The Rookie Bookie

Presented by:
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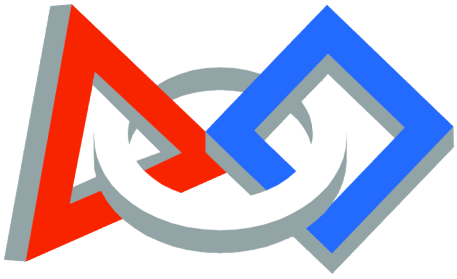
FRC Team 1676



FIRST®
TECH
CHALLENGE

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I. Introduction

What is *FIRST*?

FIRST stands for For Inspiration and Recognition of Science and Technology. It is a global organization with participation of 110+ countries and 3.2 million+ youth participants since 1989. FIRST consists of three programs designed for kids from elementary to high school:

FRC- *FIRST* Robotics Competition for ages 14-18.

FTC- *FIRST* Tech Challenge for ages 12-18.

FLL- *FIRST* LEGO League Challenge for ages 9-16.

FLL- *FIRST* LEGO League Explore for ages 6-10.

FLL- *FIRST* LEGO League Discover for ages 4-6.

FIRST enables individual students to thrive in a team setting. Teams build a robot every year to execute a set of challenges set out by *FIRST*. The challenges and size of the robots vary from program to program. For FTC, the robots are 18 by 18 by 18 inches (45 cm x 45 cm x 45 cm) in starting position, and complete tasks on a 12 by 12 foot (3.65 m x 3.65 m) field. Teams should create an Engineering Portfolio that documents the design process of the robot and their sustainability/business plan, to not only stay organized but to also qualify for many awards.

When is the FTC Season?

Registration opens in May, when teams generally prepare for the upcoming season. *FIRST* announces the season's game in September, and teams begin to build their robots. Competition season can begin as early as October, but it typically starts around November and December for qualifying competitions, and higher-level competitions continue into April. After competition season, there are off-season events where teams can strategize, hone their skills, learn new technology, meet other teams, and most importantly- have fun!

What is Gracious Professionalism?

According to *FIRST*:
Gracious Professionalism® is part of the ethos of *FIRST*. It's a way of doing things that encourages high quality work, emphasizes the value of others, and respects individuals and the community.
In the context of *FIRST*, this means that all teams and participants should:

- Learn to be strong competitors, but also treat one another with respect and kindness in the process
- Avoid leaving anyone feeling as if they are excluded or unappreciated.

FIRST recommends providing your team with real-life examples of Gracious Professionalism in practice, such as when a team loans valuable materials or expertise to another team that they will later face as an opponent in competition. Routinely highlight opportunities to display Gracious Professionalism at events and encourage team members to suggest ways in which they can demonstrate this quality themselves and through outreach activities.

What is Coopertition?

According to *FIRST*:
At *FIRST*, Coopertition® is displaying unqualified kindness and respect in the face of fierce competition. Coopertition is founded on the concept and philosophy that teams can and should help and cooperate with one another even as they compete. Coopertition involves learning from teammates and mentors. Coopertition means competing always but assisting and enabling others when you can.

FIRST recommends spending time going over these concepts with your team and reinforcing them regularly.

FTC Competition Structure

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Registration Opens												
Pre-Season												
Kickoff												
Build and Practice Season												
Qualifying Season												
State/Regional Championships												
World Championship												

The flowchart above from the *FIRST* website illustrates the various ways teams advance through the competition. Depending on your region, your team's first competition can be a meet, or a qualifying tournament. Some teams advance to league championships by competing at meets while others go straight to a qualifying tournament. Every team that advances from either super-qualifying, qualifying, or league championships have the opportunity to go to a regional/state championship to advance to the *FIRST* World Championship in Houston, Texas.

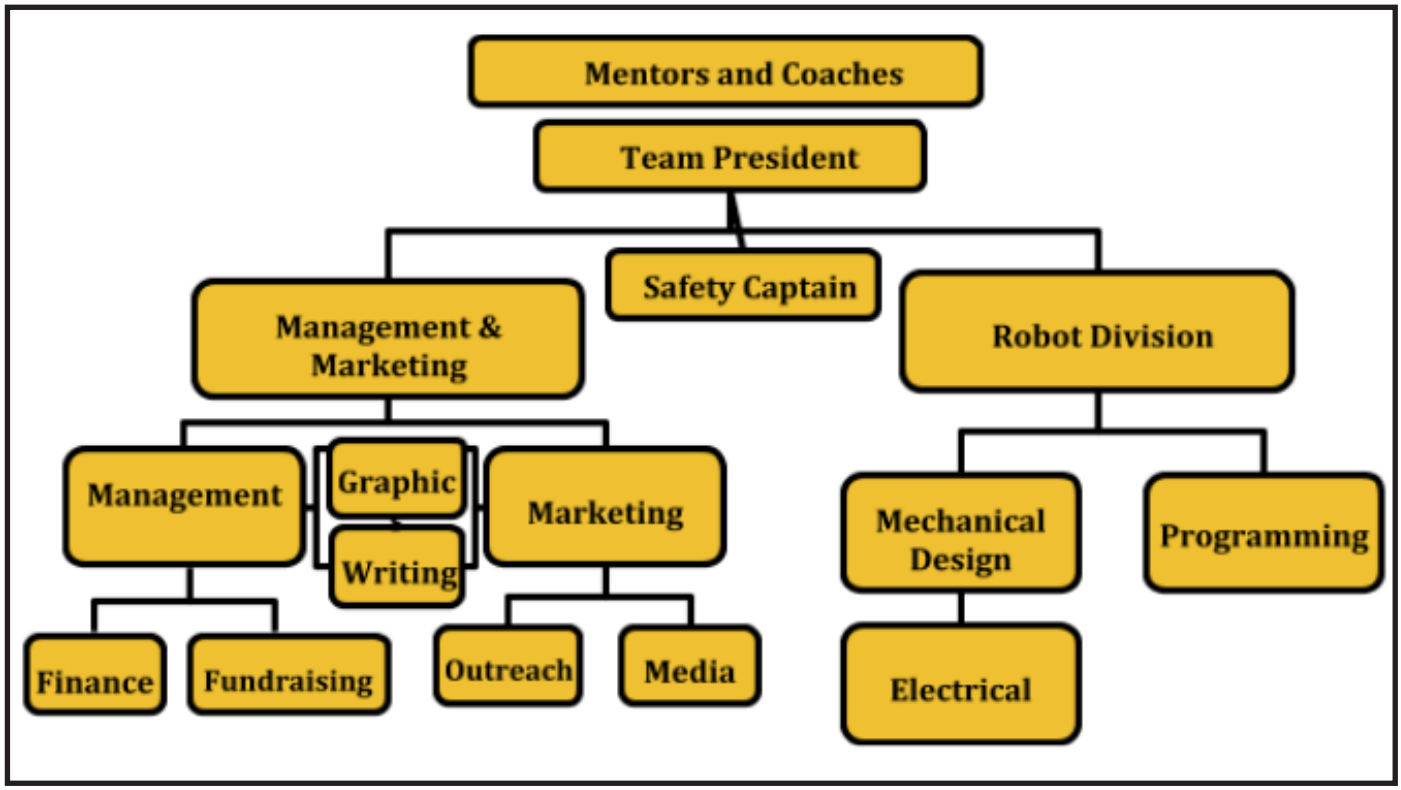
Photo by Team 1676

II.a. Leadership Guide

Team organization is the key to success. As a rookie team, a system of organization is essential for building a strong foundation for the team's future. The establishment of Divisions will allow for an even distribution of work.

Teams can be divided into two Divisions: Robot and Management & Marketing. For each individual Sub-Division, a student leader should be appointed to oversee all aspects and direct team members on their Sub-Division. Depending on the size of your team, you might see it necessary to separate or combine Sub-Divisions, or allow some members to work for more than one Sub-Division.

Sample Leadership Organization



Team President

A team President acts as the overarching leader of the team. **This job and its responsibilities should not be passed on to a mentor; a qualified student must be chosen**. This position is vital for maintaining a student-led team. However, the President will partner with the mentors for guidance and assistance. The responsibilities of a President include:

- Organizing & leading team meetings with the mentors and coaches
- Ensuring steady and consistent progress is being made in every Sub-Division
- Acting as a link between Sub-Division leaders and the mentors/coaches
- Keeping students involved in team activities
- Dividing work and choosing team Division and Sub-Division leaders in partnership with the mentors/coaches

Robot Division

The Robot Division works to create a functional robot that is able to complete the goals presented by *FIRST* in order to perform well at the competition each year. Although it varies by team, at its core, the team only needs two Subdivisions for the robot.

- **Mechanical**
  - The Mechanical Subdivision is responsible for designing the robot, the drive train, the chassis, and any additional parts specific to the game.
  - An important aspect of being on the Mechanical Subdivision is wiring the robot, arranging electrical components, and ensuring all the wiring is done correctly. For some teams, Electrical can be its own Sub-Division.
- **Programming**
  - The Programming Subdivision is responsible for programming the robot in autonomous and teleoperated modes. The code can be written in Java using Android Studio, OnBot Java Programming, Blocks Development tool, Java Native Interface (JNI) & Android Native Development Kit (NDK), or other available resources. The programs can run through the Dashboard and the Robot Controller apps available at the control hub and driver's station.

Drive Team

A Drive Team is a maximum of four people from the same FTC team responsible for team performance for a specific match. There are three specific roles on a Drive Team that alliances can use to assist robots, and no more than one member of the Drive Team is allowed to be a non-student.

ROLE	DESCRIPTION	MAX./ DRIVE TEAM	CRITERIA
DRIVE COACH	Guide or advisor	1	• Any team member • Can be an adult • Must wear a “Drive Coach” badge
DRIVER AND OPERATOR	Operator and controller of the robot	2	• Student • Must wear a “Driver” badge
HUMAN PLAYER	Scoring element manager	1*	• Student • Must wear a “Human Player” badge

***Only one HUMAN PLAYER is allowed to represent an alliance in a match**

Drive Team consists of members who:

- Arrive at the competition affiliated with their specific team
- Are responsible for team and robot performance at that event
  - A person may be affiliated with more than one team
- Have been checked against the official team roster by Queuing prior to the Drive Team entering the field of play area

Drive Team members from other teams:

- Teams may not “adopt” members of other teams for strategic advantage for any team/alliance
  - For example, if “an alliance captain believes one of their drivers has more experience than a driver of their alliance partner, and the teams can agree, the first pick team will “adopt” that driver and make them a member of their drive team for playoffs” (FTC Game Manual, Section 10.2)
- However, to allow teams to display Gracious Professionalism, teams may loan drivers as temporary members of the team until the drive team arrives.
  - For example, if a team is delayed, and the DRIVE COACH has no DRIVERS, other teams can agree to help by loaning DRIVERS as temporary members of the team until their team arrives

Management & Marketing Division

The Management & Marketing Division is responsible for everything that does not relate to the building of the robot. For larger teams, this can be divided up into Sub-Divisions with individual leaders appointed to each group; for smaller teams, the Management & Marketing Division might have one leader that delegates each of these tasks to individuals or groups. The Management & Marketing Division's responsibilities include:

- **Management**
    - Finance
        - Finance is responsible for management of team funds
        - They organize all receipts/expenses
        - They create the team budget with income/expenses
        - They work with the Writing Sub-Division to apply for grants
        - They work with the Writing Sub-Division to fill out the Business Section of the Engineering Notebook
    - Fundraising
        - Fundraising creates fun and interesting events to raise money for the team
            - Organize bake sales, car washes, sell spirit wear, or any other type of event your team thinks of- be creative!
- **Marketing**
    - Outreach
        - Outreach arranges new, fun events that incorporate STEAM (Science, Technology, Engineering, Art, & Math) into the community and spread *FIRST*
    - Media
        - Media photographs all team events, regular team meetings, and progress of the robot
        - They create and uphold all social media platforms for the team by consistently posting about team activities and the events they are holding
        - They create video submissions for the Promote Award, and also create a record of team activities
        - They can create a website for the team

- **Graphic Design**
    - Graphic design creates a team shirt, team buttons, and a team logo
    - They help with the design and layout of the Engineering Portfolio and the Engineering Notebook
    - They create brochures and handouts for the team, including pit information
    - They also may create flyers for outreach and other projects the team is advertising

- **Writing**
    - Writers are responsible for the Team and the Business section of the Engineering Portfolio/ Notebook
    - Responsible for managing daily log of the Engineering Notebook
    - They create and write any team handout materials

- **Safety Captain**
    - The Safety Captain is responsible for creating procedures and protocols to ensure the safety of everyone on the team, including:
        - Establishing tool qualification testing, overseeing tool qualifications, and ensuring tool safety is enforced while working
            - Maintaining team certification chart
        - Establishing and maintaining safety rules during Build Season, Competition Season, and travel
            - The team should have a Safety Binder to stay organized and easily find information, which includes:
                - Create a Safety Contract - explicitly outlines all safety rules and expectations
                - Machine Certification Chart - team members are trained and certified to use tools
                - Injury Chart
                - Safety Data Sheets - any chemicals used by the team need to have data sheets that contain instructions for safe use and list potential hazards
                - *FIRST* Safety Manual - https://www.firstinspires.org/sites/default/files/uploads/resource_\library/frc/team-resources/safety/ftc-frc-safety-manual.pdf
            - Some example rules include:
                - Wear closed-toe shoes when in the build area
                - Keep hair tied back when working on the robot and with tools
                - Wear safety glasses in the build area
                - Know of an emergency meeting place at all competitions and events
                - Have emergency contact information at all competitions.
        - Creating an Emergency Plan - What to do in case of an injury/emergency
        - Maintain a first aid kit, understanding how to use it, ensuring all team members know its location
            - Taking the first aid kit to all outreach events and to all competitions
        - Pit Attack Plan - All pit members have assigned duties to carry out in case of an emergency and must check in and out of the pit when leaving the area. Everyone is assigned to do a job in this order
            1. Take Control: This person will be telling everyone what to do when there is an emergency and make sure the area is safe to help the person who is injured
            2. Go for Help: This person will run to the EMTs at the competition, pit administration, or the safety advisor
            3. Security and Back it up: This person will back up the situation and square the area
            4. Perform Compressions (CPR): There is a person in charge of giving compressions who is CPR/AED certified
            5. Retrieve the Bug-Out-Box: This will have the first aid kit and other essentials to the situation

II.b. Mentor Requirements

According to the *FIRST* website, “In *FIRST* Tech Challenge, it is important that mentors and students are equal and that the relationship is a partnership. Mentors should be willing to acquire some basic knowledge of programming and robot building. *FIRST* strongly encourages teams to invite people with backgrounds in engineering and programming to share their knowledge and experience.”

- ***FIRST* Responsibilities for Coaches**:
  - Create a *FIRST* account for your team
  - Create a Team Profile
  - Complete Youth Protection Screening (US/Canada Lead Coach/Mentors only)
  - Invite Team Members to “Join Team” through *FIRST* website
  - Register the team for the season
  - Find a build space and a place to store team materials
  - Purchase a Kit of Parts
    - An electronics kit, a control/communication kit, and a competition kit
  - Organize Kickoff
  - Register for local events

- **Team responsibilities**:
  - Have basic building materials
    - Allen set
    - Deburring tool
    - Dremel tool or disk sander
    - Hex keys
    - Hand drills
    - Metal file
    - Pliers
    - Small screwdrivers
    - Wrench metric and SAE set
    - Zip ties
  - Electronics
    - Laptop to run your development tool
    - At least one power strip
    - An extension cord (optional)

- **Team Meetings**:
  - Create a meeting schedule & timeline for team goals
    - Keep the team goal-oriented (short and long term)
    - Utilize communication to ensure deadlines are met (Within the team and its Sub-Divisions)
  - Facilitate team problem solving and brainstorming
  - Ensure students develop mechanical skills without completing tasks for them
    - Develop training regimen for Sub-Divisions
  - Work with the team’s Safety Captain to maintain safety standards

II.c. Recruitment

Recruitment is a key part of maintaining a successful and sustainable team. There are many ways to inspire enthusiasm and accumulate members through your school and community:

- Present to your school's science/math classes
- Hold interest meetings before or after school
- Demonstrate the benefits of engaging students in STEAM/*FIRST*
- Reach younger students that will look forward to joining the team
    - Visit middle schools who will attend your school
- Promote team through community events
- Create a recruitment flyer and distribute it throughout your school and social media
- Place an advertisement in the local newspaper about your team

II.d. Engineering Portfolio

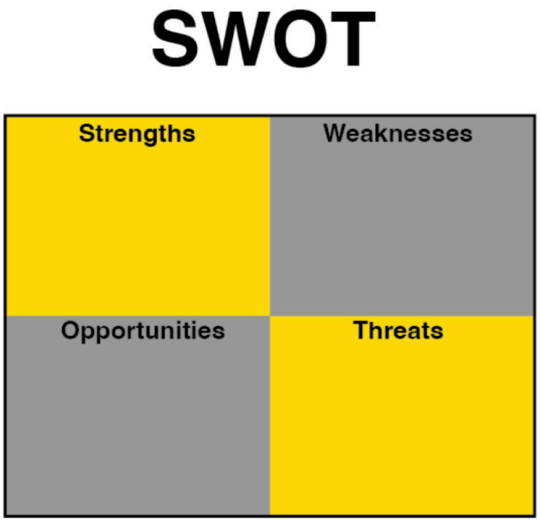
Engineering Portfolio Section

Introduction

The main objective of the Engineering Portfolio is to convey the most important team information, including organizational structure, history, outreach, and robot design in a concise manner – it is an abridged version of the Engineering Notebook limited to 15 pages. No other information may be given to the judges to consider.

- **Specifications**
  - Limited to 15 pages - includes the cover
  - Minimum font size 10 point
  - US letter size (8.5” x 11”) or A4 size (210 x 297 mm) paper
  - Digital submissions must be smaller than 15MB
  - Judges will not open or view videos or links to external sources
  - Teams may use Artificial Intelligence (AI) to assist in making a portfolio, however, it must be credited via footnote or endnote.
- **Cover Page** (included in the 15-page count)
  - Team Number
  - Team Name
  - Team Logo
  - “Engineering Portfolio”
  - FTC logo
  - Team Address
  - Optional: Sponsored by - names and/or logos
- **Table of Contents** (included in the 15-page count)
  - Include the page number for each page
  - Hyperlink the page number to its respective section for online versions
  - Team Mission Statement
    - Provide your team’s mission statement
    - If you haven’t made one, hold a full team meeting and discuss important team goals and objectives you want to accomplish.
  - Team Photo.

- **Team Plan** (included in the 15-page count)
  - Team overview
  - Statistics
  - Organization Chart
    - Visually depict your team's organizational structure outlining team leaders, subdivision leaders, and subdivision groups
    - Provide a timeline highlighting team milestones of all sub-groups.
- **Business and Sustainability** (2 pages)
  - SWOT Chart
    - Create a chart detailing the team's strengths, weaknesses, opportunities, and threats. Strengths correspond with weaknesses, and opportunities correspond with threats.
  - Finances (Expenses and Revenue)
    - Include an Expense Chart and a Revenue Chart
  - Fundraising Chart
    - Includes sponsorships, fundraising events, spiritwear sales, gifts-in-kind
  - Sponsorships
    - Include a chart of the team's current sponsors
    - Briefly explain how sponsors are recruited, acknowledged, and retained
  - Recruitment
    - Explain how you recruit new team members and how you will improve recruiting efforts in the future



- **School Outreach** (1 - 2 pages)
  - List the most impactful school outreach events your team has held.
  - Planning
    - Provide a plan of the outreach event, including time, location, supplies needed, timeline of planning, day of the event.
  - Obstacles/Solutions
    - Describe any problems encountered before or during the event, as well as possible solutions that could be implemented for next time.
  - Team member reflections
    - In addition to problems and solutions, add feedback and reflections from team members.
    - Include how the event was impactful and what it meant to team members
- **Community Outreach** (1 - 2 pages)
  - List the most impactful community outreach events your team has held
  - Planning
    - Provide a plan for the outreach event, including time, location, and supplies needed.
  - Obstacles/Solutions
    - Describe any problems encountered before or during the event, as well as possible solutions that could be implemented for next time
  - Team member reflections
    - In addition to problems and solutions, add feedback and reflections from team members
    - Include how the event was impactful and what it meant to team members
- ***FIRST* Outreach** (1 - 2 pages)
  - Planning
    - Provide a plan of the outreach event, including time, location, and supplies needed.
  - Obstacles/Solutions
    - Describe any problems encountered before or during the event, as well as possible solutions that could be implemented for next time.
  - Team member reflections
    - In addition to problems and solutions, add feedback and reflections from team members.

- **Robot**
  - Design Process (Preliminary drawings/ideas, CAD, Prototype) (1 page)
    - It is important to outline preliminary robot design ideas for each apparatus.
    - As design ideas evolve, provide insight into newer concepts.
    - Questions to ask yourself: How did you brainstorm new robot design ideas? Who is involved in this brainstorming process?
  - Strategic Design (1 page)
    - Include different apparatuses of the robot and the strategic design of each
    - Explain how the robot supports your strategic approach within the game.
      - How will your robot help earn ranking points?
      - What roles will your robot play in an alliance?
      - How is your design unique?
    - Include preliminary sketches of each apparatus and collective robot design.
  - Programming
    - Explain strategic/unique approaches you took in code to fulfill robot tasks
- **Final Product (2 pages)**
  - Provide an image of the final CAD design and physical flight robot (All images should have a caption).
  - Describe each apparatus on the robot and how they work together.
  - Highlight mechanical advantages and disadvantages.
  - Programming
    - Include a section on Autonomous - Briefly describe what challenges/obstacles you faced with the code
    - Include a section on Teleop - Briefly describe what challenges/obstacles you faced with the code

Judging & Presentation

- Teams must submit their portfolio on time per the Event Director.
- If the Event Director does not give a time, teams submit one copy of their portfolio during the Judging Interview.
- To be considered for any awards, teams must:
    - Attend their scheduled judging session
- Interviewees should bring:
    - At least two student representatives
        - A copy of the Engineering Portfolio
        - Demonstration items (highly encouraged to bring the team's robot)
        - One adult silent observer (optional, may be a mentor)
        - One translator (as needed)
- Judging Interview Guidelines
    - Length of interview: minimum of 10 minutes
    - The interview timer will start after the team enters the room and begins.
    - Adult observers are not allowed to give coaching during the interaction between Judges and students.
    - The first 5 minutes of the interview are reserved for the team to give an uninterrupted oral presentation. This time may be ended early by the team, and the interview will continue as question and answer led by the Judges.
    - If a team requires a translator prior to their interview, they may request additional time of two to five minutes with the Event Director.
    - Video/Audio recording is prohibited during the interview.
- Judging Feedback
    - In-Person - After the interview, teams will receive a feedback form along with their portfolio
    - Remote - The lead coach/mentor will receive access to a digital copy of the feedback form following the event.

All teams must present to judges. Think strategically about the team members you choose to be interviewed by the judges. Talk about team highlights (both Non-Robot and Robot). We recommend using the Engineering Portfolio as a guideline.

Each team will be automatically assigned a 10-minute time slot

- To be considered for any awards, teams must:
    - Attend their scheduled judging session
- Interviewees should bring:
    - At least two student representatives
        - A copy of the Engineering Portfolio
        - Demonstration items (highly encouraged to bring the team's robot)
        - One adult silent observer (optional, may be a mentor)
        - One translator (as needed)
    - All team members in the room must be knowledgeable about all topics, but only speak about the ones they directly contributed to.
    - Suggested flow of presentation (Should be practiced and order should be pre-set):
        - Team Introduction
            - Team history and origin
            - Team organization
        - Robot
            - Discuss the key features that make your robot special. You can also discuss an obstacle your team struggled with and then overcame.
        - Engineering Portfolio
            - Present your sketches, explain how your design developed over the course of the meetings, and explain the strategy behind the design.
        - Business and Sustainability
            - Discuss highlights of your sustainability and business plan, such as sponsors, member recruitment, unique fundraising, or specific aspects of the plan that sets you apart from other teams.
        - Outreach/Other
            - Mention your team's community outreach or impact on the community and FIRST.
- 5 min Q & A
    - Judges will end your session with a 5 minute Question & Answer.
      - If they have more questions about your team, they will visit your pit.

II.e. Engineering Notebook

In the past, *FIRST* described the Engineering Notebook as a means to document "...the team's robot design and records the time spent doing research, outreach, team meetings, and plans for growth. This notebook includes the phases of the problem definition, concept design, system-level design, detailed design, test and verification, and production of the robot. These notebooks track a team from the beginning of the season and throughout the competition season. Judges review a team's engineering notebook to better understand the journey, design, and team as a whole. "

The submission of the Engineering Portfolio is required.
The submission of the Engineering Notebook is not permitted.
However, we recommend that the Notebook be
kept in the pit for reference when judges visit.

The Engineering Notebook should include:

- Dates on all meeting logs
- Sketches and explanations of all robot designs, parts, software updates, team logos, etc.
- Notes on discussions at team meetings, including team members' thought processes
- Processes and obstacles of robot/team and their solutions/results

Format

The notebook can be in an electronic or handwritten format:

- Electronic: should be printed and inserted into a binder, on front and back of each page
- Handwritten: spiral-bound, laboratory or documentation notebooks, must be in ink
  - To insert pictures or outside information into the notebook, tape the picture into the notebook and outline with permanent ink, to note that it was there in case it falls out. Put the corresponding page number on that inserted page
  - If there is an error, draw a single line through the incorrect data. Do NOT erase or use correction fluid. All corrections should be initialed and dated.

1. Front Cover

- Front cover **must have**:
  - Official team name and number
  - Name of school/address of team meeting place
  - Team logo (if available)
  - Optional: Use team colors
  - Optional: Use FTC logo
- One page summary on inside front cover
  - Bulleted highlights of your team's season
  - A Table of Contents with page numbers

2. Team Section

The Team Section is your team's opportunity to document team history, outreach events, and more to keep track of team development. Future members will need this information as the team grows, providing a comparison from year-to-year.

- **About Your Team**:
  - How, why, and when was your team created?
    - How was the team initiated?
    - Introduce each member of your team (no last names) with their position, grade, and how many years on the team
    - Explain what inspired people to initiate a team
    - Explain the story behind your team's name, logo, and colors
    - Include a timeline of your team's development since its creation
    - Discuss original sponsors
  - What is your team's mission?
    - Compose your team's mission statement
    - Consider including benefits for the team members, which may include learning STEAM skills, presentation skills, teamwork, leadership skills, management experience, and real-life skills for college and employment

- What are your team's goals?
  - Provide a plan for how your team will grow and develop in the next two to three years
- How do you divide work within your team?
  - Include a team's Organization Chart with the first names of your current team leaders, and explain the responsibilities of each Division and Sub-Division
- What are your team's statistics?
  - Number of members on your team yearly
  - Grade-level distribution
  - Percentage of males/females/other
  - Graduation rate (after rookie year)
  - Percentage of students that pursue STEAM in college/career (after rookie year)

- **Outreach**
  - Community Outreach
    - Your team's impact on increasing STEAM/*FIRST* interest within your
    - community
    - Events your team has done to contribute to the community
    - Include dates, times, flyers, and photos from your events
  - School Outreach
    - Recruitment of new members
    - Partnerships with other school clubs
    - Support from the school administration/Board of Education
  - *FIRST* Outreach
    - Team partnerships/collaborations
    - Team mentorships
    - Starting new teams
    - Include dates, times, and photos
    - Include letters/emails of communication and recognition

EVENT	
DATE	
PLACE	
PURPOSE	

NOTES/DESCRIPTION FOR EVENT

CHECKLIST
•

SCHEDULE
3 MONTHS - 1 YEAR BEFORE •
2 MONTHS BEFORE •
1 MONTH BEFORE •
2 WEEKS BEFORE •
1 WEEK BEFORE •
DAY BEFORE EVENT •
DAY OF EVENT •

POST EVENT	
What works: •	**What doesn't work:** •

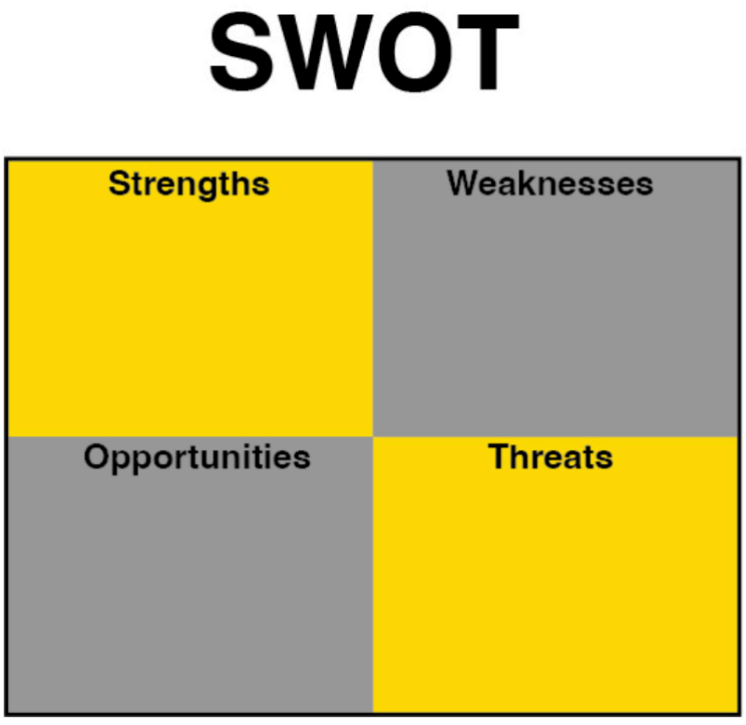
3. Business Section:

FIRST has described the Business Plan as: "The Business Plan can act as the backbone and guiding force for your team. This is a living document and may change based on challenges that may arise through the season, lessons learned, or new opportunities. Plan on revisiting this document a few times throughout the season to see if your team is on track or if a new direction is being taken, and modify your Business Plan accordingly."

The Business Section creates a detailed plan of how your team acquires/manages resources and how these resources are sustained. Sub-sections to include are:

- **Finance**
  - Fundraising
    - Your team's fundraising efforts
    - Photos, Videos, Event flyers from fundraising efforts
    - Mention lessons learned from each effort - Was it worth the effort? How can it be improved? What went well?
    - Chart of revenue from each individual event
  - Sponsorship
    - Outreach
      - For example: Presentations to local businesses, school administration/Board of Education, community events
    - How did you relay information to potential sponsors?
    - What was successful, what was not, what did you learn?
    - Chart of all sponsors and their monetary donations or gifts-in-kind
  - Team Budget
    - Chart
      - Income: includes sponsorships, school support, and fundraising
      - Expenses: amount spent on supplies, parts, competition fees, travel, etc.

- **Sustainability**
  - Recruitment
    - What methods does your team use to recruit members?
    - How successful/unsuccessful have your recruitment efforts been?
    - How do you recruit new mentors?
  - Training Team members
    - What is your process to train members?
    - When does training begin?
- **SWOT Chart**
  - Analyzes Strengths, Weaknesses, Opportunities, and Threats
    - Strengths: positive aspects of a team
    - Weaknesses: areas for improvement
    - Opportunities: ways to overcome a weakness/threat
    - Threats: potential unfavorable situations



4. Engineering Section:

The Engineering Section documents the team's robot design and records the time spent on research, outreach, team meetings, and plans for growth. This documentation should include:

- Meeting Log
  - Dates and times of every meeting
  - Each page must be initialed by person logging information
  - All plans made and all ideas discussed at the meeting
    - Each meeting should be a new page, regardless if the previous page was filled or not
- Design Process
  - Show all prototypes, sketches, and initial designs of your robot
    - Photographs, sketches are clear and easy to understand
    - Online notebooks should have all photographs outlined in black
  - Explain the process of your robot's development throughout the season
    - Include major milestones, as well as the minute highlights
  - Document all failures and obstacles you encountered
  - Discuss software development
- Strategic Design
  - How does the design of your the robot specifically relate to the robot challenges?
    - Explain in detail how each portion of your robot completes each task and why it is the most effective way to complete them
    - Include the process of how you came to the most effective way
  - How does your strategy process help your team?
    - Do you have quantitative/qualitative data? How do you ensure it is accurate? How do you formulate your ideal alliance?

- Final Product
  - Explain the function of all the elements in your robot
  - Discuss all the programs and sensors on your robot, and any changes during competition season

Engineering Notebook Questions

Your team journey goes beyond logging the day-to-day “here’s what we did” or “we met today.”

When logging entries make sure to answer:

- What is the agenda today and what are your goals?
- What decisions did your team make in forming the team, creating the robot, writing the program, the outreach projects, etc.?
- Why was it the logical choice? (Built specific robot element, coded the software that way, chose that group of individuals to outreach to, etc.?
- How did the decision impact your team, robot, or community?
- What is the next step?

III. Finance

Grant Applications

Grants are sums of money donated by corporations, governments, or other organizations. They are especially useful for teams that need funding to sustain themselves before they begin gaining sponsors. There are grants available through FIRST and outside of FIRST for rookie teams. If your team is school-based, you can begin by researching grants for afterschool programs. Grants require filling out a form that describes the purpose of the funding. These are the typical requirements and responses:

- **Program Description**:
    - Try to tailor your point of view to the specific type of grant you are applying for
        - Every grant has questions to learn more about your group. Know the following:
            - Origin
            - Mission Statement
            - Social Media Handles
            - Partner Organizations & their Role
            - List of Existing Sponsors & Amount
            - Basic Statistics
                - Demographics
                - Geography served
            - Financial Documents
                - Ex: 501-C3, with travel expenses, robot expenses, tools
                - Provide any additional sources of revenue in list format
                - State the cost to run your team annually, and your intentions for the money you are requesting. Insert a sentence or two to provide specifics on how their money will play into your overall budget.
            - Provide qualitative information about the program's impact.
                - Provide a short paragraph or two describing your program's effect on team members, statistics measuring the success of your program, and the short/long-term results you are aiming for.
            - Primary Goals
            - How do you measure success?

- Some grants have character limits, so you need to be concise and impress them with as few words as possible. Be sure to describe the FIRST program, as well as your team.

• **How They Will be Recognized as a Sponsor**:

- Assure them that your team will feature their name on your team shirt, robot side plates, team website, or elsewhere, based on the amount of money they donate.

• **Additional Comments**:

- Occasionally, they will offer space to include any additional information that you feel would sway them that did not fit into any of the above categories. Examples include outreach flyers and brochures (PDF).

Fundraising Efforts

To procure funds for the team and to help offset expenses, it is important to host various fundraising events, such as car washes, bake sales, and community events.

• **Bake sales**:

1. Get school permission– request a day and a time slot and add to your team calender
2. Assign one mentor to supervise and one student Project Manager to take charge
   a. Send out a team email asking for donations of baked goods from students and parents
   b. Designate 5-6 student volunteers to work the bake sale
   c. Collect necessary materials (tables, napkins, money box, etc.)
   d. Build in time for set up and clean up
3. Advertise- make an announcement, send out an email, hang flyers before the bake sale

• **Restaurant Sponsored Events**:

1. Check restaurant website for fundraising program
2. Contact the restaurant manager about hosting a fundraising event
   a. Typically, teams receive 15-20% of profit from customers who present the event flyer (which is provided by the team and can be downloaded)
3. Choose a date and time window and add to your team calender
4. Advertise your event

a. Before: Post on social media, send throughout your school district, and hang flyers

b. Contact the local newspaper about the event, if possible

c. Send an initial “Save the Date” email to members and families, and attach the flyer

d. Send email reminders to team members and families two days in advance

• **Donations**

Bring a donation jar to every team event. Be sure you know exactly what you are going to do with the money raised, to assure your donors that their contribution is going toward a good cause. Are they going to be used to buy your team t-shirts? Are they going to be used to support your trip to the World Championship? Have a plan!

• **School Support**

It is helpful to establish a strong relationship with your school administration. To ensure school support from the beginning, meet with the administration of your school to explain the goals and what you would need to be successful, such as:

- Workspace
- Teacher mentors/coaches
- A stipend for the coaches
- Sponsorship

After the initial meeting, maintain and develop your relationship with your school district. Volunteer to participate in school events such as back-to-school nights, orientation for incoming students, and any others your school might host.

IV.a. Outreach

What is Outreach?

Outreach is your team's opportunity to bring the message of STEAM and FIRST to your community, school, and beyond. It can be as simple as taking your robot to community events and telling others about your team, or as complex as multi-year projects.

Finding events to participate in:

Check your town calendar/website and local online news outlets

Parades, town days, community events, and charity events are held in most towns.

To participate, contact your city/borough/town hall, and they will direct you to the right person.

Project and event creation:

1. Determine Purpose of Event
    a. Promoting *FIRST*, Fundraising, Recruitment, Spreading STEAM, etc.
2. Hold brainstorming sessions with entire team
3. Assign a student Project Manager for each event
    a. A Project Manager will facilitate organization and proper planning, a successful event. A Project Manager is a student who is responsible for the overall event, and designates specific tasks.

Outline For Project Manager

What are a project manager's duties?

- Plan and execute projects
- Assist with gathering resources for the project
- Ensure that all delegated assignments and projects are being completed and progressing as planned
- Calculate a reasonable budget for each project

IV.b. Project Manager Guide

What qualities do project managers need?

- Efficient time and task management
- Strong leadership
- Ability to communicate and collaborate with others
- Flexibility/ability to perform all roles
- Work under pressure

What are the stages of planning an event?

- Find a location
- Determine a time
- Who are your attendees?
- PR Materials
  - Flyers
  - Newspaper
  - Email sent out to community, team parents, schools
  - Social media
- Decide which teammates will be there to work the event
  - Which teammates are essential to the event
  - Other teammates to provide support
- Make a packing list
  - Cash box to make change if needed
  - Other items you may need to bring include: team shirts for sale
    your robot for a demonstration, including batteries and laptop, and game components
    team flyers, brochures information about *FIRST*
- Appoint a set-up crew and clean-up crew
  - If the event is long consider having two shifts for the duration

V.a. Awards

***FIRST* Tech Challenge Awards**:

- **Individual**
  - **Dean's List**: This award is given to 10th or 11th-grade students who have "led their teams and communities to increase awareness for *FIRST* and its mission." Teams should nominate two students each for the award. The Kamen family sponsors awards for *FIRST*'s most outstanding secondary school students to recognize their leadership and dedication. *FIRST* hopes that these individuals will continue, post-award, as great leaders, student alumni, and advocates of *FIRST*.
    - ***For regions of the world that do not use grade levels such as this to identify years of schooling: This award is given to students who are two to three years away from entering college or university.
  - **Compass Award**: At regional championship tournaments, students may submit a 40-60-second video nominating an adult coach or mentor who has provided outstanding guidance and demonstrates Gracious Professionalism. The video should describe how the mentor has guided the team and focus on what sets the mentor apart. This award is given to a mentor who is "a beacon and leader in the journey of *FIRST* Tech Challenge."
    - Submission must be in video format and should include the following:
      - Submitted by the deadline established by the Event Director or local Program Delivery Partner instructions
      - Submissions must be in one of the following formats: .mp4, .mov, .avi, or .wmv (no links to streaming services will be accepted)
      - Teams are limited to one video submission per event (videos can be updated or changed between events)
      - Music must be used with permission from the copyright owners and be indicated in the video credits
      - Videos cannot be longer than 60 seconds, including credits

- **Team (Robot)**
  - **Innovate Award** - This award is given to a team that thinks imaginatively and has the ingenuity, creativity, and inventiveness to make their designs come to life. This judged award is given to the team with an innovative and creative robot design solution to any specific components in the *FIRST* Tech Challenge game. Elements of this award include a unique design, robustness, and creative thinking related to design. This award may address the design of the whole robot or a specific mechanism attached to the robot and does not have to work all the time during matches to be considered for this award. A portfolio is not required but is **recommended** for this award.

  - **Think Award**: This award is given to a team that best reflects their journey as they experienced the engineering design process during the build season. The team must show a clear understanding of the design process and journey throughout the build season. A portfolio is **required** for this award.
    - The team should include evidence of the following in their portfolio:
      - Use of the engineering process
      - Lessons learned
      - Include cost-benefit analysis and/or mathematical analysis used to make design decisions

- **Design Award:** This award is given to a team that demonstrates how their robot's design balances "form, function, and aesthetics." The team should communicate how they designed their entire robot (not a specific component) to be effective and elegant by including drawings and sketches in their engineering portfolio. A portfolio is not required but is **recommended** for this award in order to present the information in a professional manner.

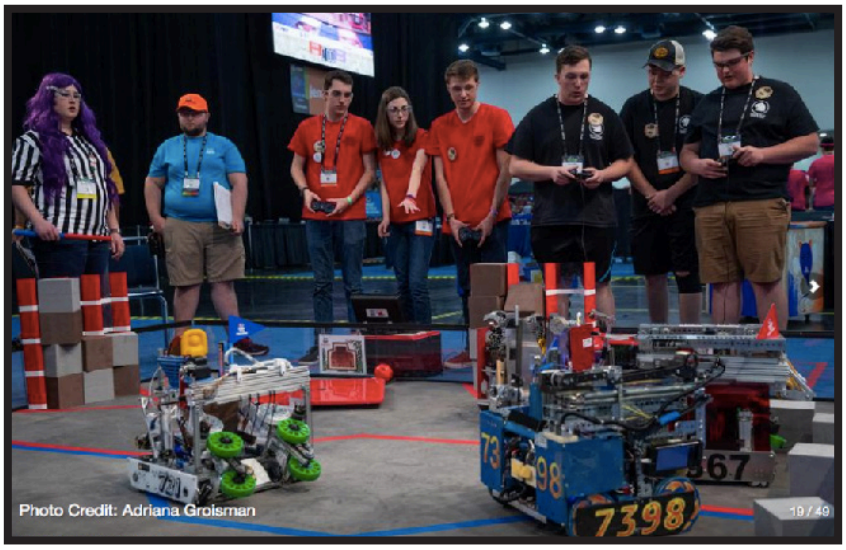
- **Control Award:** This award is given to a team that uses sensors and software to increase the robot's functionality in the field. It is also given to the team that demonstrates innovative thinking to solve game challenges, such as autonomous operation, improving mechanical systems with intelligent control, or using sensors to achieve better results on the field. The solution(s) should work consistently during matches. A portfolio is **required** for this award.
    - The portfolio must contain:
        - A summary of the software, sensors, and mechanical control but not copies of the code.
        - Hardware and software control components on a robot as well as what challenges they are intended to solve and how they solve those challenges.
        - The control solutions are encouraged to work consistently during most matches.
        - The team should document how the solution is reliable and how it could be improved.
        - They should also show the engineering process of control solutions used and the lessons learned.

- **Team (Non-robot)**
  - **Connect Award**: This award is given to a team that connects with their local science, technology, engineering, art, and math (STEAM) community. A *FIRST* team's engagement in their local STEAM community plays an essential part in their success. This team should have a plan and have identified steps to achieve their goals. A portfolio is not required but is **recommended** for this award in order to present the information in a professional manner.(*)
    - To be considered for this award, each team is required to document a team plan that showcases:
      - The team's goals for the development of team member skills
      - The steps the team has taken or will take to reach those goals
      - Examples of developing in-person or virtual connections with individuals in the STEAM community

  - **Motivate Award:** This team embraces the culture of *FIRST* and shows what it means to be a team. This team makes a collective effort to make *FIRST* known throughout their school and community and sparks others to embrace *FIRST's* culture. For this award, the team should be able to document the individual contributions of each team member, and how these apply to the team's overall success. A portfolio is not required but is **recommended** for this award.
    - To be considered for this award, each team is required to document an organizational plan that includes a minimum of one or more of the following examples:
      - Team or organization goals
      - Finances and financial sustainability plan
      - Risk management planning
        - See page 22 for a template of a SWOT chart
      - Season timeline project planning and/or outreach and service plan
        - See page 4 for a team outreach/project organizational form

- **Team (Robot and Non-Robot)**
  - **Inspire Award**: The team that receives this award is a strong ambassador for FIRST programs and a role model *FIRST* team. This team is a top contender for many other judged awards and is a gracious competitor. The Inspire Award winner is an inspiration to other teams, acting with Gracious Professionalism both on and off the playing field. This team shares their experiences, enthusiasm and knowledge with other teams, sponsors, their community, and the judges. Working as a unit, this team will have shown success in performing the task of designing and building a robot. A portfolio is **required** for this award.
    - Teams can only be considered for the Inspire Award when competing in a competition in their own region
    - Teams may win 1st place for the Inspire Award once per season at Qualifying or League Tournaments. They cannot be considered for the award at subsequent competitions.

  - **Judges Award**: This award recognizes a team for their outstanding efforts but does not factor into the advancement criteria. During the competition, the judging panel may meet a team whose unique efforts, performance, or dynamics merit recognition but do not fit into any of the existing award categories. This award is not required to be given at all *FIRST* Tech Challenge events.



V.b. Competition Packing List

Competition Packing List

- Engineering Portfolio (2 copies/1 for judges in the interview, 1 for pit judge visit)
- Engineering Notebook if you have one (2 copies/1 for reference only in the interview, 1 for pit judge visit)
- Your robot
- Tools
- Spare parts
- Extra surge protector
- Extension cords
- Phone chargers
- Battery chargers
- Gamepads
- Phones
- Laptop and charger
- First aid kit
- Team swag and pit display
- Things you must print and bring:
- Team Roster
- Robot Inspection Forms
- Field Inspection Checklist
- Scouting Form
- Control Award Content Sheet
- Team Judge Feedback Sheet
- Engineering Notebook Checklist
  - All located: https://www.firstinspires.org/resource-library/ftc/preparing-for-competition
- Personal
  - Safety Glasses
  - Team shirt
  - Camera for photos and videos

Good luck and see you at the competiton!

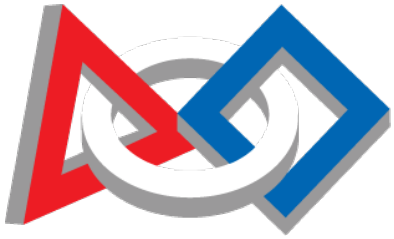
References

"Into the Deep Game Manual" (2024). *FIRST* Inspires. Accessed on November 30, 2024, from https://ftc-resources.firstinspires.org/file/ftc/game/manual.

FIRST Robotics Competition Team 1676, The Pascack Pi-oneers, was established during the 2004-2005 season in Montvale, New Jersey. Team 1676 created this guide to help rookie teams learn to operate cohesively and become self-sufficient.

If your team has any questions or concerns, please reach out!

FRC Team 1676: www.team1676.com
Instagram: @frcteam1676
Instagram Safety: @frcteam1676safety
Facebook: FRC Team 1676
X: @FRCTeam1676
X Safety: @Team1676Safety



FIRST TECH CHALLENGE

www.firstinspires.org

For more information please contact:

The Pascack Pi-oneers, *FIRST* Robotics Competition Team 1676

The 2017 *FIRST* World Champions

www.team1676.com