FIRST® Robotics Competition Guided Experience

Course Outline: Pre-Season Training Path

Module 1: Intro to FIRST Robotics Competition
Online Training Content: 1.5 – 2 hours | Recommended Guided Activities: 3-5+ hours

Participants in the *Intro to FIRST® Robotics Competition* module will learn more about *FIRST* Robotics Competition teams, games, competitions, resources, and more.

LESSON	OBJECTIVE
FIRST Robotics Competition Ethos	Explore the *FIRST* Robotics Competition and its community spirit (ethos), including *Gracious Professionalism*®, *Coopertition*®, and Core Values.
Overview of *FIRST* Robotics Competition Games	Explore common types of exciting *FIRST* Robotics Competition games and learn the anatomy of a match. Then analyze, reflect, and discuss various aspects of previous *FIRST* Robotics Competition games with your teammates using guided questions.
Sub teams and Career Connections	Learn about the roles on *FIRST* Robotics Competition teams and their connections to jobs in different industries.
Team Organization	Explore best practices for building team leadership, fostering communication, and leveraging your team's brand.
Community Resources	Explore the numerous resources in the *FIRST* Robotics Competition community that will help your team succeed, including how to find inspiration and help during build season.
Competitions	Explore how *FIRST* Robotics Competition competitions are both similar to, and unlike, other sporting events, filled with learning and team-building opportunities. Participants will also find resources to attend an off-season competition.

Assessments	Formative assessments include knowledge checks, guided activities, and class and team discussions. The guided activities are Core Values Poster Project, Career Exploration, Resource Scavenger Hunt, and Plan and Host a Team Building Party. The Guided Experience Rubric serves as the summative assessment.

Module 2: How Do FIRST Robotics Competition Robots Work?
Online Training Content: 2 hours | Recommended Guided Activities: 2-4+ hours

Participants in the *How Do FIRST® Robotics Competition Robots Work?* module will learn more about basic drivetrains, mechanisms, power, and programming commonly used by *FIRST* Robotics Competition teams.

LESSON	OBJECTIVE
Robot Chassis and Drivetrain	Explore robot chassis considerations, including the frame, bumpers, and belly pans, as well as the pros and cons of common drivetrains. Then, explore a variety of wheels used in *FIRST* and watch drivetrains in action in order to reflect and discuss with your teammates using guided questions.
Game Piece Manipulators	Explore a wide variety of mechanisms that can be integrated into a robot in order to play a *FIRST* Robotics Competition game. Then, use the Engineering Design Process to take part in a fun engineering challenge: Lift Larry.
Power and Control	Learn how robots are powered and controlled by exploring motors and actuators, electronics, and the control system as well as the Driver Station. Then, test your knowledge of these components.
Programming	Explore robot programming languages and decide which language your team wants to use to code your robot. Then, install important software tools and explore important programming tools and resources.

Assessments	Formative assessments include knowledge checks, guided activities, and class and team discussions. The guided activity is the Lift Larry Engineering Challenge. The Guided Experience Rubric serves as the summative assessment.

Module 3: Intro to CAD and 3D Printing

Online Training Content: 2-3 hours | Recommended Guided Activities: 2-4+ hours

Participants in the *Intro to CAD and 3D Printing* module will learn the fundamentals of Computer-Aided Design (CAD) and how it's used in engineering, robotics, and other careers. Then, explore 3D printing through hands-on design activities and troubleshooting exercises.

LESSON	OBJECTIVE
What is Computer-Aided Design?	Learn how computer-aided design (CAD) is used to digitally create 2D drawings and 3D models of real-world products and parts before they are manufactured. Then, explore careers that use CAD software.
CAD for Product Design	Navigate the CAD software program Onshape by exploring basic tools and processes. Then, learn how to design a *FIRST* logo keychain using a guided CAD walkthrough in Onshape
Intro to 3D Printing	Explore how 3D printing has revolutionized manufacturing, the types of 3D printers and how they work, and tips and tricks to 3D printing. Then, complete a guided exploration to evaluate whether your team's keychain design will print correctly.
CAD Resources for *FIRST* Robotics Competition	Explore a variety of CAD resources that help *FIRST* Robotics Competition teams design their robot. Then, use KrayonCAD to complete a Guided Experience, Lift Larry: The Iterative Sequel!

Assessments	Formative assessments include knowledge checks, guided activities, and class and team discussions. The guided activities are *FIRST* Logo Keychain Design, Will My Part Print?, and Lift Larry: The Iterative Sequel. The Guided Experience Rubric serves as the summative assessment.

Module 4: Fabrication Tools and Safety

Online Training Content: 1.5 – 2 hours | Recommended Guided Activities: 4-8+ hours

Participants in the *Fabrication Tools and Safety* module will learn how to safely and effectively operate fabrication tools commonly used in robotics. This module emphasizes safety protocols, tool and fastener selection, and organization strategies, preparing students to confidently contribute to the physical construction of robot components.

LESSON	OBJECTIVE
Safety Resources for *FIRST* Teams	Explore safety best practices for *FIRST* Robotics Competition teams, including the use of Personal Protective Equipment (PPE) and a variety of resources provided by *FIRST*. Then, test what you've learned in a safety Kahoot!
Subtractive Manufacturing	Learn about common subtractive manufacturing tools used by *FIRST* teams, including power saws, drills, and more advanced tools such as mills, lathes, laser cutters, and CNC machines. Then, complete a Guided Experience to tour your team's shop and manufacturing tools.
Tools and Fasteners	Explore the most common fasteners and their associated tools used by *FIRST* Robotics Competition teams. Then, utilize your tool training to complete a Team Activity: Build a Battery Cart!

Assessments	Formative assessments include knowledge checks, guided activities, and class and team discussions. The guided activities are Safety Kahoot!, Tools Tour, and Battery Cart Build. The Guided Experience Rubric serves as the summative assessment.

Module 5: Rapid Prototyping

Online Training Content: 1.5 – 2 hours | Recommended Guided Activities: 3-6+ hours

Participants in the *Rapid Prototyping* module will learn ways to test design ideas, quickly iterate, and make changes to a mechanism for a robot. Explore commonly used materials for the structure of a robot as well as tips, tricks, and materials for rapid prototyping through hands-on exercises.

LESSON	OBJECTIVE
Structural Materials	Navigate a variety of materials that *FIRST* teams use for the structural parts of their robots and learn which materials are best used for rapid prototyping. Then, test your knowledge about these materials and their uses through an interactive scenario.
Intro to Rapid Prototyping	Learn tips and helpful materials for rapid prototyping to create "aha!" moments. Then, complete a Guided Activity, Low-Fidelity Prototype, to use a drill and hex shaft to test how different wheels might interact with different potential game pieces.
Building a Better Prototype	Learn what it means to make a medium- or high-fidelity prototype by following a step-by-step guide to build a frisbee launcher. Then, test your prototype and use what you've learned to continue making improvements or create a new frisbee launcher prototype with an alternate design.

Assessments	Formative assessments include knowledge checks, guided activities, and class and team discussions. The guided activities are Quick and Easy Prototyping, Medium Fidelity (Circular) Frisbee Launcher and High Fidelity (Linear) Frisbee Launcher. The Guided Experience Rubric serves as the summative assessment.

Module 6: Preparing for Build Season

Online Training Content: 2 hours | Recommended Guided Activities: 3-6+ hours

Participants in the *Preparing for Build Season* module will learn how to prepare for success in build season through evaluating resources, planning schedules and meals, fundraising, and holding a mock kickoff.

LESSON	OBJECTIVE
Inventory Resources	Identify the resources that your *FIRST* team needs to be successful during build season, from Mentors to materials to meals. Then complete a Guided Experience: Team Materials and Budget to detail what the team needs in order to be ready by Kickoff.
Develop a Fundraising Plan	Navigate a variety of resources provided in the *FIRST* Fundraising Toolkit, including advice for gaining sponsorships, in-kind donations, grants, and the possibility of creating a 501(c)3 or a booster club. Then complete a Guided Experience: Fundraiser Event Template to create a plan for a fundraising event.
Hold a Mock Kickoff	Get ready to take on a new *FIRST* Robotics Competition game by learning tips and tricks for reading the game manual, understanding the rules and specifications, as well as conducting a game analysis to create a strategy. Then test your understanding of the game by taking a rules quiz.

Assessments	Formative assessments include knowledge checks, guided activities, and class and team discussions. The guided activities are Core Values Poster Project, Career Exploration, Resource Scavenger Hunt, and Plan and Host a Team Building Party. The Guided Experience Rubric serves as the summative assessment.

Build Season Training Path (JANUARY 2026 RELEASE)

- **Module 7: Kickoff Strategy & Game Analysis**
- **Module 8: Mechanical Systems & Design**
- **Module 9: Electrical Systems & Programming Integration**
- **Module 10: Business, Branding, & Media**
- **Module 11: Preparing for Competition & Scouting**
- **Module 12: Season Reflection & Sustainability Planning**

Career Technical Education Module Alignments

MODULES	1	2	3	4	5	6
Career Clusters and Sub Clusters						
Advanced Manufacturing						
Engineering	•	•	•	•	•	
Industrial Machinery		•		•	•	
Production & Automation			•	•	•	•
Robotics	•	•	•	•	•	•
Safety & Quality Assurance				•	•	•
Construction						
Architecture & Civil Engineering			•		•	
Construction Planning & Development						•
Equipment Operation & Maintenance		•		•		
Skilled Trades		•		•	•	
Arts, Entertainment, and Design						
Design & Digital Arts	•		•		•	•
Media Production & Broadcasting						•
Hospitality, Events, & Tourism						
Conferences & Events						•
Culinary & Food Services						•
Financial Services and Education						
Accounting						•
Financial Strategy & Investments						•
Learner Support & Community Engagement	•					•
Teaching, Training & Facilitation	•					•
Public Service & Safety and Health & Human Services						
Emergency Response		•		•		
Local, State & Federal Services	•					
Public Safety		•		•		
Community & Social Services						•
Agriculture and Energy & Natural Resources						
Food Science & Processing						•
Utilities		•				
Marketing & Sales						
Market Research, Analytics, & Ethics						•
Marketing & Advertising						•
Strategic Sales						•
Management & Entrepreneurship						
Business Information Management	•				•	
Entrepreneurship & Small Business						•
Leadership & Operations	•					•
Project Management	•	•	•	•	•	•
Regulation				•		
Digital Technology						
IT Support & Services	•	•		•	•	•
Network Systems & Cybersecurity		•		•		
Software Solutions	•	•	•		•	•
Unmanned Vehicle Technology						
Web & Cloud			•		•	•
Supply Chain & Transportation						
Planning & Logistics						•
Purchasing & Warehousing						•
Career Ready Practices						
1. Lead as a contributing and professional employee	•			•		•
2. Communicate clearly, effectively & with reason	•		•			•
3. Think critically to make sense of problems & persevere in solving them		•	•	•	•	
4. Collaborate productively while using cultural & global competencies	•					•
5. Use digital skills & technologies to enhance productivity & make data informed decisions		•	•		•	
6. Remain resilient in a changing workplace & world of work	•			•		•
7. Manage time effectively & space effectively	•			•		•
8. Demonstrate a creative & innovative mindset			•	•		
9. Act as a good steward of organizational & personal finances & resources					•	
10. Navigate an education & career path aligned to strengths, work style, interests & goals	•					•
11. Consider the environmental & social impacts of decisions					•	
12. Apply appropriate academic & technical skills	•	•	•	•	•	•
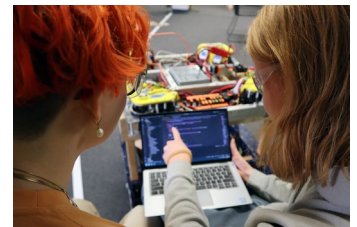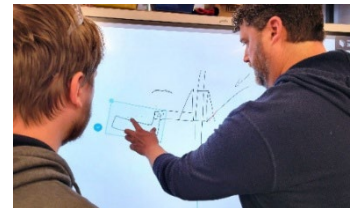
Academic Standards Module Alignments

Next Generation Science Standards (NGSS)

MODULES	1	2	3	4	5	6
HS-ETS1-1	•			•		•
HS-ETS1-2	•	•			•	
HS-ETS1-3	•					•
HS-ETS1-4			•		•	

	1	2	3	4	5	6
HS-PS1-1			•			
HS-PS1-3			•			
HS-PS2-1				•		

	1	2	3	4	5	6
HS-PS2-6		•				
HS-PS3-1						•
HS-PS3-3		•			•	

International Society for Technology in Education Standards (ISTE)

MODULES	1	2	3	4	5	6
1.1.a	•		•		•	•
1.1.c	•					
1.2.b	•			•		
1.3.a	•	•	•		•	•

	1	2	3	4	5	6
1.3.b	•					
1.3.c			•	•		
1.4.a		•	•	•	•	•
1.5.c		•	•	•	•	•

	1	2	3	4	5	6
1.5.d		•		•		
1.6.b		•	•	•	•	•
1.7.a	•					
1.7.d	•					•

International Technology & Engineering Educators Association Standards (ITEEA STEL)

MODULES	1	2	3	4	5	6
1N	•					
1O	•	•	•			•
1P	•					
1Q	•		•		•	
1R	•	•	•		•	•
2T		•	•	•	•	
2U		•		•		
2V		•		•		
2W		•		•		•
2X		•	•	•	•	
2Y		•	•	•	•	
2Z		•		•		•
3I		•				•

	1	2	3	4	5	6
3J	•		•		•	•
4P	•	•	•	•	•	•
4R			•			
4S				•	•	•
4T	•	•				
5H	•					•
5I	•					
6F	•					
6G	•					
6H	•					•
6I	•					
6J	•					

	1	2	3	4	5	6
7W		•	•		•	•
7X		•			•	•
7Y		•	•		•	•
7Z					•	•
7AA			•		•	
7BB			•		•	
7CC			•		•	
7DD				•	•	
8N				•		•
8P		•		•		
8Q			•	•		•
8R						•

Computer Science Teacher Association (CSTA)

MODULES	1	2	3	4	5	6
3A-CS-01		–	–			
3A-CS-02		–				
3A-CS-03		•		–	–	
3A-DA-09			–			
3A-DA-10						–
3A-DA-11					–	–
3A-DA-12		–			–	
3A-AP-13		–			–	
3A-AP-15		–				
3A-AP-16		–				
3A-AP-17		•			•	•
3A-AP-18		–				

	1	2	3	4	5	6
3A-AP-21					–	
3A-AP-22	•	•	•	•	•	•
3A-AP-23	•	•	•	•	•	•
3A-IC-24	•					
3A-IC-25	–					
3A-IC-26			–			–
3A-IC-27	–					–
3B-CS-02			–			
3B-DA-05					–	–
3B-DA-06					–	–
3B-DA-07			–			–

	1	2	3	4	5	6
3B-AP-10		–				
3B-AP-14		–				
3B-AP-15						–
3B-AP-16		–				
3B-AP-20		–	–	–	–	
3B-AP-21		–			–	
3B-AP-22		–				
3B-AP-23		–				
3B-AP-24		–				
3B-IC-25	•					
3B-IC-26		–				
3B-IC-27		–				

● Fully Addressed   — Partially Addressed

Academic Standards Module Alignments

Common Core State Standards-English Language Arts (CCSS.ELA)

MODULES	1	2	3	4	5	6
RST.11-12.7		•	•	•	•	•
RST.11-12.9	–	–	–	–	–	–
RST.9-10.3	•	•	•	•	•	•
SL.11-12.4	•	•	–	–	–	–
SL.11-12.6	–	–	–	–	–	–
SL.9-10.1	•	•	•	•	•	•

	1	2	3	4	5	6
SL.9-10.4	•	•	–	–	–	–
SL.9-10.6	–	–	–	–	–	–
W.11-12.4		•		•	•	•
W.11-12.6			–	–	–	–
W.11-12.7	–	–	–	–	–	–
W.9-10.4		•		•	•	•

	1	2	3	4	5	6
W.9-10.6		–	–	–	–	–
W.9-10.7		–	–	–	–	–
WHST.11-12.2	–	–	•	•	•	•
WHST.11-12.6	–	–	–	–	–	–
WHST.11-12.7	–	–	–	–	–	–
WHST.11-12.9	–	–	–	–	–	–
WHST.9-12.2	–	–	•	•	•	•

Common Core State Standards-Math (CCSS.Math)

MODULES	1	2	3	4	5	6
N-Q.1		•	•	•	•	•
N-Q.2		•	•	•	•	•
N-Q.3		•	•	•	•	•
N-VM.1		•	–	–	•	
N-VM.2		•	–	–	•	
N-VM.3		•	–	–	•	
N-VM.4		•	–	–	•	
N-VM.5		•	–	–	•	
A-SSE.1		•	•		•	•
A-CED.1		•	•	•	•	•
A-CED.2		•	•	•	•	•
A-CED.3		•	•	•	•	•
A-CED.4		•	•	•	•	•
A-REI.3		•	•	•	•	•
A-REI.5					•	
A-REI.6					•	
F-IF.1		•	•		•	–
F-IF.2		•	•		•	–
F-IF.3		•	•		•	–
F-IF.4		•	•		•	–
F-IF.5		•	•		•	–
F-IF.6		•	•		•	–
F-IF.7		•	•		•	–
F-IF.9		•	•		•	–
F-BF.1		•	•		•	–
F-BF.3		•	•		•	–
F-LE.1		•	•		•	–
F-LE.2		•	•		•	–
F-LE.3		•	•		•	–
F-LE.5		•	•		•	–
F-TF.1			•	•	•	
F-TF.2			•	•	•	
F-TF.3			•	•	•	
F-TF.4			•		•	
F-TF.5			•		•	
F-TF.6			•		•	
F-TF.7			•		•	

	1	2	3	4	5	6
G-CO.1		•	•	•	•	
G-CO.2		•	•	•	•	
G-CO.3		•	•	•	•	
G-CO.4			•	•	•	
G-CO.5			•	•	•	
G-CO.6			•		•	
G-CO.7			•		•	
G-CO.8			•		•	
G-CO.12			•	•	•	
G-CO.13			•	•	•	
G-SRT.1		–	–	–	–	
G-SRT.2		–	–	–	–	
G-SRT.3		–	–	–	–	
G-SRT.4		–	–	–	–	
G-SRT.5		–	–	–	–	
G-SRT.6		–	–	–	–	–
G-SRT.7		–	–	–	–	–
G-SRT.8		–	–	–	–	–
G-SRT.9			–	–	–	
G-SRT.10			–	–	–	
G-SRT.11			–	–	–	
G-C.1			–	–	–	
G-C.2			–	–	–	
G-C.3			–	–	–	
G-C.4			–	–	–	
G-C.5		–	–	–	–	
G-GPE.1		–		–	–	
G-GPE.2		–		–	–	
G-GPE.3		–		–	–	
G-GPE.4		–		–	–	
G-GPE.5		–		–	–	
G-GPE.6		–		–	–	
G-GPE.7		–		–	–	
G-GMD.1		–		–	–	
G-GMD.2		–		–	–	
G-GMD.3		–		–	–	
G-GMD.4		–		–	–	
G-MG.1		•	•	•	•	
G-MG.2		•	•	•	•	
G-MG.3		•	•	•	•	

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S-ID.1		–	–	–	–	–
S-ID.2		–	–	–	–	–
S-ID.3		–	–	–	–	–
S-ID.4					–	
S-ID.5					•	•
S-ID.6		–	–	–	–	
S-ID.7		–	–	–	–	
S-ID.8		–	–	–	–	
S-ID.9		–	–	–	–	
S-IC.1					•	–
S-IC.2					•	
S-IC.3					•	
S-IC.4					•	
S-IC.5					•	
S-IC.6					•	
S-CP.1					–	–
S-CP.2					–	–
S-CP.3					–	–
S-CP.4					–	–
S-CP.5		–				–
S-CP.6					–	–
S-CP.7					–	–
S-CP.8					–	–
S-CP.9					–	–
S-MD.1					–	–
S-MD.2					–	–
S-MD.3					–	–
S-MD.4					–	–
S-MD.5					–	–
S-MD.6					–	–
S-MD.7					–	–
MP1	•	•	•	•	•	•
MP2		•			•	•
MP3	•	•	•	•	•	•
MP4	–	•	•		•	•
MP5	–	•	•	•	•	•
MP6		–	•	•	•	•
MP7					–	
MP8						–

• Fully Addressed   — Partially Addressed