

Roanoke Valley Governor's School for Science and Technology
Introduction to Engineering Research Syllabus 2020-2021
Mr. Connor Wade

I. Course Information

a. Course Description

This class will offer many opportunities for students who are interested in engineering to gain a variety of engineering and fabrication skills. This class will be very hands-on and will include: CAD (Solid Works) training, 3-D printer fabrication, laser cutting fabrication, 3 axis machining, building-testing electronic circuits, and Arduino programming. All students will design, build, and develop the code for an engineering design project that is controlled by a microcontroller. Students will be responsible for designing and fabricating the majority of the component's and will only be allowed to procure specific items that cannot be made. Students will learn numerous skills in this class that will not only assist them as their design and fabrication project, but will provide the students with skills that they can use throughout their college career.

b. Gifted education strategies

i. Differentiation: Instructor will differentiate/modify the curriculum and his instructional methods in response to the needs, strengths, learning styles, and interests of individual students so that all students have an opportunity to learn at their full potential. Differentiation typically involves modifying instruction in terms of **content** (skills to be learned), **process** (activities designed to teach the skills), and **product** (projects and assessments that demonstrate the extent to which the skills were learned).

ii. An Emphasis on Higher-Level Thinking. Students need to learn about important engineering concepts and also to manipulate those concepts in complex ways. Having students analyze the relationship between real world problems and seeing the connections between engineering and society provides opportunities for both critical and creative thinking within a problem-based episode.

iii. An Emphasis on Inquiry, Especially Problem-Based Learning. The more that students can construct their understanding about engineering for themselves, the better able they will be to encounter new situations and apply appropriate scientific processes to them. Through guided questions/problems by the teacher, collaborative dialogue and discussion with peers, and individual exploration of key questions, students can grow in the development of valuable habits of mind found among engineers.

iv. Higher Order Thinking: Advanced questioning in discussions and providing activities based on the six levels of the 'Revised Bloom's Taxonomy of Higher-Order

Thinking Skills.’ The process verbs, activities, and products range from simple and factual thinking to more complex and abstract levels of thinking. **v. An Emphasis on Learning the Scientific Process, Using Experimental Design Procedures.** Engineering design activities will be used in the classroom to expose students to the design cycle and the need to work collaborative.

Text, Printed Resources, and Media Resources

- Handouts by your instructor.
- Websites
- Professional documents developed by the student.

II. Grading Policy

a. Grading Scale

100-90%	A
89-80%	B
79-70%	C
69-60%	D
59-0%	F

b. Types of Evaluations

i. Fall:

1. Solid Works Project
2. Fabrication Project Evaluations.
3. Laser Fabrication Project Evaluations.
4. Electronic Design and Circuit Board Project Evaluations 6.
6. Engineering Notebook Evaluation.

ii. Spring:

1. Engineering Notebook: Students will submit a lab notebook detailing the work that was done and when the work was done. It will be comprehensive and in enough detail that another engineering student would be able to replicate the design
2. Project Forum Display Board and Presentation: Students will create a professional display board and present their findings at project forum.
3. Post Project Forum Process: Students will be actively engaged in developing modifications to their project.

c. Semester Grade Determination

1st Semester

- i. Engineering Notebook, 20%. This will include:
 - 1. Proper Documentation
 - 2. Logging all work done and when it was done.
 - 3. Time management with respect to the assignments listed above
- ii. Design and Fabrication Process/Classwork, 50%. This will include:
 - 1. Solid Works Detail and Assembly Projects:
 - 2. 3-D Printer Fabrication Projects
 - 3. Laser Fabrication Project
 - 5. Electronic Design and Circuit Board
- iii. Project, 30%. This will include:
 - 1. Quality of Design.
 - 2. Scheduling
 - 3. Time management with respect to the assignments listed above

2nd Semester

- i. Research Presentation/Classwork, 50%. This will include:
 - 1. Project Display Board Components
 - 2. Completed Project Display Board
 - 3. Project Forum Day
 - 4. PowerPoint Presentation to class
 - 5. Time management with respect to the assignments listed above
- ii. Engineering Notebook, 20%. This will include:
 - 1. Proper Documentation
 - 2. Logging all work done and when it was done
 - 3. Time management with respect to the assignments listed above
- iii. Final Design/Fabrication Research Project, 30%. This will include:
 - 1. Effort
 - 2. Quality of work done during intersession
 - 3. The level of rigor of their final project
 - 4. Time management with respect to the assignments listed above

d. Final Grade Determination

The final grade is the average of the 2 semester grades. Students who fail to maintain a B average or above will be subject to the RVGS probationary policy.

III. Class Policies and Procedures

a. Absences and tardies: The policy in the RVGS student handbook will be followed. **b. Make-up Work:** If an absence is unplanned, a student will be allotted the same

number of days to make up the work as they were absent (i.e., if they were absent for 2 days, they would have 2 days to make up the work.) Note this includes extra- curricular activities.

c. Late-work policy: If an assignment is turned in late, the max credit will be lowered by one letter grade. After 4 days late, the assignment will not be accepted for credit.

d. Cheating: The policy in the RCPS student code of conduct will be followed.

e. Technology Policy: The RCPS Acceptable Use Policy and the RVGS student handbook policy will be followed.

f. Extra help: It is inevitable that there will be times when a student may not grasp a concept the first time. Extra help is always available, but it is to the student to seek help as soon as possible. The following options are available to the student for extra help, but the student should be sure to make arrangements with your instructor to make sure that he is available at a given time:

i. Before School (arrangements must be made the previous day)

ii. During Lunch (arrangements must be made the previous day)

iii. Email **iv.** Telephone

g. Home Access Center: Grades are available at all times through Home Access Center. When viewing your grades, understand that:

i. A blank in the grade book means that the assignment has not yet been graded. Teachers will have all assignments graded within 5 school days of the due date (with the exception of very long assignments which will be graded within 10 school days). You may have a blank because the teacher has not graded the class set or because your assignment was turned in after the due date. Blanks do not count as zeros in your average.

ii. A zero in the grade book means that you have earned a zero on the assignment. Cases in which this might occur include submitting incorrect answers to an assignment or submitting an assignment past the due date.

iii. An excused (EX) in the grade book means that you are excused from the assignment without penalty.

h. Interim Reports: A hard-copy of your current grade will be given to you to take home three times during each semester (see dates on the school calendar). The interim report is a snapshot of the current class average. Please feel free to discuss your report with your instructor.

i. Student Performance Strategy: Interventions will be implemented at the teacher's discretion or in the event that the student's grade falls below an 80.

j. General classroom procedures: Students are expected to be productive at all times.

