Engineering Design & Problem-Solving

2020 – 21 Course Description

Welcome to *Engineer Your World!* This course will engage students in authentic engineering practices in a project-based learning (PBL) environment. Learning is developed over a series of engaging and socially-relevant team-based explorations and design challenges. The curriculum focuses on

- building engineering design skills
- applying knowledge and skills from core academic courses
- developing engineering habits of mind, and
- introducing engineering fields and professions.

Units of Instruction

1	Course Introduction & Norms	
2	Discovering Design – Camera Obscura	*Design Challenge*
3	Reverse Engineering & Product Redesign	*Design Challenge*
4	Understanding Data – Designing Coffee	*Exploration*
5	Designing with Data – Safer Buildings	*Design Challenge*
6	Programming – Electronic Music	*Exploration*
7	Systems Engineering – Aerial Imaging	*Design Challenge*

Required Materials

IN-PERSON:

- all students are expected to have their personal tablet or laptop in class every day
- 1-inch binder with student's name clearly identified and easy to see on the front cover

ONLINE:

- graph paper in a bound book (it does not have to have a lot of pages; thicker paper is more important than a large spiral)
- large cardboard box (at least 14" per side), tape, scissors/box cutters

Recommended Materials

- mechanical pencil with eraser – highly recommended for sketching and calculations
- scientific or graphing calculator

Prerequisites and Course Credit

Completion of *Algebra I* and *Geometry* are required.

This course is the required third course in the STEM Engineering Endorsement, taken after *Principles of Applied Engineering* and *Engineering Design and Presentation*. It can also count as a fourth science credit when taken in 11th or 12th grades. As a science credit, no prior engineering courses are required. To receive a STEM endorsement, students must complete physics, which can be taken concurrently with this course or before completing it.

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Evaluation and Grading Policy

We have a lot to accomplish this year, and we have a rigid schedule in order to complete our work. *If a student misses class, they miss important team design work*, which is sometimes hard to recreate individually. It is the student's responsibility to make arrangements for late work and missed time both with the instructor and teammates, as necessary.

A point system is used to record grades, with minor assignments valued between 10 and 25 points and major assignments valued between 50 and 100 points.

Engineering Notebook Design Documentation (many minor grades per grading period)	Students are required to keep an up-to-date engineering notebook throughout the course, which will represent a significant portion of the overall grade. The notebook will include class notes, research notes, design sketches, test procedures and results, planning and documentation of construction, and reflections.
Individual Assessments (a few minor grades per grading period)	Individuals assessments, over science or engineering concepts, will usually be given as short homework assignments, due within a week of the date assigned. Some will be on BLEND, while others are written.
Design Challenges (a few major grades per grading period)	All design challenges will be completed in teams. Students on a team will be assessed on final design components, test results, and team documentation, including reports and/or presentations.
Employability Skills & Work Habits (one major grade per grading period)	Employability skills are important. All students will be given a Work Habits assessment *every day of class*. The average of these daily assessments will count for 15% of the six weeks grade. It is difficult to complete work for this course outside of class time, so our class time is highly valued and must be used well. Tardies, unexcused absences, lack of effort, and inappropriate use of technology are all issues that will affect a student's Work Habits daily grade. ONLINE – the Work Habits assessment will NOT be used until face-to-face instruction begins in the spring semester

College Credit

The University of Texas Cockrell School of Engineering is now offering a dual enrollment option for the spring semester. Students who submit a portfolio of work from this course in the fall semester can be approved to enroll in an engineering elective course at UT in the spring semester (ES 301). Students will submit coursework online, directly to UT, several times in the spring for evaluation. More information will be sent home in the fall semester about this opportunity.

Lab Safety & Material Use

Throughout the course students will be using electrical components, heating elements, cutting tools, chemicals, and possibly power tools to complete design challenges. If a student is irresponsible, wastes materials, or jeopardizes safety he or she will lose the privilege of accessing tools and materials in the classroom. All students will be required to turn in a signed AISD safety contract and pass a safety test with a grade of 100% before accessing classroom equipment and materials.