Print Form

Office of the Registrar
FORM 40G REV. 12/09

PURDUE UNIVERSITY

REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF A GRADUATE COURSE
(50000-60000 LEVEL)

EFD 16-11

Graduate Council Doc. No. 11-3a

DEPARTMENT School of Engineering Education

EFFECTIVE SESSION Spring ~~2010~~ 2012

INSTRUCTIONS: Please check the items below which describe the purpose of this request.

- [X] 1. New course with supporting documents (complete proposal form)
- [ ] 2. Add existing course offered at another campus
- [ ] 3. Expiration of a course
- [ ] 4. Change in course number
- [ ] 5. Change in course title
- [ ] 6. Change in course credit/type
- [ ] 7. Change in course attributes
- [ ] 8. Change in instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered
- [ ] 12. Transfer from one department to another

PROPOSED:

Subject Abbreviation ENE

Course Number 50600

Long Title Content, Assessment and Pedagogy: An integrated engineering design approach

Short Title Content, Assessmt & Pedagogy

Abbreviated title will be entered by the Office of the Registrar if omitted. (30 CHARACTERS ONLY)

EXISTING:

Subject Abbreviation

Course Number

TERMS OFFERED
Check All That Apply:
[ ] Summer [ ] Fall [X] Spring

CAMPUS(ES) INVOLVED
[ ] Calumet [ ] N. Central
[ ] Cont Ed [ ] Tech Statewide
[ ] Ft. Wayne [X] W. Lafayette
[ ] Indianapolis

CREDIT TYPE

1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range: Minimum Cr. Hrs (Check One) To [ ] Or [ ]
   Maximum Cr. Hrs.
3. Equivalent Credit: Yes [ ] No [X]
4. Thesis Credit: Yes [ ] No [X]

COURSE ATTRIBUTES: Check All That Apply

1. Pass/Not Pass Only [ ]
2. Satisfactory/Unsatisfactory Only [ ]
3. Repeatable [ ]
   Maximum Repeatable Credit: [ ]
4. Credit by Examination [ ]
5. Special Fees [ ]
6. Registration Approval Type: Department [ ] Instructor [ ]
7. Variable Title [ ]
8. Honors [ ]
9. Full Time Privilege [ ]
10. Off Campus Experience [ ]

OFFICE OF THE REGISTRAR
2011 MAR -3 AM 10:58

Cross-Listed Courses

Schedule Type	Minutes Per Mtg 170	Meetings Per Week 1	Weeks Offered 16	% of Credit Allocated 100
Lecture				
Recitation				
Presentation				
Laboratory				
Lab Prep				
Studio				
Distance				
Clinic				
Experiential				
Research				
Ind. Study				
Pract/Observ				

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

The course is explicitly identified in the ENE PhD requirements as a "foundation course" required for all students. This course is intended to be taken early in a graduate student's curriculum and therefore is designed to be a bridge between the student's previous experience with engineering (education, work, and teaching) and new engineering education research-based approaches. It is intended as an entryway to help students apply an engineering design approach to the design of instruction. To meet this aim, the course involves an iterative project-based approach in a context (design site) that is chosen by the student for its relevance, interest and potential application. Professors Streveler and Smith.

Calumet Department Head	Date	Calumet School Dean	Date	Calumet Undergrad Curriculum Committee	Date
Fort Wayne Department Head	Date	Fort Wayne School Dean	Date	Fort Wayne Chancellor	Date
Indianapolis Department Head	Date	Indianapolis School Dean	Date	Undergrad Curriculum Committee	Date
North Central Faculty Senate Chair	Date	Vice Chancellor for Academic Affairs	Date	Date Approved by Graduate Council	
West Lafayette Department Head	Date	West Lafayette College/School Dean	Date	Graduate Council Secretary	Date
Graduate Area Committee Convener	Date	Graduate Dean	Date	West Lafayette Registrar	Date

R. Cipra 11/30/2010

APPROVED APR 28 2011

Laura L. Payne 4/28/11

10/15/10

11/29/2010

5/28/11

6/3/11

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PROPOSED:	EXISTING:
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Course Number 50600	Course Number
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Short Title Content, Assessmt & Pedagogy	

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(Check One) To [ ] Or [ ]
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2. Satisfactory/Unsatisfactory Only		Department	
3. Repeatable		Instructor	
Maximum Repeatable Credit:		7. Variable Title	
4. Credit by Examination		8. Honors	
5. Special Fees		9. Full Time Privilege	
		10. Off Campus Experience	

Schedule Type	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated
	170	1	16	100
Lecture				
Recitation				
Presentation				
Laboratory				
Lab Prep				
Studio				
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Indianapolis Department Head	Date	Indianapolis School Dean	Date	X R. Cipra Undergrad Curriculum Committee	11/30/2010 Date
North Central Faculty Senate Chair	Date	Vice Chancellor for Academic Affairs	Date	Date Approved by Graduate Council	
West Lafayette Department Head	10/15/10 Date	West Lafayette College/School Dean	11/29/2010 Date	Graduate Council Secretary	Date
Graduate Area Committee Convener	Date	Graduate Dean	Date	West Lafayette Registrar	Date

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PROPOSED:		EXISTING:	
Subject Abbreviation	ENE	Subject Abbreviation	
Course Number	50600	Course Number	
Long Title	Content, Assessment and Pedagogy: An integrated engineering design approach		
Short Title	Content, Assessmt & Pedagogy		

Abbreviated title will be entered by the Office of the Registrar if omitted. (30 CHARACTERS ONLY)

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Graduate Area Committee Convener	Date	Graduate Dean	Date	West Lafayette Registrar	Date

10/15/10

OFFICE OF THE REGISTRAR

To: The Faculty of the College of Engineering
From: School of Engineering Education
Subject: New Graduate Course, ENE 50600

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

ENE 50600 Content, Assessment and Pedagogy: An Integrated Engineering Design Approach
Sem. 2, Class 3, Cr. 3.

Prerequisite: Open to students in Engineering Education or by consent of instructor.

Course description: The purpose of this course is to help participants build a foundation of knowledge, skills, and habits of mind or modes of thinking that facilitate the integration of content (or curriculum), assessment, and pedagogy (or instruction) for learning module, course, and program design. Rather than treat each of these areas separately the intention is to help the participants consider all three together in systematic way, such as described in Pellegrino (2006) *Rethinking and redesigning curriculum, instruction and assessment: What contemporary research and theory suggests*. The approach is essentially an engineering design approach, that is, start with requirements or specifications, emphasize metrics, and then prepare prototypes that meet the requirements. The course philosophy embraces engineering professor Jim Duderstadt's argument that "faculty members of the twenty-first century college or university will find it necessary to set aside their roles as teachers and instead become designers of learning experiences, processes, and environments." See Duderstadt (2008), *Engineering for a Changing World: A Roadmap to the Future of Engineering Practice, Research, and Education* for elaboration.

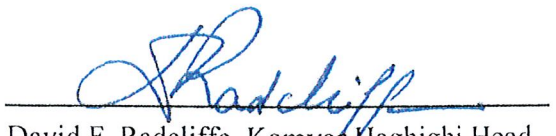
Reasons: Content, Assessment and Pedagogy is a School of Engineering Education foundation course that is designed to provide the participants with a working knowledge of these three areas and especially the integration of these three areas for the design of learning modules, lessons, courses, and programs. The course features the state-of-the-art ideas of textbook authors –David Pace & Joan Middendorf, and James Pellegrino – and article authors, as well as the instructor's and participant's ideas. The course features an engineering design approach and a hands-on project that is intended to help the participants learn the key elements and apply them in a real context. This is a required course for the graduate program in the School of Engineering Education (ENE). This new course will also be of interest to graduate students in other Departments, Schools, and Colleges with engineering education or related interests. The purpose of the course is to provide students with an opportunity to:

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE ENGINEERING
CURRICULUM COMMITTEE

ECC Minutes #5
Date 11/16/10
Chairman ECC R. Cipra

(1) Develop and articulate an engineering design approach for content, assessment and pedagogy;
(2) critically describe the research-based features of each of the elements – content, assessment and pedagogy;
(3) apply the principles and theories to the design of a course, module, lesson plan, or other instructional setting;
(4) use reflection and dialogue as a tool of self-discovery for shaping and refining personal philosophies for the design of instruction, and
(5) participate in a "community of practice" culture through formation of our own community and participation in the broader community of engineering education.

This course was previously offered in Spring Semester of 2008, 2009, and 2010 as ENE 695N– Content, Assessment and Pedagogy: An Integrated Engineering Design Approach. It was co-taught by Ruth Streveler and Karl Smith, along with at least one Apprentice Faculty member (ENE PhD student) each semester. Enrollment has been strong for the three years the course has been offered. Sixteen students were enrolled in Spring 2008, eight in Spring 2009, and sixteen in Spring 2010. Given the size of the current cohort of ENE PhD students, enrollment for Spring 2011 is predicted to be between fifteen and twenty students. Evaluation results indicate the course is well received by students, is achieving its intended learning outcomes, and provides a foundation for students to articulate a research proposal.



David F. Radcliffe, Kamyar Haghighi Head
Epistemology Professor of Engineering Education
School of Engineering Education

Supporting Document for a New Graduate Course

To: Purdue University Graduate Council

From:
Faculty Member: Ruth Streveler
Department: School of Engineering Education
Campus: West Lafayette

Date: July 27, 2010

Subject: Proposal for New Graduate Course-Documentation Required by the Graduate Council to Accompany Registrar's Form 40G

For Reviewer's comments only
(Select One)

Reviewer:

Comments:

Contact for information if questions arise:
Name: Cindey Hays
Phone Number: 494-3884
E-mail: isenberg@purdue.edu
Campus Address: ARMS 1321

Course Subject Abbreviation and Number: ENE 50600

Course Title: Content, Assessment, and Pedagogy: An integrated engineering design approach

A. Justification for the Course:

- Provide a complete and detailed explanation of the need for the course (e. g., in the preparation of students, in providing new knowledge/training in one or more topics, in meeting degree requirements, etc.), how the course contributes to existing fields of study and/or areas of specialization, and how the course relates to other graduate courses offered by the department, other departments, or interdisciplinary programs.

- Justify the level of the proposed graduate course (50000- or 60000-level) including statements on, but not limited to: (1) the target audience, including the anticipated number of undergraduate and graduate students who will enroll in the course; and (2) the rigor of the course.

B. Learning Outcomes and Method of Evaluation or Assessment:

- Describe the course objectives and student learning outcomes that address the objectives (i.e., knowledge, communication, critical thinking, ethical research, etc.).

- Describe the methods of evaluation or assessment of student learning outcomes. (Include evidence for both direct and indirect methods.)

- Grading criteria (select from dropdown box); include a statement describing the criteria that will be used to assess students and how the final grade will be determined.

Criteria Papers and Projects

- Identify the method(s) of instruction (select from dropdown box) and describe how the methods promote the likely success of the desired student learning outcomes.

Method of Instruction Lecture

C. Prerequisite(s):

- List prerequisite courses by subject abbreviation, number, and title.
- List other prerequisites and/or experiences/background required. If no prerequisites are indicated, provide an explanation for their absence.

D. Course Instructor(s):

- Provide the name, rank, and department/program affiliation of the instructor(s).
- Is the instructor currently a member of the Graduate Faculty? X Yes — No
  (If the answer is no, indicate when it is expected that a request will be submitted.)

E. Course Outline:

- Provide an outline of topics to be covered and indicate the relative amount of time or emphasis devoted to each topic. If laboratory or field experiences are used to supplement a lecture course, explain the value of the experience(s) to enhance the quality of the course and student learning. For special topics courses, include a sample outline of a course that would be offered under the proposed course.

F. Reading List (including course text):

- A primary reading list or bibliography should be limited to material the students will be required to read in order to successfully complete the course. It should not be a compilation of general reference material.
- A secondary reading list or bibliography should include material students may use as background information.

G. Library Resources

- Describe the library resources that are currently available or the resources needed to support this proposed course.

H. Example of a Course Syllabus (While not a necessary component of this supporting document, an example of a course syllabus is available, for information, by clicking on the link below, which goes to the *Graduate School's Policies and Procedures Manual for Administering Graduate Student Programs*. See Appendix K.)

http://www.gradschool.purdue.edu/downloads/Graduate_School_Policies_and_Procedures_Manual.pdf

ENE 50600: Content, Assessment, and Pedagogy: An Integrated Engineering Design Approach

A. Justification for the Course:

- *Provide a complete and detailed explanation of the need for the course (e. g., in the preparation of students, in providing new knowledge/training in one or more topics, in meeting degree requirements, etc.), how the course contributes to existing fields of study and/or areas of specialization, and how the course relates to other graduate courses offered by the department, other departments, or interdisciplinary programs.*
- *Justify the level of the proposed graduate course (50000- or 60000-level) including statements on, but not limited to: (1) the target audience, including the anticipated number of undergraduate and graduate students who will enroll in the course; and (2) the rigor of the course.*

Explanation of the course: The course is explicitly identified in the ENE PhD requirements as a "foundation course" required for all students. This course is intended to be taken early in a graduate student's curriculum and therefore is designed to be a bridge between the student's previous experience with engineering (education, work, and teaching) and new engineering education research-based approaches. It is intended as an entryway to help students apply an engineering design approach to the design of instruction. To meet this aim, the course involves an iterative project-based approach in a context (design site) that is chosen by the student for its relevance, interest and potential application.

By the end of the course students will be able to apply an integrated engineering design approach to the construction of learning modules, courses, and programs; and will recognize the importance of (1) clearly identifying what is intended for students to know and be able to do as a result of the course; (2) articulate the evidence needed to convince themselves, their colleagues, the students, employers and accreditation bodies that students have mastered the specified knowledge and skills; (3) choose an appropriate pedagogy that will help students achieved the specified outcomes; and (4) provide a coherent and compelling line of reasoning for the alignment among Content, Assessment and Pedagogy.

As an ENE foundation course, the course is designed to:

- Provide students with an understanding of theories, principles and practices in content (or curriculum), assessment and pedagogy.
- Contribute to students' satisfying the Graduate Competencies, especially Apply Engineering Education Principles to the Solution of Instructional or Curricular Problems(5), and to some extent Synthesize Knowledge (1), Communicate Knowledge (3), Think Critically and Reflectively (4). It also has implications for but does not specifically address Teach Engineering (10).
- Provide some foundation regarding central research needs in engineering education: Engineering Epistemologies (nature of engineering knowing), Learning Systems (structure, culture, and organization of engineering education), Learning Mechanisms (attributes of engineering thinking), Diversity and Inclusiveness (engineering identity and membership, access, barriers), and Engineering Assessment (assessment methods, instruments, and metrics).
- Provide opportunities and experiences to integrate content, assessment and pedagogy.
- Provide a "community of practice" culture in which students have opportunities to form their own community as well as participate within the broader community of engineering education via engagement in our practices, methods, and beliefs.

Justification for course level: The proposed course is at the 5000-level because:

(1) The target audience is ENE PhD students (approximately 10-20 graduate students per Spring term).
(2) Successful completion of the course requires that student's course design paper demonstrates they can comprehend, synthesize and critique content, assessment and pedagogy literature; and apply it to their design site. These activities require creative thinking and an ability to synthesize large amounts of knowledge.
(3) Pedagogical methods used in the course require that students demonstrate scholarly inquiry, independent and critical thinking, reflection, and clear and compelling writing.

B. Learning Outcomes and Method of Evaluation or Assessment

- *Describe the course objectives and student learning outcomes that address the objectives (i.e., knowledge, communication, critical thinking, ethical research, etc.).*
- *Describe the methods of evaluation or assessment of student learning outcomes. (Include evidence for both direct and indirect methods.)*
- *Grading criteria (select from dropdown box); include a statement describing the criteria that will be used to assess students and how the final grade will be determined.*
- *Identify the method(s) of instruction (select from dropdown box) and describe how the methods promote the likely success of the desired student learning outcomes.*

The course objectives with associated learning activities and assessment methods are listed in the table on the following page. Course objectives are organized into two categories: knowledge development objectives and professional development activities.

COURSE OBJECTIVES	ACTIVITIES	ASSESSMENT
Knowledge development		
Develop and articulate an engineering design approach for content, assessment, and pedagogy (CAP)	Reading, refection and dialogue around an integrated design approach. Design a course using the CAP model.	Discussion of readings Formulation of a course design report
Critically describe the research-based features of each of the elements – content, assessment and pedagogy	Readings, discussion and application of scholarly literature	Review of design report drafts - extent and quality of grounding of CAP in scholarly literature
Apply the principles and theories to the design of a course, module, lesson plan, or other instructional setting	Readings, presentation and discussion of the research process	Quality and alignment of CAP features in the course design report
Professional development		
Use reflection and dialogue as a tool of self-discovery for shaping and refining personal philosophies for the design of instruction	Formation of in-class dialogue groups and a collaborative learning environment	Active participation in collaborative activities and assignments
Participate in a "community of practice" culture through formation of our own community and participation in the broader community of engineering education	Formation of "intellectual neighborhoods" based on students working in similar design sites	Review and critical reflection on one another's work

Methods of evaluation and assessment: Grading criteria – Course design report, which goes through four iterations with revisions based on detailed feedback prior to the final report.

Grading criteria used to assess students and articulate final grades listed below.

80% of the final grade is based on the quality of the course design report.

20% of the final grade is based on the frequency and quality of participation in class and online discussions, and final presentation of course design.

Rubric used to score the course design report is on the following page.

CAP Design Assessment Matrix Spring 2010

	None/Weak	Some/ Moderate	Lots/Strong
CAP Framing ▪ Rationale for project ▪ Design Site/ Setting/ Context – Class/ Module ▪ Overall Alignment of CAP ▪ Elaborated Artifacts – Syllabus/ Overview			
Content- C ▪ Rationale ▪ Learning Objectives ▪ Grounded in literature and theory ▪ Elaborated Artifacts – Concept map ▪ Aligned with A & P			
Assessment- A ▪ Rationale ▪ Grounded in literature and theory ▪ Elaborated Artifacts – Pellegrino Triangle – Assessment & Learning Goals Worksheet ▪ Aligned with C & P			
Pedagogy- P ▪ Rationale ▪ Grounded in literature and theory ▪ Pedagogical Statement – Learner Expectations – Teacher Expectations – Instructional Choices ▪ Aligned with C & A			

Final Presentation Format and Guidelines

- Audience – curriculum committee or other decision-making body
- Format – 10 minute presentation followed by 5 minutes of discussion, 5-10 slides
- Key criterion – overall alignment of CAP elements
- Feedback from audience (on note cards)
  - What did you find most interesting?
  - What is unclear?
  - Suggestions for strengthening alignment.

Method of instruction: Seminar

The instructional approach for this course emphasizes discussion, synthesis and reflection. Critical thinking will be facilitated through discussion of readings starting with Content, proceeding to Assessment, and finally to Pedagogy. Students are often asked to work in pairs or small groups to analyze articles and discuss implications and applications. This small group work is the starting point for larger discussions. Students are asked to share their course design educational and practice experience.

The major deliverable of the course, the final course design report is written in a way that allows for formative feedback by the instructors and by peers. Successively more expansive drafts are written during the course of the semester and are uploaded to Blackboard where they receive written instructor comments. Drafts are also shared with peers for peer feedback. The students use the rubric for scoring the proposal as a way to provide feedback to peers on their penultimate draft.

These instructional methods promote likely success of desired student learning outcomes because they allow students to practices the skills which are assessed, and to receive formative feedback from the instructors and peers to continuously improve the final product. Standards of assessment are transparent to the students as the final grading rubrics for the two course deliverables (proposal and journal summary) are posted on Blackboard from the first day of the class. These are discussed several times over the semester and are refined based on student questions.

C. Prerequisite(s):

- *List prerequisite courses by subject abbreviation, number, and title.*
- *List other prerequisites and/or experiences/background required. If no prerequisites are indicated, provide an explanation for their absence.*

There are no course prerequisites but students must currently be enrolled in a graduate program at Purdue. The course is designed to be an early course ENE PhD students take; however, it is recommended that students complete the Engineering Education Inquiry course prior to taking this course.

D. Course Instructor(s):

- *Provide the name, rank, and department/program affiliation of the instructor(s).*
- *Is the instructor currently a member of the Graduate Faculty? (If the answer is no, indicate when it is expected that a request will be submitted.)*

Course Instructor(s):

Dr. Ruth Streveler, Assistant Professor, School of Engineering Education
Dr. Karl Smith, Cooperative Learning Professor, School of Engineering Education

Both instructors are currently members of the Graduate Faculty.

E. Course Outline:

Provide an outline of topics to be covered and indicate the relative amount of time or emphasis devoted to each topic. If laboratory or field experiences are used to supplement a lecture course, explain the value of the experience(s) to enhance the quality of the course and student learning. For special topics courses, include a sample outline of a course that would be offered under the proposed course.

Course Outline:

The tentative schedule below describes course topics and indicates the relative amount of time devoted to topic areas.

COURSE SCHEDULE [tentative] Dates listed are for 2010

Date	Class focus	Assigned Readings Due Date (may "jigsaw" via study groups)	Writing (will receive instructor and peer feedback)
Jan 11	Course overview, introductions, CAP (engineering design) model		
Jan 18	Holiday NO CLASS		
Jan 25	Engineering design approach, discuss readings, feedback on preliminary idea for design site	Read articles by: Pellegrino and Wiggins & McTighe	Idea for design site
Feb 1	Engineering design approach, peer feedback on first draft of paper	Read Pace & Middendorf Ch 1.	First draft of project paper(overview)
Feb 8	Begin discussion of "content" with focus on readings, bottlenecks and difficult concepts in engineering	Pace & Middendorf, Read Chs 2, 7, 9, 11	
Feb 15	Content – structure of the content, creating concept maps	Develop you own reading list in your content area	
Feb 22	Content, continue discussion with focus on second draft of paper		Second draft of project paper (overview and content)
March 1	Assessment triangle and its application to engineering education	Pellegrino, Read Chs 2, 3, Skim chapters 1, 4	
Mar 8	Assessment matrix and its application in engineering education		
Mar 15	SPRING BREAK		

Date	Class focus	Assigned Readings Due Date (may "jigsaw" via study groups)	Writing (will receive instructor and peer feedback)
Mar 22	Assessment, feedback on third draft of paper		Third draft of paper (overview, content and assessment)
Mar 29	Pedagogies of Engagement	Read articles by: Nakamura & Csikszentmihalyi, Shulman, and Smith et al.	
April 5	Pedagogy Statement and First Principles of Instruction and Motivation	Read articles by: Keller and Merrill	
April 12	Pedagogy Statement and Comparison of Instruction Methods	Students will read two articles based upon assigned instructional topic area.	Fourth draft of the paper (overview, content, assessment and pedagogy)
April 19	Student presentations		
April 26	Student presentations		
May 3	Finals weeks begins		Final draft of project paper (integration of all pieces)

F. Reading List (including course text):
A primary reading list or bibliography should be limited to material the students will be required to read in order to successfully complete the course. It should not be a compilation of general reference material. A secondary reading list or bibliography should include material students may use as background information.

Reading List (including course texts):

Overview and Framing:

Required:

1. Pellegrino, James 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
2. Wiggins, Grant and McTighe, Jay. 1998. Understanding by Design. Alexandria, VA: ASCD. Chapter 1 "What is backward design?"
3. Supplemental – Integrated Design:
4. Bransford, John, Vye, Nancy, and Bateman, Helen. 2002. Creating High-Quality Learning Environments: Guidelines from Research on How People Learn. The Knowledge Economy and Postsecondary Education: Report of a Workshop. National Research Council. Committee on the

Impact of the Changing Economy of the Education System. P.A.Graham and N.G. Stacey (Eds.). Center for Education. Washington, DC: National Academy Press.

5. Fink, L. Dee. 2003. A Self-Directed Guide to Designing Courses for Significant Learning. (Notes based on Fink, L. Dee. 2003. Creating significant learning experiences: An integrated approach to designing college courses. San Francisco: Jossey-Bass).
6. Krajcik, Joseph; McNeill, Katherine L.; Reiser, Brian J. 2008. Learning-Goals-Driven Design Model: Developing Curriculum Materials that Align with National Standards and Incorporate Project-Based Pedagogy. Science Education, 92(1), 1-32.
7. Wiggins, Grant and McTighe, Jay. 2005. Understanding by Design: Expanded Second Edition. Prentice Hall. Excerpts available at Google Books – http://books.google.com/books?id=N2EfKlyUN4QC&dq=Understanding+by+Design&source=gbs_navlinks_s

Supplemental – Engineering Education:

1. Duderstadt, James J. (2008). Engineering for a Changing World: A Roadmap to the Future of Engineering Practice, Research, and Education. The Millennium Project, The University of Michigan. (http://milproj.dc.umich.edu/)

2. Sheppard, Sheri D., Macatangay, Kelly, Colby, Anne, and Sullivan, William M. 2008. Educating Engineers: Designing for the Future of the Field. San Francisco: Jossey Bass. Excerpt available at http://www.josseybass.com/WileyCDA/WileyTitle/productCd-0787977438.html

Content:
Required:

1. Pace, David and Middendorf, Joan, Eds. 2004. Decoding the Disciplines: Helping Students Learn Disciplinary Ways of Thinking. New Directions for Teaching and Learning 98.

Each student will develop a reading list in the content area they are pursuing for their project.

Supplemental:

1. Donald, Janet. 2002. Learning to think: Disciplinary perspectives. San Francisco: Jossey-Bass. Nelson, Thomas F., Shoup, Rick, Kuh, George D. and Schwarz, Michael J. 2008. The effects of discipline on deep approaches to student learning and college outcomes. Research in Higher Education 49:469-494.

Assessment:

Required:

1. Pellegrino, James W., Chudowsky, Naomi, and Glaser, Robert (editors). 2001. Knowing what students know: The science and design of educational assessment. Washington, DC: National Academy Press.

Supplemental:

2. Anderson, Lorin R. and Krathwohl, David W. 2001. A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives. Allyn and Bacon.

Pedagogy:

Required:

1. Gibson, J. T. 2009. Discussion Approach to Instruction. In C. M. Reigeluth & A. A. Carr-Chellman (Eds.), Instructional-Design Theories and Models, Volume III: Building a Common Knowledge Base (pp. 99-116). New York: LEA/Routledge.
2. Hmelo-Silver, C. 2004. Problem-based learning: what and how do students learn? Educational Psychology Review, 16(3), 235-266.
3. Huitt, W. G., Monetti, D. M., & Hummel, J. H. 2009. Direct Approach to Instruction. In C. M. Reigeluth & A. A. Carr-Chellman (Eds.), Instructional-Design Theories and Models, Volume III: Building a Common Knowledge Base (pp. 73-98). New York: LEA/Routledge.
4. Keller, J. 2008. First principles of motivation to learn and e3-learning. Distance Education, 29(2), 175-186.
5. Kirschner, P., Sweller, J., & Clark, R. 2006. Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. Educational psychologist, 41(2), 75-86.
6. Kolb, A., & Kolb, D. 2005. Learning styles and learning spaces: Enhancing experiential learning in higher education. Academy of Management Learning and Education, 4(2), 193-212.
7. Lindsy, L., & Berger, N. 2009. Experiential Approach to Instruction. In C. M. Reigeluth & A. A. Carr-Chellman (Eds.), Instructional-Design Theories and Models, Volume III: Building a Common Knowledge Base (pp. 117-142). New York: LEA/Routledge.
8. Merrill, M. D. 2009. First Principles of Instruction. In C. M. Reigeluth & A. A. Carr-Chellman (Eds.), Instructional-Design Theories and Models, Volume III: Building a Common Knowledge Base (pp. 41-56). New York: LEA/Routledge.
9. Nakamura, J., & Csikszentmihalyi, M. 2005. Engagement in a profession: the case of undergraduate teaching. Daedalus, 134(3), 60-67.
10. Savery, J. R. 2009. Problem-Based Approach to Instruction. In C. M. Reigeluth & A. A. Carr-Chellman (Eds.), Instructional-Design Theories and Models, Volume III: Building a Common Knowledge Base (pp. 143-166). New York: LEA/Routledge.
11. Shulman, L. 2005. Signature pedagogies in the professions. Daedalus, 134(3), 52-59.
12. Smith, K., Sheppard, S., Johnson, D., & Johnson, R. 2005. Pedagogies of engagement: classroom-based practices. Journal of Engineering Education, 94(1), 87-101.
13. Welty, W. 1989. Discussion method teaching: How to make it work. Change, 40-49.

Supplemental:

1. Reigeluth, C. M. (Ed.). 1999. Instructional-Design Theories and Models, Volume II: A New Paradigm of Instructional Theory. Mahwah, NJ: Lawrence Erlbaum Assoc.
2. Reigeluth, C. M., & Carr-Chellman, A. A. (Eds.). 2009. Instructional-Design Theories and Models, Volume III: Building a Common Knowledge Base. New York: LEA/Routledge.
3. Svinicki, Marilla. 2004. Learning and motivation in the postsecondary classroom. Bolten, MA: Anker Publishing Company.

Other Readings:

Each student will develop a CAP reading list for their design site (project).

G. Library Resources

Describe the library resources that are currently available or the resources needed to support this proposed course.

Library resources:

- Pace, D. and Middendorf, J. (2004) and Pellegrino, J. W., Chudowsky, N., and Glaser, R. (2001) are available on library reserve.
- Engineering librarian Amy Van Epps is available to assist students in finding engineering education research articles in the Purdue libraries. She has created an online study guide for students in the Engineering Education Inquiry course that we recommend students use in this course as well. It is located at http://www.lib.purdue.edu/subjectguides/ENEinquiry/