Spaulding High School
2022 Engineering and Design Syllabus

Course Title: Engineering
Department: Mathematics
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Course Description:
Students in this course will develop key engineering skills through the use of design principles and the Iterative Process This STEAM course provides an introduction to engineering through a series of team-based design projects and discussions based around the process and habits of engineers. Students will practice written and oral communication, teamwork, and management of long-term team-based projects. The course integrates mathematics, problem solving and engineering principles in order to transform a standard classroom into a modern engineering environment.

Practice:
Students will be expected to work in groups of 2 or more, adhering to current social distancing and virtual collaboration practices. Teams will need to be willing to do research, document their ideas and progress, while adhering to hard deadlines in order to complete projects and be successful in class.
Students will be required to document all work, and ideas in an engineering journal (digital and/or physical journal) as proof of problem solving and using the iterative process. This is crucial for being assessed.

Assessment/Reassessment:
Students will be assessed in multiple ways (Engineering journals, conversations with the teacher, written presentations and demonstrations) and may reassess on any topic that they wish as long as they show evidence of progress using the PAS system.

To be assessed students will build a portfolio of work that demonstrates their proficiency in a particular indicator and/or standard. Students need to show growth or consistency in any indicator they work toward being proficient in. These portfolios will be shared with the teacher and guardians.

Course Standards: *Students will be able to…*
Provide evidence and a reflection on how they achieved proficient or better in the standards and indicators shared below.

Engineering Standards Rubric

Standards	Beginning	Developing	Proficient	Exemplary
A. Problem Scoping	Student does not identify the boundaries of a problem or alters them to suit their needs	Student can identify some of the boundaries of a problem (naming). Student rarely considers trade-offs or the interactions of different constraints or criteria. There is little to no reflection on decisions.	Student can identify the boundaries of a problem (naming). Student considers trade-offs or the interactions of different constraints or criteria. There is documented reflective practices on how to prioritizing different criteria and boundaries	Student can identify the boundaries of a problem across different categories and perspectives (naming). Student considers trade-offs or the interactions of different constraints or criteria. There is documented reflective practices on how to prioritize different criteria and boundaries. Student can create and generate new problems as they arise in the project.
B. Research	Very little or cursory research is done on a few topics.	Research is done on a few topics. The student relies mostly on their own knowledge base and assumes outcomes.	Research is done on relevant topics in order to help plan and predict. Research is clearly used (i.e. mathematical calculations or scientific/engineering research.) Research is cited from a variety of legitimate sources.	Research is done on all relevant topics in order to help plan and predict. Research is cited from a variety of legitimate sources and clearly utilized throughout the design process.
C. Brainstorming and Idea selection process	Can create few ideas or solutions.	Can create few ideas or solutions. Solution to the problem was identified on instinct or little logical process	Can create many ideas or solutions, ideas are not limited to the personal knowledge base of the designer. Ideas worth pursuing are chosen using a logical design selection strategies	Can consistently create many ideas or solutions. ideas are not limited to the personal knowledge base of the designer. Ideas worth pursuing are chosen using a diverse range of logical design selection strategies
D. Testing and Prototyping	Can create simple non scientific testing of ideas and prototypes	Can create basic tests that do not accurately compare, challenge, or push ideas	Can create well defined tests that accurately compare, challenge, and push ideas forward. Clearly uses testing as a way to receive feedback and improve designs	Can create well defined tests that accurately compare, challenge, and push ideas forward. Tests conclusively show success or failure based on data and sound scientific practices.. Clearly uses testing as a way to receive feedback and improve designs.

E. Planning and documentation	Little to no planning is done. Student presents a final product with little to no documentation	An attempt at planning is done. Student is late with due dates and has rudimentary documentation indicating their use of the design process.	Student has clearly documented a plan for solving the problem. This may include how they will utilize the design process. Due dates are met consistently	Student has clearly documented a plan for solving the problem. This may include how they will utilize the design process. Student is able to adapt and change their strategy based on new information, failure and feedback. Due dates are met consistently
F. Improving ideas and Iteration of Design	It is unclear how the solution has evolved and is very similar to one of the original ideas.	Final solution has evolved very little from brainstorming. An attempt was made to go through the design process at least once.	Final solution has evolved throughout the design process.. Improvements are documented and based on tests, failure, and research. An attempt was made to go through the design process more than once.	Final solution has evolved throughout the design process.. Improvements are documented and based on tests, failure, and research. Student clearly used the design process multiple times in order to create a best solution to the problem.

Students are expected to demonstrate that they are proficient or better in 4 of the 6 standards before the end of the semester. To be proficient in a standard students need to either show consistency by having multiple pieces of evidence that are either proficient or better, or they must show growth in the topic throughout the course, with at least one piece of evidence that is proficient or better. This also the process for being exemplary in a standard.

Course Expectations:

- Students will be expected to work in groups and complete assignments as a team.
- Students will be expected to share their ideas and work publicly and participate in classroom discussions.
- Students are expected to document their completed work in an Engineering Journal
- If you are absent, it is your responsibility to make arrangements to make up missed work/assessments.
- It is the student's responsibility to make a plan for reassessing and relearning missed concepts or standards.
- Cell phone will be turned off and placed in assigned area of classroom at the beginning of class.
- Supports are in place for extra help if needed
    - Advisory
    - PAS system

Materials/Resources:

- Pencils and erasers: Every day.
- Engineering Journal (necessary for being assessed)
- An online space to Journal or keep track ideas
- Whiteboard markers
- School issued Chromebook