this syllabus* as the template for your project.

**COURSE SCHEDULE for Spring 2019**

<b>Date</b>	<b>Class focus</b>	<b>Assigned readings due</b>	<b>Deliverables due</b>
Week 1 January 7	Course overview, introductions, CAP model		
Week 2 January 14	Knowledge centered aspect of content. Big ideas, guiding concepts, essential questions. Concept maps.	<ul style="list-style-type: none"> <li>• Hansen – Ch. 2, 5, first part of Ch. 3 (pps. 26-37)</li> <li>• Streveler, Smith &amp; Pilotte (2012)</li> </ul>	
Week 3 January 21	Choosing your project	Look an exemplar projects	Discuss your potential project ideas with the instructor
Week 4 January 28	Learner-centered aspect of content, Curricular priorities.- How do students learn in your target domain?	<ul style="list-style-type: none"> <li>• Wiggins &amp; McTighe (1998)</li> <li>• Pellegrino article (2006)</li> <li>• Svinicki – Chs. 2, 3</li> </ul>	Bring initial idea for your project to class and be ready to identify your intellectual neighbors
Week 5 February 4	Learner-centered aspect of content, II - Difficult concepts and 'misconceptions' Linking your content elements together.	<ul style="list-style-type: none"> <li>• Hansen – part of Ch 4. (pp. 57-62)</li> <li>• Perkins – Ch. 3</li> <li>• Svinicki – Chs. 4, 5</li> </ul>	
Week 6 February 11	Linking content and assessment. Learning objectives, taxonomies.	<ul style="list-style-type: none"> <li>• Anderson &amp; Krathwohl (2001)</li> <li>• Fink (2013)</li> <li>• Hansen – last part of Ch 3. (pps. 38-46), Ch 6.</li> </ul>	
Week 7 February 18	Assessment triangle Assessment worksheet Survey of assessment methods, classroom assessment techniques Authentic assessments Rubrics Linking assessment elements together.	<ul style="list-style-type: none"> <li>• Hansen – Chs. 7, first part of Ch. 8 (pp.112-119)</li> <li>• Pellegrino, Chudowky &amp; Glaser (2001)</li> <li>• Svinicki &amp; McKeachie (2011)</li> </ul>	
Week 8 February 25	Integration of content and assessment.		Exchange your first draft with an intellectual neighbor for peer review. Post first draft to Blackboard no later than <b>12 noon</b> Tuesday, <b>February 26</b>
Week 9 March 4	ICAP framework	<ul style="list-style-type: none"> <li>• Chi (2009)</li> <li>• Smith (2018)</li> </ul>	

Week 10 March 11	SPRING BREAK – No assignments due		Revise your first draft based on feedback
Week 11 March 18	Perkins – Making Learning Whole	<ul style="list-style-type: none"> <li>Perkins, entire book except Ch. 3 (read previously).</li> <li></li> </ul>	
Week 12 March 25	Teaching for motivation, individual differences, and metacognition.	<ul style="list-style-type: none"> <li>Svinicki – Chs. 6, 7, 8</li> </ul>	
Week 13 April 1	Aligning your content, assessment, and pedagogy in written and graphical form.		Exchange your second draft with an intellectual neighbor for peer review. <b>Post</b> draft to Blackboard no later than 12 noon Tuesday, <b>April 2</b>
Week 14 April 8	Preparing your posters		
Week 15 April 15	Student poster presentations.		<b>Bring your poster</b>
Week 16 April 22	Student poster presentations.		<b>Bring your poster</b>

**ACCOMODATIONS:**

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](mailto:drc@purdue.edu) or by phone: 765-494-1247.

**EMERGENCY PREPAREDNESS:**

[http://www.purdue.edu/epps/emergency\\_preparedness/](http://www.purdue.edu/epps/emergency_preparedness/)

EMERGENCY NOTIFICATION PROCEDURES are based on a simple concept – if you hear a fire alarm inside, proceed outside. If you hear a siren outside, proceed inside.

- **Indoor Fire Alarms** mean to stop class or research and immediately evacuate the building.
  - Proceed to your Emergency Assembly Area away from building doors. Remain outside until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.
- **All Hazards Outdoor Emergency Warning Sirens** mean to immediately seek shelter (Shelter in Place) in a safe location within the closest building.
  - “Shelter in place” means seeking immediate shelter inside a building or University residence. This course of action may need to be taken during a tornado, a civil disturbance including a shooting or release of hazardous materials in the outside air. Once safely inside, find out more details about the emergency\*. **Remain in place** until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.

\*In both cases, you should seek additional clarifying information by all means possible...Purdue Emergency Status page, text message, Twitter, Desktop Alert, Albertus Beacon, digital signs, email alert, TV, radio, etc....review the Purdue Emergency Warning Notification System multi-communication layers at [http://www.purdue.edu/ehps/emergency\\_preparedness/warning-system.html](http://www.purdue.edu/ehps/emergency_preparedness/warning-system.html)

#### EMERGENCY RESPONSE PROCEDURES:

Emergency Procedures Guideline

[https://www.purdue.edu/emergency\\_preparedness/flipchart/index.html](https://www.purdue.edu/emergency_preparedness/flipchart/index.html)

Building Emergency Plan is available on the Emergency Preparedness website listed above or from the building deputy for:

- Evacuation routes, exit points, and emergency assembly area
- When and how to evacuate the building.
- Shelter in place procedures and locations additional building specific procedures and requirements.

#### EMERGENCY PREPAREDNESS AWARENESS VIDEOS

"Shots Fired on Campus: When Lightning Strikes," is a 20-minute active shooter awareness video that

illustrates what to look for and how to prepare and react to this type of incident. See:

<http://www.purdue.edu/securePurdue/news/2010/emergency-preparedness-shots-fired-on-campus-video.cfm> (Link is also located on the Emergency Preparedness website)

#### MORE INFORMATION

Reference the Emergency Preparedness web site for additional information:

[https://www.purdue.edu/ehps/emergency\\_preparedness/](https://www.purdue.edu/ehps/emergency_preparedness/)