

FIRST[®] Documentation



- Team Meeting Guide*
- Engineering Notebooks*
- Robot Game Rulebook*
- Updates (During the Season)



*Included with mission kit

Facilitators and Team Members Need To Read the Robot Game Rulebook!

Engineering Design Process

- A process that starts with asking what your design is to do
- Then imagining ideas and selecting one
- Followed by planning how to build it and resources needed
- Creating a prototype
- Evaluate how to improving the design



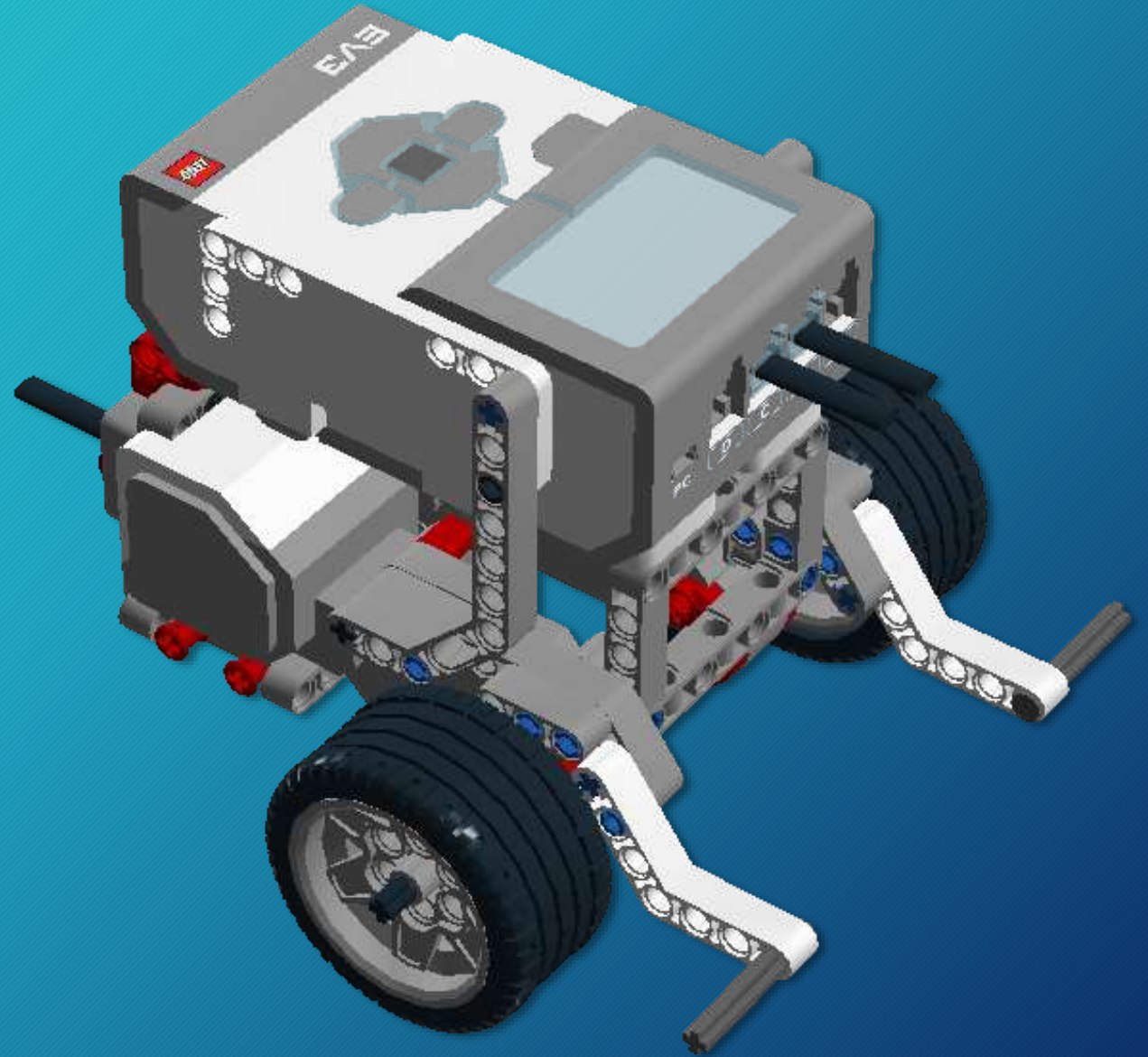
LEGO® EV3 Educational Robot

The LEGO® Educational Robot is a go place to start for new teams

Keep robot design simple and functional

Building Instructions:

<https://education.lego.com/en-us/support/mindstorms-ev3/building-instructions#building-core>



EV3 Lessons Educator++

An example of the engineering design process. Started with EV3 Educational robot, then designed refined

Building Instructions:

<https://ev3lessons.com/en/RobotDesigns.html>



LEGO® SPIKE™ Prime

- The newly release SPIKE™ Prime
- Combines colorful LEGO building elements, easy-to-use hardware, and an intuitive drag-and-drop coding language based on Scratch with the option to explore text-based coding with Python



FLL[®] Rubric



- Robot Design has three main categories:
 - Mechanical Design
 - Programming
 - Strategy and Innovation

		Beginning	Developing	Accomplished	Exemplary
Robot	Mechanical Design	Economic use of parts and time; easy to repair and modify with evidence of structural integrity and the ability of the robot to move or act with appropriate speed, strength & accuracy for intended tasks, to withstand rigors of competition. <i>Accomplished: rare faults/repairs; appropriate use of parts and time to repair/modify; appropriate balance of speed, strength and accuracy on most tasks</i>			
	Programming	Modular, understandable programs that are appropriate for intended purpose and would achieve consistent results using mechanical or sensor feedback <i>Accomplished: should achieve purpose repeatedly; appropriate code and easy to understand; robot moves/acts as intended repeatedly w/ occasional driver intervention</i>			
	Strategy & Innovation	Ability to develop and explain improvement cycles where alternatives are considered; ability to clearly define and describe the team's game strategy which includes unique, or unexpected feature(s) that are beneficial in performing the specified tasks <i>Accomplished: systematic and well-explained; clear strategy to accomplish the team's well-defined goals; original feature(s) with the potential to add significant value</i>			
	Comments:				



Use the rubric throughout the season to evaluate your robot.

Basic Design Tips



- Simpler is better
- Smaller robots navigates obstacles easier
- Wheel size: small more accurate, large quicker
- Fast robot - less travel time to missions, slow robot - more accurate
- Design for attachments to go on and off quickly
- Design to use the field for position (i.e. used the black lines, missions, and wall for position)
- Design robot to always start from the same location, don't visually aim
- Design to minimize time in base
- Passive vs powered attachments
- Watch your center of gravity
- Make structure sturdy

5 Basic troubleshooting steps



1. Identify and Verify the Problem
2. Rule Out the Obvious
3. Start with the Simple Solutions
4. Use Isolation Troubleshooting Techniques
5. None of Us Are as Smart as All of Us



You can observe a lot by just watching. - Yogi Berra

CAD for LEGOS[®]

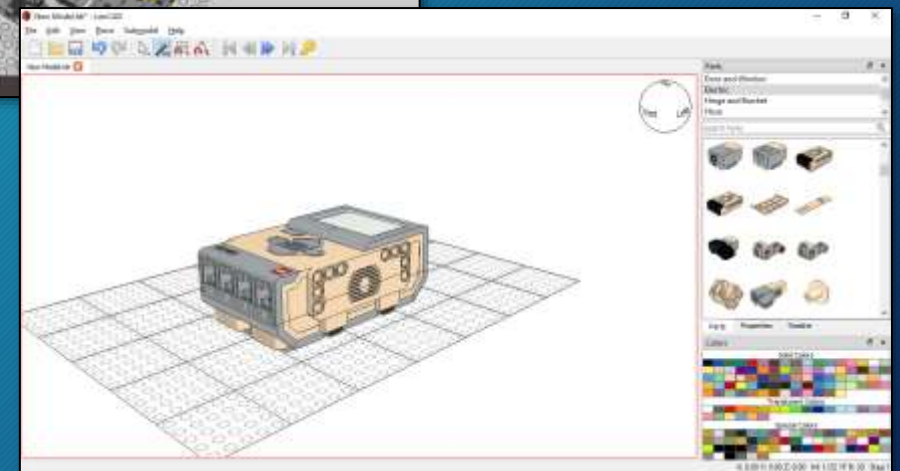
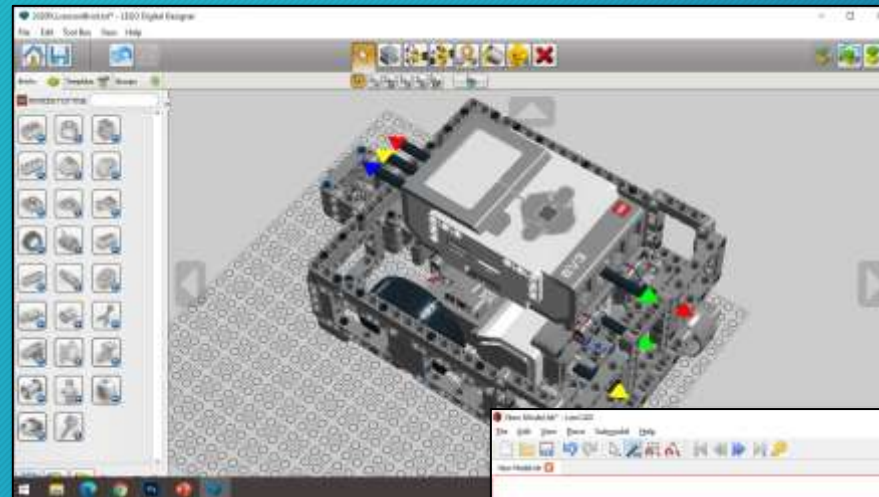


- Can be used to design and document your team's robot
- Team members can share robot designs

Lego Digital Designer

<http://ldd.lego.com/en-us/>

LeoCAD: <https://www.leocad.org/>



Common Questions



- Is there ever a point where teams should stop redesigning their robot?
- Are there any robot design mistakes you would like to warn new coaches about?
- How important is having a team name their robot?

Online - References, Tools and Parts



- Roboplex.org FLL Resources: <http://roboplex.org/fll/resources/>
- Techbrick: <http://www.techbrick.com/>
- Wheels: <http://wheels.sariel.pl/>
- Gears: <http://gears.sariel.pl/>
- Lego Educational: <http://legoeducation.us/>
- Brick Owl: <http://www.brickowl.com/>
- Techbrick: <http://www.techbrick.com/>
- BrickSet: <http://brickset.com/browse>

