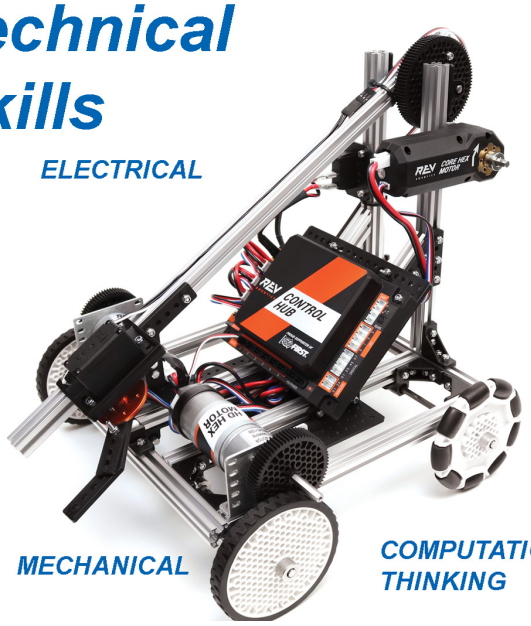
FIRST TECH CHALLENGE

Crossroads Class Pack

Technical Skills

ELECTRICAL



MECHANICAL

COMPUTATIONAL THINKING

Workforce Skills

Technical and workforce skills developed through robotics competition in the classroom.

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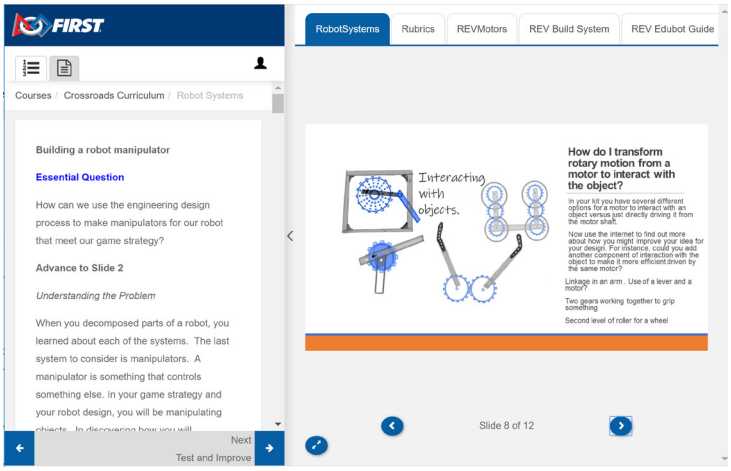
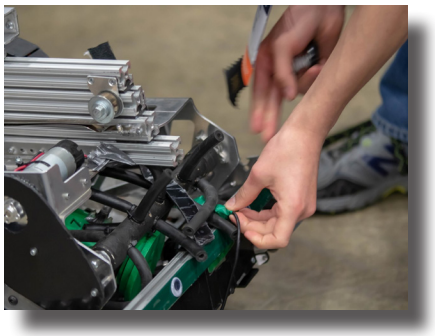
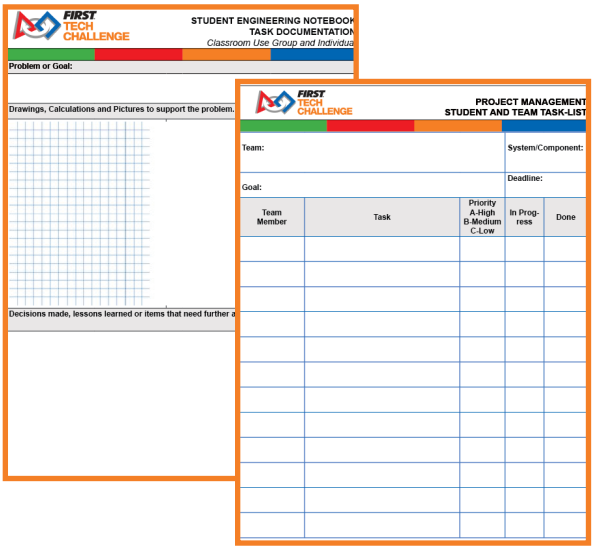
Students discover academic and technical skills needed for building a robot using the digital learning management system.



Students practice problem-solving and perseverance through building, modifying, and improving the robot.



Students develop teamwork, collaboration, and communication skills through documenting engineering design and project management.



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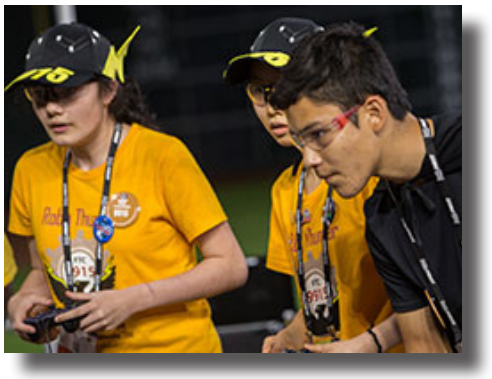
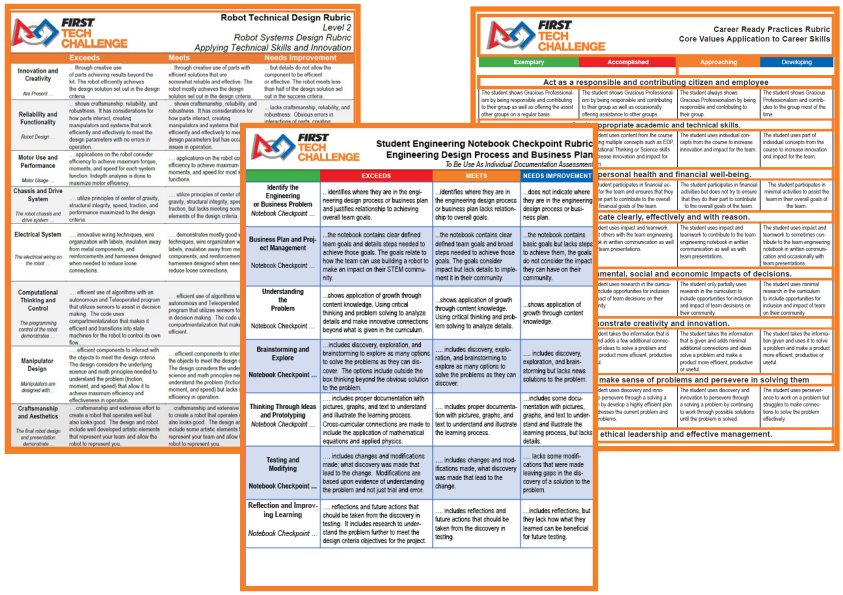
Teams compete in presentations and class mini-game for awards in robot technical design, engineering notebook, and career readiness.



Teams and individuals use rubrics tied to learning outcomes to set goals and improve through iteration.



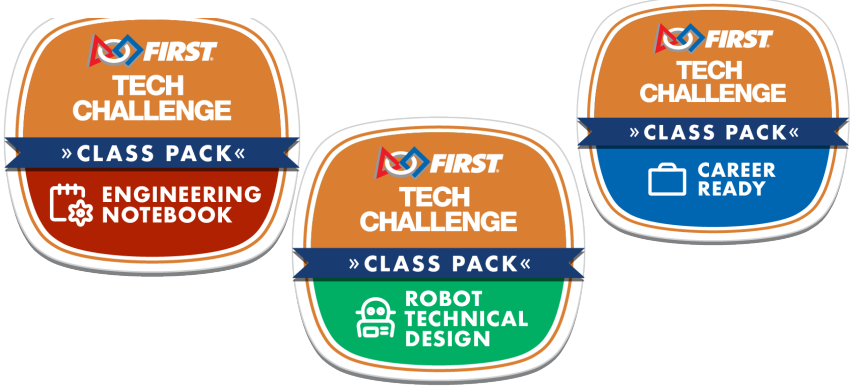
Robot Technical Design Rubric
Level 2
Robot Systems Design Rubric
Applying Technical Skills and Innovation

	Exceeds	Meets	Needs Improvement
Innovation and Creativity	... through creative use of parts achieving results beyond the kit. The robot efficiently achieves the design solution set out in the design criteria.	... through creative use of parts with efficient solutions that are somewhat reliable and effective. The robot mostly achieves the design solution set out in the design criteria.	... but details do not allow the component to be efficient or effective. The robot meets less than half of the design solution set out in the success criteria.
Reliability and Functionality	... shows craftsmanship, reliability, and robustness. It has considerations for how parts interact, creating manipulators and systems that work efficiently and effectively to meet the design parameters with no errors in operation.	... shows craftsmanship, reliability, and robustness. It has considerations for how parts interact, creating manipulators and systems that work efficiently and effectively to meet the design parameters but has some issues in operation.	... lacks craftsmanship, reliability, and robustness. Obvious errors in interactions of parts, creating
Motor Use and Performance	... applications on the robot consider efficiency to achieve maximum torque, moments, and speed for each system function. Indepth analysis is done to maximize motor efficiency.	... applications on the robot consider efficiency to achieve maximum moments, and speed for most functions.	
Chassis and Drive System	... utilize principles of center of gravity, structural integrity, speed, traction, but lacks meeting some elements of the design criteria.	... utilize principles of center of gravity, structural integrity, speed, traction, but lacks meeting some elements of the design criteria.	
Electrical System	... innovative wiring techniques, wire organization with labels, insulation away from metal components, and reinforcements and harnesses designed when needed to reduce loose connections.	... demonstrates mostly good techniques, wire organization with labels, insulation away from metal components, and reinforcements and harnesses designed when needed to reduce loose connections.	
Computational Thinking and Control	... efficient use of algorithms with an autonomous and Teleoperated program that utilizes sensors to assist in decision making. The code uses compartmentalization that makes it efficient and translates into stable machines for the robot to control its own flow.	... efficient use of algorithms with an autonomous and Teleoperated program that utilizes sensors to assist in decision making. The code uses compartmentalization that makes it efficient.	
Manipulator Design	... efficient components to interact with the objects to meet the design criteria. The design considers the underlying science and math principles needed to understand the problem (friction, moment, and speed) that allow it to achieve maximum efficiency and effectiveness in operation.	... efficient components to interact with the objects to meet the design criteria. The design considers the underlying science and math principles needed to understand the problem (friction, moment, and speed) but lacks efficiency in operation.	
Craftsmanship and Aesthetics	... craftsmanship and extensive effort to create a robot that operates well but also looks good. The design and robot include well developed artistic elements that represent your team and allow the robot to represent you.	... craftsmanship and extensive effort to create a robot that operates well but also looks good. The design and include some artistic elements that represent your team and allow the robot to represent you.	

Career Ready Practices Rubric
Core Values Application to Career Skills

	Exemplary	Accomplished	Approaching	Developing
Act as a responsible and contributing citizen and employee	The student shows Gracious Professionalism by being responsible and contributing to their group as well as offering the assist other groups on a regular basis.	The student shows Gracious Professionalism by being responsible and contributing to their group as well as occasionally offering assistance to other groups.	The student always shows Gracious Professionalism by being responsible and contributing to their group.	The student shows Gracious Professionalism and contributes to the group most of the time.
...ppropriate academic and technical skills.	...dent uses content from the course ...g multiple concepts such as EDP, ...ditional Thinking or Science skills ...rease innovation and impact for ...	The student uses individual concepts from the course to increase innovation and impact for the team.	The student uses part of individual concepts from the course to increase innovation and impact for the team.	
...personal health and financial well-being.	...tudent participates in financial ac... for the team and ensures that they ...er part to contribute to the overall ...financial goals of the team.	The student participates in financial activities but does not try to ensure that they do their part to contribute to the overall goals of the team.	The student participates in minimal activities to assist the team in their overall goals of the team.	
...cate clearly, effectively and with reason.	...dent uses impact and teamwork ...others with the team engineering ...k in written communication as well as ...team presentations.	The student uses impact and teamwork to contribute to the team engineering notebook in written communication as well as with team presentations.	The student uses impact and teamwork to sometimes contribute to the team engineering notebook in written communication and occasionally with team presentations.	
...mental, social and economic impacts of decisions.	...dent uses research in the curricu... include opportunities for inclusion ...act of team decisions on their ...nity.	The student only partially uses research in the curriculum to include opportunities for inclusion and impact of team decisions on their community.	The student uses minimal research in the curriculum to include opportunities for inclusion and impact of team on their community.	
...onstrate creativity and innovation.	...dent takes the information that is ...ld adds a few additional connec... ...d ideas to solve a problem and ...product more efficient, productive ...l.	The student takes the information that is given and adds minimal additional connections and ideas solve a problem and make a product more efficient, productive or useful.	The student takes the information given and uses it to solve a problem and make a product more efficient, productive or useful.	
...make sense of problems and persevere in solving them	...dent uses discovery and inno... ...s persevere through a solving a ...to develop a highly efficient plan ...chooses the current problem and ...problems.	The student uses discovery and innovation to persevere through a solving a problem by continuing to work through possible solutions until the problem is solved.	The student uses perseverance to work on a problem but struggles to make connections to solve the problem effectively.	
...ethical leadership and effective management.				

Student Engineering Notebook Checkpoint Rubric
Engineering Design Process and Business Plan
To Be Use As Individual Documentation Assessment

	EXCEEDS	MEETS	NEEDS IMPROVEMENT
Identify the Engineering or Business Problem Notebook Checkpoint ...	...identifies where they are in the engineering design process or business plan and justifies relationship to achieving overall team goals.	...identifies where they are in the engineering design process or business plan lacks relationship to overall goals.	...does not indicate where they are in the engineering design process or business plan.
Business Plan and Project Management Notebook Checkpoint ...	...the notebook contains clear defined team goals and details steps needed to achieve those goals. The goals relate to how the team can use building a robot to make an impact on their STEM community.	...the notebook contains clear defined team goals and broad steps needed to achieve those goals. The goals consider impact but lack details to implement it in their community.	...the notebook contains basic goals but lacks steps to achieve them, the goals do not consider the impact they can have on their community.
Understanding the Problem Notebook Checkpoint ...	...shows application of growth through content knowledge. Using critical thinking and problem solving to analyze details and make innovative connections beyond what is given in the curriculum.	...shows application of growth through content knowledge. Using critical thinking and problem solving to analyze details.	...shows application of growth through content knowledge.
Brainstorming and Explore Notebook Checkpoint ...	...includes discovery, exploration, and brainstorming to explore as many options to solve the problems as they can discover. The options include outside the box thinking beyond the obvious solution to the problem.	...includes discovery, exploration, and brainstorming to explore as many options to solve the problems as they can discover.	...includes discovery, exploration, and brainstorming but lacks news solutions to the problem.
Thinking Through Ideas and Prototyping Notebook Checkpoint ...	...includes proper documentation with pictures, graphs, and text to understand and illustrate the learning process. Cross-curricular connections are made to include the application of mathematical equations and applied physics.	...includes proper documentation with pictures, graphs, and text to understand and illustrate the learning process.	...includes some documentation with pictures, graphs, and text to understand and illustrate the learning process, but lacks details.
Testing and Modifying Notebook Checkpoint ...	...includes changes and modifications made, what discovery was made that lead to the change. Modifications are based upon evidence of understanding the problem and not just trial and error.	...includes changes and modifications made, what discovery was made that lead to the change.	...lacks some modifications that were made leaving gaps in the discovery of a solution to the problem.
Reflection and Improving Learning Notebook Checkpoint ...	...reflections and future actions that should be taken from the discovery in testing. It includes research to understand the problem further to meet the design criteria objectives for the project.	...includes reflections and future actions that should be taken from the discovery in testing.	...includes reflections, but they lack how what they learned can be beneficial for future testing.

Individuals earn digital badges through Tallo to demonstrate skills and competencies to others.