



SATURDAY ENRICHMENT SPRING 2022

Robotics Arena

Instructor: A.J. Balatico

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Location: Mary Gates Hall (MGH), Room 254

Course Description

Starting with a group of metal robot champions – designed and built by the previous robotics class – students will focus on building parts and equipment for their robots to address new challenges every other week. A bigger robot may be able to push others around, but can it win in a race? Will a small robot have enough capacity to carry objects across the room? Constraints such as time or limited parts will make it so teams need to think creatively about trade-offs. Students will work together to design and test possible solutions and they will spend time practicing driving and controlling their robot. No previous robotics experience is required.

Learning Outcomes

Students will:

- 1) design robots and parts with goals (such as pushing, pulling, rolling, and climbing) and constraints (such as storage, sturdiness, length) in mind.
- 2) design for accessibility, modularity, and ergonomics in mind; robot assembly should be repeatable.
- 3) give and receive constructive feedback related to the design of their robot.

Instructional Strategies

Each week, we will have a goal outlined in the course schedule. These metal pieces are lightweight and can be assembled with screws and hex Allen wrenches. The motors are also “plug and play,” allowing students to focus on rapid prototyping and design. Robot parts can be moved from robot to robot and should be kept assembled for the entirety of class.

Students will have the option to work on their own robot, or as a team. We will occasionally watch YouTube videos or refer to the work of existing VEX and FIRST competition teams.

Machining, or making custom parts, is not part of the class, but most kinds of movement can be accomplished with the parts we have on hand. *The main cleanup rule: All loose parts that are not attached to the robot will be put away each week.* To encourage students to complete portions of their robots, parts must be attached.

If a student must miss class, their robots will be set aside. When they return, they will have the option to continue building their own robot but may also work with another group.

The instructor will facilitate discussion about certain robot challenges and comment on the robustness of the robot designs. Students are encouraged to use as few parts as possible for their robots to function with a “less is more” approach to design.

Resources and Materials

Our primary building materials are metal VEX EDR, the “robot brain,” and “smart motors” that act like servo motors, or ones that can maintain their position. Students will be able to draw and plan their builds from week to week. All materials will be provided by the Robinson Center.

Tentative Course Schedule

Date	Topics, Activities, and Challenges
Week 1 – April 2	<p>Robot Champion and Parts Drafting Students will select from existing robots. They are only allowed to make repairs and adjustments for alignments on these robots, but cannot change the overall design. They will each select from a limited number of parts to make modifications.</p>
Week 2 – April 9	<p>Racing Students will practice driving for a race around historic Mary Gates Hall!</p>
Week 3 – April 16	<p>Sumo Tournament Will the fast robot be able to push bigger robots? How does the shape of the chassis and attachments help push other robots?</p>
Week 4 – April 23	<p>Mod Build Build a few multipurpose attachable items like claws and flywheels to accomplish various goals such as picking up, sweeping, or launching objects.</p>
Week 5 – April 30	<p>Carrying Capacity How many objects can the robot retrieve by itself? What about in a team? The opponent in one match might be the teammate in the next match.</p>
Week 6 – May 7	<p>Balance Can the robot successfully navigate a maze without dropping an object? Can it release the object on a platform without knocking anything over?</p>
Week 7 – May 14	<p>Game and Free Design Students will design the final challenge and their robot loadouts while agreeing on fair scoring and win conditions.</p>
Week 8 – May 21	<p>Rumble Arena Students will showcase their final robots. Whose robot will last the longest?</p>