Course Change Request

Date Submitted: 01/30/18 9:36 pm

Viewing: EDCI 720: Engineering Design for School Teaching and Learning

Last approved: 05/04/17 3:18 am
Last edit: 02/01/18 2:04 pm
Changes proposed by: ambyrrios

Catalog Pages referencing this course:
Department of Teaching, Learning and Culture
EDCI - Educ Curriculum & Dev.

Programs referencing this course:
CERT-CG57: Science, Technology, Engineering and Mathematics (STEM) Education - Certificate

Faculty Senate Number: F642251

Contact(s)

<table>
<thead>
<tr>
<th>Name</th>
<th>E-mail</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambyrrios Kerri-Smith</td>
<td><a href="mailto:ambyrrios@tamu.edu">ambyrrios@tamu.edu</a></td>
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</tr>
</tbody>
</table>

Rationale for Course

Edit
The proposed changes are for accreditation purposes.

Other
The proposed changes are part of a routine curriculum review.

Explain other rationale

distance education requirements

Course prefix: EDCI    Course number: 720

Department: Teaching, Learning & Culture
College/School: Education & Human Development
Academic Level: Graduate
Academic Level (alternate): Undergraduate
Effective term: 2018-2019 2017-2018

Complete Course Title
Engineering Design for School Teaching and Learning
Abbreviated Course Title
ENGR DESGN SCH TEACH & LEARN

Catalog course description
Understanding engineering design, the development of an engineering design conceptual framework and the K-12 curricula that are available to address STEM teaching and learning; equips teacher-leaders with the resources to interpret classroom phenomena with a multifaceted perspective using research-based evidence.

Prerequisites and Restrictions
Graduate classification.
Concurrent Enrollment: No

In Workflow
1. TLAC Department Head
2. Curricular Services Review
3. ED Committee Preparer
4. ED Committee Chair GR
5. ED College Dean GR
6. GC Preparer
7. GC Chair
8. Faculty Senate Preparer
9. Faculty Senate
10. Provost II
11. President
12. Curricular Services
13. Banner

Approval Path
1. 01/31/18 9:48 am
   Michael DeMiranda (demiranda): Approved for TLAC Department Head
2. 02/01/18 2:04 pm
   Sandra Williams (sandra-williams): Approved for Curricular Services Review
3. 02/01/18 3:19 pm
   Melanie Robideau (mrobideau): Approved for ED Committee Preparer GR
4. 02/13/18 3:42 pm
   Beverly Irby (irbyb): Approved for ED Committee Chair GR
5. 02/13/18 3:45 pm
   Beverly Irby (irbyb): Approved for ED College Dean GR
6. 02/16/18 12:51 pm
   Meagun Kelly (meagankelly): Approved for GC Preparer
7. 03/01/18 3:13 pm
   LaRhosa Johnson (lrjohnson): Approved for GC Chair

History
1. May 4, 2017 by Kerri Smith (ksmith)

https://nextcatalog.tamu.edu/courseleaf/approve/
Learning Outcomes

Meets traditional face-to-face learning outcomes.

Describe how learning outcomes are met or provide justification why they are not met.

EDCI 720 matches the face to face learning objectives. Masters students in the STEM online program will engage in tasks that require the exact hours that are required of face to face students. These rigorous assignments allow both the online and face to face students to use the engineering design process to evaluate STEM curriculum in their schools. Both of the courses (online and face to face) allow for hands on collaborative interactive tasks (online through gotomeeting).

Hours

Meets traditional face-to-face hours.

Describe how hours are met or provide justification why they are not met.

Both of the EDCI 720 courses (online and face to face. Both versions require the same number of contact and outside of class readings and assignments. Activities and assignments are engaging and rigorously designed to help develop students into critical consumers of engineering curriculum. The online EDCI 720 course requires the same engagement that a face to face course would.

Will this course be taught as a distance education course?

Yes

I verify that I have reviewed the FAQ for Export Control Basics for Distance Education.

Yes

Is 100% of this course going to be taught in Texas?

Yes

Will classroom space be needed for this course?

No

This will be a required course or an elective course for the following programs:
Required (select program)

<table>
<thead>
<tr>
<th>Program(s)</th>
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</thead>
<tbody>
<tr>
<td>(MED-EDCI) Master of Education in Curriculum and Instruction</td>
</tr>
<tr>
<td>(MS-EDCI) Master of Science in Curriculum and Instruction</td>
</tr>
</tbody>
</table>

Course Syllabus

Syllabus: Upload syllabus

Upload syllabus: EDCI 720 Syllabus October 31.doc

Letters of support or other documentation: No

Additional information: Yes

Reviewer Comments: 

Reported to state: No
EDCI 720 Engineering Design for Teaching and Learning
Course Syllabus

Office: Harrington 328
Office Phone: (979) 845-8384 (see – Class Communication)
Office Hours: Skype Wednesday 4:30 – 5:30 PM & 8:35-9:30 PM
e-mail: rcapraro@tamu.edu

Course Description
The focus of this course is the building of an understanding of Engineering design, the development of an engineering design conceptual framework and the K-12 Curricula that are available to address STEM teaching and learning. Through this course teacher-leaders will be equipped with the resources to interpret classroom phenomena a multifaceted perspective using research-based evidence.

Prerequisites
Graduate Classification

Required Readings

Recommended Resources
Engineering TEKS

Class Communication
E-mail
I will respond to e-mail sent to A&M account periodically and respond as necessary usually within 48 hours. E-mail sent with notifications and excuses will not receive responses. Please note that telling me you are going to be absent or late or late with an assignment is professional and a polite way of acting. However, notification is not proof of an acceptable excuse. Please check the university policy on late assignments.
Goals
You will be part of a unique STEM experience. You will be examining engineering curricula used in the K-12 setting and other teaching innovations that make use of Engineering Design. Students will build an understanding of Engineering Design. You will be able define the principles of Engineering Design, be able to draw a conceptual diagram, and assess its presence or lack thereof, in commercially available STEM programs.

Objectives
1) Identify various STEM curricula suitable for elementary, middle, and secondary grade bands.
2) Develop a definition of Engineering Design
3) Develop a conceptual model of Engineering Design
4) Evaluate STEM curricula for quality of enactment of Engineering Design
5) Examine published research on the successes and failures of STEM curricula
6) Work collaboratively to develop a synthesis of STEM curricula for its enactment of Engineering Design

Grades
Percentages of the course grade are listed next to each requirement. Grades will be assigned as follows:

- 90%-100%  A
- 80%-89%     B
- 70%-79%     C
- 60%-69%     D

Late Assignments
Only assignments submitted complete and on time will be considered for full credit. Any assignments turned in more than one week late will receive zero points unless it is due to a university excused absence. Assignments must be turned in by Saturday, 11:59 PM of the week it is due. Electronic submission via e-mail is not acceptable. All assignments must be submitted within the learning management system (LMS), http://student-rules.tamu.edu

Diversity Statement for the Department of Teaching, Learning, and Culture
The Department of Teaching, Learning, and Culture (TLAC) does not tolerate discrimination, violence, or vandalism. TLAC is an open and affirming department for all people, including those who are subjected to racial profiling, hate crimes, heterosexism, and violence. We insist that appropriate action be taken against those who perpetrate discrimination, violence, or vandalism. Texas A & M University is an Affirmative Action and Equal Opportunity institution and affirms its dedication to non-discrimination on the basis of race, color, religion, gender, age, sexual orientation, domestic partner status, national origin, or disability in employment, programs, and services. Our commitment to non-discrimination and affirmative action embraces the entire university community including faculty, staff, and students.

Students with Special Needs
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an
accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

Statement of Plagiarism
The handouts used in the course are copyrighted. By "handouts", I mean all materials generated for this class, which include but are not limited to syllabi, quizzes, exams, lab problems, in-class materials, review sheets, professor’s web site, video, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts, unless I expressly grant permission. As commonly defined, plagiarism consists of passing off as one's own the ideas, words, writings, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you have the permission of that person. Plagiarism is one of the worst academic offences, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. If you have any questions regarding plagiarism, please consult the latest issue of the Texas A & M University Student Rules, under this section "Scholastic Dishonesty".

Aggie Honor Code
"An Aggie does not lie, cheat, or steal or tolerate those who do."

For more information please consult Honor Council Rules and Procedures on the web http://aggiehonor.tamu.edu

All assignments must contain the following statement and be signed before it can be graded:
"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work."

________________________________
Signature of student
Academic Integrity Task Force, 2004
Students must sign this statement on all assignments and exams. Please sign electronically for all assignments submitted via e-mail.

Course Evaluations
Each student must complete on-line evaluations of the professor and the class. The link is: https://pica.tamu.edu – complete during the last week of class.

Attendance
Attendance of individuals in the class is required, and university rules regarding absences will be followed. Exchange of ideas is essential for the learning that occurs in this online class. The absence or lack of participation of one individual impacts the performance of all persons. http://student-rules.tamu.edu/rule7

Assignments
5% Quizzes/Discussion
10% Engineering Design Definition
20% Conceptual Model for Engineering Design
30% Curricula Evaluation
20% Curricula Adoption Model
15% Presentation

**Quizzes/Discussion (5%)**
Several quizzes will be administered and your discussion prompts will be used as a composite score. For the discussion you will need to post two questions from the week’s reading(s) and respond to two questions. If there are two readings then post one question per reading. You should respond to no more than 1 question from any 1 person. Please respond to ONLY 1 question per person, responses must be narrative and not fewer than 4 sentences. You will need to respond to two different people to meet the expectation of addressing two questions. You may post two statement positions instead of questions based on the reading to which people can respond. The position should prompt discussion and develop a community of learners exploring difficult or clearly unresolved perspectives on the readings. For example, “STEM should be STEAM because students are engaged in the aesthetics of any and all product designs. For example, the Apple Computer sold well because of the look and color. It looked good in the office, classroom and home. It was nicer looking than those old gray or tan boxes and made a style statement. Therefore, I think every STEM activity should include an aspect of aesthetics that builds knowledge of art and appreciating diverse perspectives on the importance of art in our schools.”

**Engineering Design Definition (10%)**
Students will review the engineering education literature and after review of at least 5 resources develop an engineering design definition. There is some literature to help you in the references of the syllabus. Each aspect of the definition should be supported by the resources. The definition should include implications 1) for teaching, 2) for learning, 3) for assessing, and 4) for curriculum development. Consider using Google Scholar (http://scholar.google.com), or the library website (library.tamu.edu). No longer than 500 words.

**Conceptual Model for Engineering Design (20%)**
Each person is expected to develop a conceptual model for engineering design. A sample model was developed by Aggie STEM and is included here for heuristic example.
Your conceptual model will identify resources that support each component. Align each component to the four implications 1) teaching, 2) learning, 3) assessing, and 4) curriculum development. All submissions MUST have your name and the assignment name in the document name for example assignment name_YOUR NAME.docx.

Curricula Evaluation (30%)
You will explore a STEM based curriculum used in K-12 education. You will provide the research base summary of the effectiveness or lack there of. Your report will include at least 10 research based articles from a research journal for example Research in Childhood Education, Educational Researcher, American Educational Research Journal, Kappa Delta Pi Record, School Science and Mathematics etc. (ERIC documents, dissertation abstracts [no more than 10% of your references can come from the previous two categories], or statistical journals - - i.e., Multiple Linear Regression Viewpoints and Educational and Psychological Measurement etc.). Your review should include proper APA citations. You should not have a paragraph per article but instead find commonalities and differences and integrate the articles to tell a story (APA Style guide 6th Edition, 2009 required). Total length should be no more than 10 pages including cover page and references.
Rubric: APA form 30%; research base (synthesized) 40%, conclusions 30% 

Curriculum Adoption Model (20%) 
Students will engage in the holistic evaluation of the available STEM curricula. You will select one program and become an unbiased expert. Each student in accordance with accepted quantitative or qualitative methodology will determine procedures for adopting their selected curriculum. The model should address the following major headings, (1) Description of the program, (2) grade level(s) appropriate, (3) research support, (4) professional development needs, (5) school adoption plan (how the program gets rolled out), (6) assessment plan (how you know that the program works), (7) administration training model (plan of how you would train the administration to support the teachers and ensure a high fidelity implementation), and (8) estimate of costs to include (a) materials, (b) curriculum, and (c) professional development. This should be no more than 10 double spaced pages, including title page and references.

Presentation of Curriculum Adoption Model (15%) 
A short summary (brief bullet points ONLY pulled from your paper) and Power Point® presentation or similar format (10-12 slides) will be developed to communicate the purpose of your project and to summarize your plan. **Total of 10 minutes max.** Voice over PPT should provide ancillary information to the minimal text on the page.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Class Introduction</td>
<td>View Teacher Video&lt;br&gt;Develop an introduction video for classmates to view&lt;br&gt;Quiz&lt;br&gt;Intro to the Library</td>
</tr>
<tr>
<td>2</td>
<td>Topic: Engineering Design</td>
<td>Read <em>Engineering Better Projects</em> Chapters 4 and 5&lt;br&gt;Discussion Board&lt;br&gt;View PowerPoint®</td>
</tr>
<tr>
<td>3</td>
<td>Engineering Design&lt;br&gt;<strong>Find 5 sources and begin reading to help with your Engineering Design Definition.</strong></td>
<td>Read <em>Engineering design thinking, teaching, and learning and A review of research in mechanical engineering design. Part I: Descriptive, prescriptive, and computer-based models of design processes</em>&lt;br&gt;Discussion Board</td>
</tr>
<tr>
<td>4</td>
<td>Developing an Engineering Design Definition</td>
<td>Review PowerPoint on Engineering Design&lt;br&gt;Engineering Design Definition Due</td>
</tr>
<tr>
<td>5</td>
<td>Developing a Conceptual Model</td>
<td>View Conceptual Model PPT&lt;br&gt;Read: <em>The decisions of engineering design</em>&lt;br&gt;Discussion Board</td>
</tr>
<tr>
<td>6</td>
<td>My Engineering Design Conceptual Model</td>
<td>Discussion Board&lt;br&gt;<strong>Conceptual Model for Engineering Design DUE</strong></td>
</tr>
<tr>
<td>7</td>
<td><em>Selection, Identification, and Research on Engineering Design Curricula</em></td>
<td>Read: <em>A Review of Literature on Teaching Engineering Design Through Project-Oriented Capstone Courses</em>&lt;br&gt;Discussion Board</td>
</tr>
<tr>
<td>8</td>
<td>Assessing Curricula Discussion Post: How to evaluate educational curricula</td>
<td>Read: <em>Curriculum Evaluation</em></td>
</tr>
<tr>
<td>9</td>
<td>Discussion Post: Overview of 5 different programs&lt;br&gt;And Discussion of Evaluation Strategies</td>
<td>Identify 5 different STEM Curricula, at least <strong>One</strong> for each grade band elementary, middle and high school and any two others. You may duplicate for a grade band as long as you do at least one from each. <em>Read: A ten year assessment of the pre-engineering program for under-represented, low income and/or first generation college students at the University of Akron</em></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Curriculum Evaluation Due</td>
</tr>
<tr>
<td>11</td>
<td>STEM Curriculum</td>
<td>Read: <em>Engineering in the K-12 STEM Standards of the 50 US States: An Analysis of Presence and Extent</em>&lt;br&gt;Group Discussion</td>
</tr>
<tr>
<td>12</td>
<td>Discussion of Curriculum Adoption Model</td>
<td>Quiz Engineering Design&lt;br&gt;View Voice Over PPT about Curriculum Adoption Model</td>
</tr>
<tr>
<td>13</td>
<td>Discussion of Presentation and View Professor synopsis and suggestions for Presentation development</td>
<td>Curriculum Adoption Model Due</td>
</tr>
<tr>
<td>14</td>
<td>Presentation via video or Voice over PPT.</td>
<td>Presentations submitted online</td>
</tr>
<tr>
<td>Points:</td>
<td>Criteria</td>
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</tbody>
</table>
| 25 Max | Organization (hierarchy)  
25 well-organized, complete and factual, correctly formatted, displays a theme, properly identified, plentiful examples from class in a logical order and relationship  
20 fairly well-organized, mostly complete and factual, no format errors and easily navigable,  
15 fairly well-organized, mostly complete and factual, a few errors in format, navigation difficulties some shared work and collaboration, some members show evidence of the events, members show limited support, limited assistance in managing the participants  
10 poorly organized or lacking significant information but extensive technology is incorporated  
5 poorly organized, lacking significant factual information, several errors in format |
| 25 Max | Mechanics  
5 presentation flows naturally  
5 easy to navigate, few spelling errors in the required handouts  
5 linear (not scattered)  
5 engaged the audience, provided for audience participation, and involvement (more than interesting)  
5 evidence of persistent and extended work  
0 No Score: numerous spelling/grammatical errors, some confusion between or among topics not supportive or unable to actively engage classmates |
| 25 Max | Content Relevancy  
25 good examples of coursework, lessons related to teaching experiences  
20 general information relevant to the course, examples of sound pedagogy, lessons, STEM accurate and precise  
15 general information and somewhat relevant to course, varied delivery that addresses the mathematics presented or being represented  
10 mostly cursory information or no relevance to coursework, readings or syllabus unlinked to class objectives  
5 only cursory information without explanation or examples |
| 25 Max | Theme  
5 Well organized and planned theme  
5 Theme necessitates individual effort  
5 The presentation follows in a natural progression that communicates the theme to the participants  
5 The theme is challenging and represents the contents of the course  
5 The theme is presented in a manner in accordance with communicating STEM knowledge  
0 No score: No theme represented or communicated. |
| /100 | Total Presentation |
Check List for Review of Writing
(Peer Review Version)

Title:
Date:___
Reviewer Name:
Person Being Reviewed: Writing Style

The paper has
☐ an introductory paragraph (not labeled introduction)
☐ heads and subheads
☐ a short/modest topic sentence for each paragraph
☐ a concluding/transition sentence for each paragraph
☐ integrated paragraph with multiple citations from different authors
☐ past tense in the lit review
☐ most of the citations have the author in parentheses and not as part of the story
☐ avoided the use of “I” or “We”

APA
☐ Used the correct APA headings and subheads
☐ Cover page
   ☐ running head
   ☐ title
   ☐ name
   ☐ author note

☐ Check my APA in the references carefully including
   ☐ Commas
   ☐ Periods
   ☐ Capitalizations
   ☐ Volumes
   ☐ Issues
   ☐ Pages
   ☐ Italics

Decision (Select only 1 category by placing you initials on the line.)

☐ Accept as is no edits necessary (I feel that this is an excellent work, and I believe my review shows exactly what I know about the content taught in this course. Any failures in the work are due to my lack of attention to detail and are indicative of my weaknesses in the area and not my classmate).

☐ Accept with Revisions Only (I feel that this is solid work, and I believe my review shows exactly what I know about the content taught in this course and through my suggested revisions, I am confident my classmate will earn a better grade than without my help).

☐ Revise and Resubmit (I feel that this is promising work, and I believe my review shows exactly what I know about the content taught in this course and with all my comments and suggested revisions, I hope my classmate will earn a better grade, than without my help).

☐ Reject (I cannot judge this work. I believe my review lacks depth because I have not assimilated the content. I have no idea how to help my classmate improve the work).

References


