**Fall 2020 Capstone Design Project**

**Overview**

In this course, you will be required to become a creative problem solver. Many literatures from learning science identified that learning is an active process of seeking new knowledge rather than receiving existing knowledge. This course will use a student-centered approach where we will abandon the familiar “lecture/homework/exam” format that you are familiar with this. Students will need to engage in more of team participation and hands-on approach to learn more about problem solving so that you become an active problem solver rather than a knowledge consumer.

**Project description**

The capstone design project will be housed in the same philosophical foundation. You will be required to work in a team. Your team defines a problem situation and solve it using your knowledge and skills. The design problem can be identified from everywhere including COVID-19, student learning, [NAE Grant Challenges](http://www.engineeringchallenges.org/), STEM education, or issues in your daily lives. In order to define the problem situation, the class will provide techniques to identify problem such as “what is the matter?” “who is the client?” and “who is the end user?” Then, you will be required to present a design solution using at least one of an advanced technology including Arduino, 3D modeling, or laser cutting. As you develop your project, you will need to document all the processes of designing on your online portfolio platform with notes and reflections.

1. **Evaluation Criteria (300 pts)**
2. Problem Definition (100 pts)
   1. Problem is important in context of the assignment, and considers issues of social, economic, or environmental equity.
   2. Problem is specific, challenging, and can be investigated given available resources,
   3. Due 11/15
3. Exploration (100 pts)
   1. Describes multiple aspects of design based on research, testing, or reverse engineering
   2. Considers multiple metrics that align with each criterion and constraints and justifies selection of the most valid metrics.
   3. Due 11/22
4. Design Prototype (100 pts)
   1. addresses the problems identified at the problem identification stage.
   2. considers realistic constraints and issues.
   3. effectively work to help vulnerable people.
   4. Due 12/7
5. **Final Due: Dec 7**
6. **Submission Materials**
   1. **Online project portfolio.**
   2. **Presentation PPTs**
   3. **Solution model & demonstration.**

**Foundations and Skills for Lifelong Learning VALUE Rubric**

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|  | **Capstone**  4 | **Milestones**  3 2 | | **Benchmark**  1 |
| **Curiosity** | Explores a topic in depth, yielding a rich awareness and/or little-known information indicating intense interest in the subject. | Explores a topic in depth, yielding insight and/or information indicating interest in the subject. | Explores a topic with some evidence of depth, providing occasional insight and/or information indicating mild interest in the subject. | Explores a topic at a surface level, providing little insight and/or information beyond the very basic facts indicating low interest in the subject. |
| **Initiative** | Completes required work, generates and pursues opportunities to expand knowledge, skills, and abilities. | Completes required work, identifies and pursues opportunities to expand knowledge, skills, and abilities. | Completes required work and identifies opportunities to expand knowledge, skills, and abilities. | Completes required work. |
| **Independence** | Educational interests and pursuits exist and flourish outside classroom requirements. Knowledge and/or experiences are pursued independently. | Beyond classroom requirements, pursues substantial, additional knowledge and/or actively pursues independent educational experiences. | Beyond classroom requirements, pursues additional knowledge and/or shows interest in pursuing independent educational experiences. | Begins to look beyond classroom requirements, showing interest in pursuing knowledge independently. |
| **Transfer** | Makes explicit references to previous learning and applies in an innovative (new and creative) way that knowledge and those skills to demonstrate comprehension and performance in novel situations. | Makes references to previous learning and shows evidence of applying that knowledge and those skills to demonstrate comprehension and performance in novel situations. | Makes references to previous learning and attempts to apply that knowledge and those skills to demonstrate comprehension and performance in novel situations. | Makes vague references to previous learning but does not apply knowledge and skills to demonstrate comprehension and performance in novel situations. |
| **Reflection** | Reviews prior learning (past experiences inside and outside of the classroom) in depth to reveal significantly changed perspectives about educational and life experiences, which provide foundation for expanded knowledge, growth, and maturity over time. | Reviews prior learning (past experiences inside and outside of the classroom) in depth, revealing fully clarified meanings or indicating broader perspectives about educational or life events. | Reviews prior learning (past experiences inside and outside of the classroom) with some depth, revealing slightly clarified meanings or indicating a somewhat broader perspectives about educational or life events. | Reviews prior learning (past experiences inside and outside of the classroom) at a surface level, without revealing clarified meaning or indicating a broader perspective about educational or life events. |