



EDUC 656: Teacher Engineering Education: Universal Design for Learning
(3 credit hours)
University of Indianapolis Semester II (Fall I 2023: 10/25/23 - 12/20/23)

Class: 5:45 – 8:25 pm – Wednesday
Fall I: 10/25/23 - 12/20/23
Format of Course: **Asynchronous**

Instructor: Dr. John W. Somers

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Office Hours: Open office hours every Wednesday from 5:45 – 7:00 p.m.

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Required Text: There is NO required text for this course. Readings will be provided.

Please see EDUC 656 on Brightspace.

Description of course:

This course is designed for K-12 teachers who strive to democratize engineering by recognizing that all teachers and students are engineers. Teachers will be introduced to engineering design principles, habits of mind, and empathy-based pedagogy. Constructs of access, equity, and social justice will be threaded throughout the course. Modules enable teachers to engage in engineering design challenges and apply them in their classrooms or other formal/informal contexts. Engineering materials for the course will be shipped to the participants. Participants will be requested to provide commonplace materials such as cardboard, scissors, tape, etc.

Course Outcomes: Students completing this course will:

- Understand the need to build engineering capacity in K-12 education.
- Apply the engineering design process and practices
- Gain knowledge of multiliteracies, multimodal composition and inclusive design
- Apply empathy and inquiry-based pedagogy and instructional strategies
- Design a service learning/community-based project to enhance access, equity, and social justice in engineering education
- Recognize the need to develop engineering identity, empathy, and curiosity in themselves and students
- Become familiar with the Social Cognitive Theory of Career Development

Teaching Methods: This course involves a combination of mini-lectures, active learning strategies, videos, hands-on activities and discussion.

Assignment and Assessment Types:

Students will engage in various assignments such as course readings, viewing instructional videos, creating projects, and presenting classroom work and outcomes.

Assessments: Students will develop lesson plans, submit written reflections on course readings and activities, maintain an engineering journal, and create a digital portfolio.

Classroom Format: Online – **Asynchronous**– Wednesday: 5:45 – 8:20 pm

School of Education Mission Statement

The School of Education prepares transformative educators who work alongside communities to learn deeply and disrupt educational and social injustice.

- We believe effective educators practice and promote self-efficacy, creativity, and curiosity to create inclusive, relationship-driven, connected communities of learners.
- We believe effective educators advocate for social justice and equitable learning opportunities in order for all students to achieve their highest potential.
- We believe effective educators are servant leaders who positively impact the future of education in our society.

Conceptual Framework and Statement of Professional Disposition:

Teachers are decision-makers who employ their talents, knowledge, and skills who...

1. Combine content and pedagogical knowledge and tools of inquiry to develop meaningful and accessible learning progressions.
2. Create inclusive learning environments where educators and learners work together to construct meaningful learning.
3. Construct high quality assessments to inform practice and provide meaningful feedback to learners.
4. Collaborate and communicate with learners, P-12 educators, and community members to create a community of practice.
5. Critically reflect on the process of teaching and learning to promote insight and action.
6. Cause positive change through leadership and advocacy.

University Learning Goals

The four university-wide learning goals are:

1. Critical Thinking – Participants will employ the use of reason in order to make a judgments on best practices for their own students in the classroom.
2. Creativity – Participants will develop or apply something new, innovative, imaginative, or divergent through the design of their inquiry-based learning unit.
3. Social Responsibility – Participants will develop the self, moral, consciousness, and responsiveness to others. Participants will design a project that helps the community and/or develops empathy in others around a societal issue.
4. Performance – Participants will present their projects through an engaging mixed-media platform.

Expectations: Success in an online learning environment depends on student initiative, interaction, and participation. Your participation in the forums, thoughtful feedback to peers, and timeliness of assignments will weigh heavily on your success. Your grade will accurately reflect your complete performance in this class, and I look forward to a great course this semester.

Attendance: This is an asynchronous online course. Attendance is defined as the timely completion of assignments, discussion boards, projects, and any other course tasks and requirements. Students who are unable

to meet course deadlines or requirements for valid reasons (e.g., sickness, funerals, jury duty, and university-sanctioned activities) should inform the instructor via email to receive accommodations.

Statement ADA: If you have a disability that may have some impact on your work in this class and for which you may require accommodations, please inform me immediately so that your learning needs may be met appropriately. Students with a disability must register with the Services for Students with Disabilities office (SSD) in Schwitzer Center 206 (317)-788-6153 / www.uindy.edu/ssd for disability verification and determination of reasonable academic accommodations. You are responsible for initiating arrangements for accommodations for tests and other assignments in collaboration with the SSD and the faculty.

Academic Integrity and Academic Misconduct: The students, faculty, and administrators of the University of Indianapolis commit themselves to the highest level of ethical conduct in academic affairs. The University of Indianapolis, therefore, adopts regulations concerning Academic Misconduct to safeguard the academic integrity of the institution. Academic Misconduct includes, but is not limited to, the following circumstances (A) Cheating, (B) Fabrication, (C) Plagiarism, (D) Interference, (E) Violation of Course Rules, (F) Facilitating Academic Dishonesty, and (G) Abuse of Confidentiality. For a full statement of the policy refer to the University of Indianapolis Student Handbook, Section I, Academic Information.

WE WILL DISCUSS and MAKE THIS PROJECT MANAGEABLE: DON'T PANIC!

Engineering Class-based project or Community-based Project: The project overview and rationale is taken from the TeachEngineering site. We will engage in a brainstorming activity to create a number of ideas and eventually narrow one down that you will conduct with your students. The ideal project will be authentic – one with a real client --- and result in the development of a prototype. There are several worksheets and attachments on the TeachEngineering site that you may use to plan the project. You are welcome to use the PBL templates that you used in EDUC 654. It will work to get you started. Many ideas for projects can be found on [TeachEngineering](#). We will discuss more about this project in class with additional resources on Brightspace.

For further suggestions and support materials, refer to the [Tips for Leading Service-Based Engineering Design Projects](#) and other attachments.

Assignment Schedule:

Assignments will be due every Wednesday at 5:45 pm. New assignments will be assigned every Tuesday at midnight. All assignments will be graded on a point scale. Grades will be determined on an earned/possible basic point formula.

Assessments:

Class Preparation Activities (warm-ups, readings, reflections):	150 points
In-Class Activities/assignments:	210 points
Engineering Service Learning Project	100 points
Engineering Journal	100 points
Total	560 points

All projects must be completed to receive a grade for the course.

Policy on Late Assignments: Assignments will be turned in by the announced due dates and times. Assignments are to be submitted online using BrightSpace, unless otherwise noted. I will accept assignments after the due date, but late work will receive 50% of the allocated points. I will not accept any late work for points after the eighth day and zero points will be given.

Grading:

Final grades will be calculated according to the following scale:

A 100 – 95 %	A- 94 – 90 %	
B+ 87 – 89 %	B 84 – 86 %	B- 80 – 83 %
C+ 77 – 79 %	C 74 – 76 %	C- 70 – 73 %
D+ 67 – 69 %	D 64 – 66 %	D- 60 – 63 %
F 60 and below		

Assignment is due on the date listed.

Each week you will have access to new modules. Modules will identify your assignments for each week along with your participation questions, exams and PowerPoints. **Modules will open on Wednesday and all work is due on the following Wednesday by 5:45 pm.**

Course Schedule

Week	Topics and Due Dates	Start Date	End Date
1	Topic <ul style="list-style-type: none"> ● Course Overview ● What is Engineering? Why Teach Engineering? ● Engineering Design Notebook ● Teacher Trading Card ● Product Archaeology (hardware dissection) ● Reading/Video/Engineering Website ● Reflection/Discussion/Video 	10/25/23	11/01/23
2	Topic <ul style="list-style-type: none"> ● Engineering Design Process (EDP) ● Engineering Literacy ● Sketching ● Engineering Poster ● Hazardous waste cleaning prototype activity (also called: robot arm) ● Reading/Video/Engineering Website ● Reflection/Discussion/Video 	11/01/23	11/08/23
Week	Topics and Due Dates	Start Date	End Date

3	Topic <ul style="list-style-type: none"> ● Introduction to Makey Makey ● Makey Makey Projects ● Circuits: simple, series, & parallel ● Scratch Coding and Makey Makey ● What makes a good project? ● AI and Coding ● Class or community-based project ● Reading/Video/Engineering Website ● Reflection/Discussion/Video 	11/08/23	11/15/23
Week	Topics and Due Dates	Start Date	End Date
4	Topic <ul style="list-style-type: none"> ● Introduction to Drones and Flight Dynamics ● DIY Basic Drone ● 24-Hour Problem Log and Scoping Tool ● Class or community-based project ● Reading/Video/Engineering Website ● Reflection/Discussion/Video 	11/15/23	11/22/23
Week	Topics and Due Dates	Start Date	End Date
5	Topic <ul style="list-style-type: none"> ● Introduction to Green Energy ● Green Energy Projects ● Results from 24-Hour Problem Log and Scoping Tool ● Class or community-based project ● Reading/Video/Engineering Website ● Reflection/Discussion/Video 	11/22/23	11/29/23
Week	Topics and Due Dates	Start Date	End Date
6	Topic <ul style="list-style-type: none"> ● Introduction to the Micro:bit ● Micro:bit Projects ● Makecode and Makecode Simulator ● Class or community-based project ● Reading/Video/Engineering Website ● Reflection/Discussion/Video 	11/29/23	12/06/23
Week	Topics and Due Dates	Start Date	End Date

7	<p>Topic</p> <ul style="list-style-type: none"> ● Introduction to Robots ● Build a Simple Robot Project ● Empathetic Engineering ● Class or community-based project ● Reading/Video/Engineering Website ● Reflection/Discussion/Video 	12/06/23	12/13/23
Week	Topics and Due Dates	Start Date	End Date
8	<p>Topic</p> <ul style="list-style-type: none"> ● Class or community-based project presentation ● Complete all projects ● Reflection/Discussion/Video ● Engineering Design Notebook 	12/13/23	12/20/23