

# Scientific Research & Design

## 2019 – 20 Course Description

Welcome to *Scientific Research & Design*. 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 individual- or team-based design challenges. The curriculum is designed to provide students with a capstone experience in engineering and technical design fields and focuses on

- building engineering design skills
- utilizing both the scientific method and engineering design process
- applying knowledge and skills from core academic courses
- developing and practicing engineering habits of mind, and
- demonstrating employability skills, including professional communication

All of these components are integrated with the career and technical education (CTE) emphasis of helping students gain entry-level employment in high-skill, high-wage jobs and/or continue their education beyond high school graduation.

### Units of Instruction

- 1 Life Cycle Assessment for design
- 2 Independent Study
- 3 Engineering Failure & Ethics

### Required Materials

- 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
- portfolio/presentation book with 24 sheet protectors (available at office supply stores)

### Recommended Materials

- mechanical pencil with eraser – highly recommended for sketching and calculations
- scientific or graphing calculator
- materials for design challenges – as necessary, depending on the chosen design

### Research & Independent Study

This course is designed to have a strong research focus and allow advanced STEM students opportunities to investigate topics of interest within the very broad engineering field. Students will be expected to choose, propose, plan, monitor, complete, and present independent projects throughout the course, either individually or in teams. The instructor is a facilitator to guide student work, and the expectation for student initiative is high.

## Credit

This course counts as a science credit for graduation. It can also count as an elective credit. It is the fourth course in the STEM Engineering Endorsement and can only be taken upon successful completion of the prior 3 courses.

## Evaluation and Grading Policy

Grading will be on a point system, with minor assignments valued between 10 and 30 points and major assignments valued between 50 and 100 points. All assignments will count as 80% of the six weeks grade.

<b>Engineering Notebook Design Documentation</b> (several 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, construction planning and documentation, and reflections. The notebook will be formatted in a professional manner.
<b>Design Challenges</b> (one or two major grades per grading period)	Most design challenges will be completed in teams. Students on a team will be assessed on final design components, results, and team documentation, including reports and/or presentations. For very long-term projects, weekly progress grades will be given.
<b>Work Habits</b> (one major grade per grading period)	Employability skills are important. All students will be given a Work Habits assessment <i>every day of class</i> . The average of these daily assessments will count for 20% of the six weeks grade. Given the independent nature of work in this course, students are expected to self-monitor their behavior and effectiveness in class. Tardies, unexcused absences, lack of effort, inappropriate behavior, and inappropriate use of technology are all issues that will affect a student's Work Habits daily grade.

## 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.