

AfterShock 263

Robotics

Handbook



- **FIRST Mission:** The mission of *FIRST*® is to inspire young people to be science and technology leaders and innovators, by engaging them in exciting mentor-based programs that build science, engineering, and technology skills, that inspire innovation, and that foster well-rounded life capabilities including self-confidence, communication, and leadership.
 - **Team Mission:** Our mission is to provide an inclusive environment for teaching and inspiring students through mentor-based science & technology programs. By engaging students technically through instruction and real-world engineering challenges, students will gain the necessary skills to design and build a competition robot for the *FIRST* robotics competitions. Through this process students will gain the necessary social skills through teamwork, community service, and leadership to prepare them for college and future employment.
 - **Code of Conduct:**
 - All students will review the code of conduct with team leaders.
 - Students and Parents will sign the code of conduct information sheet stating that they have read and understand the code of conduct.

- **Attendance policy:**
 - Meeting Dates:
 - Preseason 1 day/week (Tuesdays)
 - Kickoff Weekend (1st weekend after the new year) Meet both Sat & Sun
 - Build Season 6 days/week
 - M-F 5pm-8pm
 - Saturday 10am-3pm
 - Strict Meeting times 5pm-8pm & 10am-3pm
 - Hours counted instead of days (20hr/wk) 17hr weekdays/5hr weekend
 - Penalty for showing up late/leaving early
 - It is the students responsibility to sign in and out each meeting.
 - If you do not sign out you will only be given credit for 1 hour.
 - There will not be any but “you know I was here.”
 - Hours will be tallied at the end of each week.
 - During the build season we meet 20 hours a week.
 - **Full time:**
 - anyone contributing a minimum of 85% of the total hours of meeting time. (17 hours)
 - Must participate in team activities. (showing up is not enough)
 - Exceptions: on a case by case basis.If you are not attending, you must speak with a mentor first.
 - All team captains and subteam captains must be full time members.
 - Given first priority for trips.
 - **Part time:**
 - Any team member who contributes less than 85% of the total hours of meeting time.
 - Secondary priority for trips
 - Part Time
 - Are expected to show up when they are asked, and to complete the minimum training requirements
 - Part time team members typically are members that have other obligations such as sports.
- **Team Uniform**
 - All team members are required to purchase a minimum of one new team t-shirt each year for competitions.
 - Team members will have matching pants and t-shirts/jerseys. (TBD)
 - All drive team members must have a matching uniform. (Currently a team Jersey)
- **Trip Selection Criteria**
 - Attendance (Student responsibility)
 - See full time/part time
 - Participation/productivity
 - Just showing up is not enough.
 - Value added to the team (skill set)
 - Grade level (could be a factor)
 - Attending a trip during a prior year does not give you an automatic invite the following year.

■ **Promotional events:**

- All team members are required to attend 1 promotional event.
 - Examples include: Sachem Public Library STEAM faire, Elementary schools/Middle school science fairies, PJ Maker Faire, FOTAL..
- All team members are required to attend 1 fundraising activity (carwash, clothing drive, etc)
- All Team Members are required to attend the pre-season event (HHH invitational) If you do not attend you will be automatically disqualified from all drive team positions, pit crew members, and department lead.

Training/Safety:

All training must be completed before kickoff

● **Basic Tool/Hardware Knowledge**

- Allen keys/wrenches, etc
- Rivets/RivNuts, cap screws, nuts, washers, etc
- Training is self paced throughout the pre build season.
 - Students will be required to watch each video, answer questions, take the necessary quizzes.
 - All quizzes (completed on chromebooks) must be completed in the lab by appointment only.
 - To qualify a passing grade of 100% is required on all quizzes and demo's

● **Machinery**

- Drill press, band saws, belt sander, Metal Grinder, Metal Lathe, Milling machine.
 - Students will be required to watch each video, answer questions, take the necessary quizzes, and demonstrate their knowledge of each.
 - All quizzes (completed on chromebooks) and demonstrations must be completed in the lab by appointment only.
 - To qualify a passing grade of 100% is required on all quizzes and demo's

● **Tier System**

- **Tier 1** - General safety and quiz. Unqualified to use machinery (**all students must have this to enter the lab during build season**)
 - Everyone must pass the basic safety quiz.
- **Tier 2** - Knowledge of all hand tools and hardware utilized on our robots.
 - All hand tools on the slideshow.
 - Quiz
- **Tier 3** - Qualified, Has enough knowledge to operate the machinery without constant supervision.
 - Must watch safety videos for each machine
 - Must pass the quiz for each machine.
 - Students must demonstrate the proper use of the machine.

Captain:

- Keep people on track by organizing departments and mechanisms
 - Department membership will be permanent for build season to help organize the team. Software, Mechanical, Electrical, Design, or Social Media
 - Captains will communicate strict deadlines for subsystems and decide to cut subsystems if they don't fit into the bigger picture
 - Before each meeting, all the captains will meet in a leadership meeting (4:40pm).
 - In the meeting, they will discuss (and document) goals, progress, and time estimates for the former. This will prevent time management issues through the project management system.
 - During the first 10 minutes of each meeting, we will have a team briefing to talk to the team
 - There will be a quick brief of the captains before each meeting.
 - We will not wait for people, but the majority of the group should attend.
 - Communicates with other team captains during the season to establish a working relationship. This will be helpful during competitions.
- **Department captains**
 - Will be overseen by the team captain
 - They will keep the team on track through time management strategies, keep track of goals/progress, manage communication between groups, and perform other important tasks.
 - We designate a productivity rating for each member of their team, each meeting.
- **Daily goals**
 - Based on the prior day's accomplishments, what is each chair going to focus on today? What are they bringing back to their groups?
 - Each department captain needs to explain what they accomplished today and what they hope to accomplish tomorrow
 - Captains must raise changes to their systems to other captains, to identify compatibility issues, to continually harmonize the designs together. Then captains bring back the adjusted designs to their teams to adapt current implementation efforts.
- **System of Organization**
 - Each day the team captain will add to the document or spreadsheet on team progress.
 - This information will come from the daily leadership meetings. The document serves as the single source baseline design.

Department Responsibilities:

Each will have a department captain.

- ***Mechanical***
 - drilling/tapping/screw sizes/types of bolts
 - Lathe/Mill/Drill Press/Band saw/ grinder/RivNut tool/Rivet Gun
 - Transmissions/motor/ gears/pulleys
 - etc
- ***Electrical***

- Responsible for installing and setting up electronic on the robot towards the end of build season
 - Connectors/wire gauge
 - Soldering iron
 - Crimping tools/wire strippers
 - Pneumatics
 - Control hardware
 - Motor controller types (talon/sparkMAX)
 - Electrical layout/components
 - etc
- **Design**
 - Responsible for designing and cutting parts.
 - Must have extensive knowledge of all design software (AutoCAD, Inventor, OnShape)
 - Must be available to design parts on demand.
 - Will maintain a system for the organization and storage of all CAD and Inventor files on our team google drive. (updated daily)
 - 3D printer set-up and operation, CNC set up and operation, Laser cutter set-up and operation.
 - Make sure all software is up to date.
 - Time permitting, they will document and share our design progress through OpenAlliance on chiefdelphi alongside the Publicity team.
- **Software**
 - Unlike the other departments where most training occurs at the team meetings hands-on with physical tools and material, the development of the core programming skills is done outside of meetings with self-study.
 - Students should have a strong degree of self-drive and independence. This self-study is guided and complemented with demonstrations and hands-on application of acquired skills at the team meetings, which clarify and hone these skills.
 - Peer group study and support is strongly encouraged. You develop skills and capability independence to perform needs analysis, requirements development, solution conceptualization, effective solution options communication and negotiation, prototyping, implementation and test.
 - Learn the Java programming language.
 - Learn the Visual Code Integrated Development Environment with the WPILib, vendor and additional useful plugins.
 - Program the RoboRIO embedded computer.
 - Learn to program for the standard and advanced robot programming library's framework and software components for sensors, control systems, and actuators as documented at <https://docs.wpilib.org/>
 - Understanding the previous year's robot code and drivebase code.
 - Understand how to create from scratch a code skeleton for the typical drive bases: differential (tank or west coast), Mecanum, and swerve.
 - View home brewed training videos [Aftershock 263 Programming Training Videos](#)

- Learn team software development and file configuration management tools, to view, develop, and share software for the team at [FRC 263 Sachem Aftershock \(github.com\)](#)
 - Learn to acquire and use vendor libraries for pertinent third party hardware for the robot, including their vendor supplied configuration and firmware loading software, from suppliers like REV, CTRE, Kauai Labs, etc. Learn to inspect and ensure all hardware is at the required firmware revision levels, and configured correctly for the robot.
 - Learn additional languages (C, C++, Python, Javascript), operating systems, microcontrollers, and tools as required for advanced sensor and controller projects.
 - Sometimes virtual meetings are held using tools such as Zoom, or additional in-person meetings held at the Sachem Public Library.
- **Shop Manager (shop supervisor):**
 - Responsible for the Organization/Maintenance the shop (upstairs & down stairs)
 - Oversee daily shop cleanup. (everything gets put away)
 - Help to maintain shop equipment.
 - Take inventory regularly. (hardware cabinet, etc)
 - Set up necessary material and part orders.
 - Construction of the practice field.
- **Social Media Team:**
 - Responsible for communicating utilizing the WWW.
 - Web page (update as needed)
 - Blog (sent out once a week to all contacts, minimal)
 - Instagram (linked to facebook)
 - Twitter
 - TikTok
 - Document the team through video and photos.
 - Create a robot reveal video.
 - Organization and maintenance of the team google drive.
 - **Awards**
 - Impact Award (If Possible)
 - Full time for those students who want to take this on.
 - Must be able to contact other teams and communicate effectively.
 - Required to commit to communication with other teams, and to keep track of all information necessary.
 - Applies for all written awards (Woodie flowers, Dean's list, etc)

Additional Team Personnel

- **Drive Team:**
 - Determined by mentors.
 - Requires a minimum of 2 years experience on the team or 1 year for backup drivers.
 - Must be able to attend every event the team is going to.

- This means 3 events are mandatory.
 - Hofstra/away trip/World Championships(Houston).
 - Being a drive team member is a large responsibility and it requires your parents consent since the team members have to pay for travel.
 - Each drive team member is required to attend all days of an event. (Practice day/Qualification day/Finals day)
 - Practice driving robot
- **Drive Coach / Strategy Captain**
 - Must be observant, able to understand strategy, and every aspect of how to play the current game
 - Is the lead of strategy team, and plays a key role in focusing the design of the robot on our selected strategy (which we chose during kickoff)
 - Should work very closely with the lead scouters to develop a scouting system that gives the information that they need for during competitions
 - Must show effective communication skills among their peers
 - Work with software to make driving more efficient.
 - Extensive knowledge of the game play strategy
 - Requires a try-out
- **Strategy:**
 - Lead Scouters:
 - Should completely understand how to use and troubleshoot every element of the scouting system
 - Should coach the drive team on how to access and use the data collected through scouting
 - Should be able to manage the scouters along with the scouting policy
 - Lead Scout Guide (Contains all roles and responsibilities of lead scouts) - [Scouting Documentation](#)
- **Safety**
 - Responsible for team member safety and training.
 - train the team about safety during the season and at the events
 - Assist with hands-on training for tools & power tool operation
 - Establish procedures for reporting an accident or safety violation
- **Business**
 - Communicates with current sponsors
 - Finds and starts communication with prospective sponsors
 - Applies for all written awards (Woodie flowers, Dean's list, etc)
 - Works with social media on video awards (Impact award)
 - Work with the robotics board on new sponsorship ideas

General Lab rules.

- Everyone is expected to be on time. (5:00 start time does not mean 5:15)
- All school rules apply during after school activities.
- No food in the lab during meeting times (Saturday Exception)
- Students must stay in the lab during the entire meeting time. (no wandering the halls)
Exceptions will be discussed
- Attendance will be taken each day, at the beginning and end of each meeting (students will punch in and out daily)
- Attendance is also based on weekly hours accrued.
- **No one** is allowed in the back office or upstairs without authorization.
- **Cell Phone/Computer usage:**
 - Robotics content only
 - Warnings will be given
 - Continued warnings and individuals will be sent home for the day.
 - All students must sign up/download for the following APPS:
 - Slack app
 - Remind
 - Google classroom
 - STIMS
 - The Blue Alliance
 - One Tap (Attendance)
 - The Blue Alliance
 - OnShape

Weekly Tasks:

- We will use trello/ some similar task management app to organize weekly tasks for each department. Heads of each department would be the only ones that use this task management system and they will use it to organize their groups.

Summer (optional)

- Decide on advanced research project(s)
- T-Shirt Bot Completion
- Raise \$\$
- Work on /finish project
- Any outreach activities (Tesla)
- Team socials

System of organizing throughout the season:

We will follow the **U.S.E.** method for robot design philosophy.

- i. **Understand:** Thoroughly understand the rules of the game before proceeding with anything else. This will be the entire first day of the launch.

- ii. **Strategize:** Make sure we are completely certain we know how other teams will most likely play the game before we strategize. Then, focus on one strategy for the robot (for example, being incredibly quick and pushing in cubes).
- iii. **Execute:** After we know our strategy, we *must* decide how many subsystems will be on the bot (e.x. Intake, arm, shooter), and how many groups will be allowed to work on each. This prevents too many or too little brainpower in any one area. We *must* blueprint before we start prototyping, and designs need to be constantly evaluated (especially in leadership meetings).

Preseason

September to Build Season.

- Meeting scheduled for every Tuesday 5:00 to 7:00pm
- Additional meetings will be scheduled as needed.
- Training for all team members. (veterans included)
 - This document will be covered in full by the mentors. All team members will review and discuss this.
 - Safety
 - General
 - Hand tool
 - Machinery
 - Design software
 - AutoCad
 - Inventor
 - Programming
 - Drive team
 - ETC
- Attend off season events
- Be active in outreach activities
- Programmers will participate in:
 - the WPILib Beta Test, to be best prepared for the upcoming season. Combining this with monitoring of reveals on the cheifdelphi.com forum, thus being informed of upcoming season's changes to the rules and control systems and software, the programming team will implement and test relevant hardware and code to be ready to drop in, adjust and apply it to the upcoming season's robot.
- Fund raising (all fundraising must be completed by kickoff)

Build Season:

Week 1

- **Day 1 (KICKOFF):** Reading over the game manual and understanding the game.
 - Every aspect of the game must be determined before the design process.
 - Evaluate points system (mathematically/speed)
 - Programming downloads new season images, prepares and validates install of tools and images.
- **Day 2**

- Determine the most efficient way to score points. Decide on a strategy of scoring points and constrain all future designs to that strategy.
- Whatever strategy document we make on this day should be used and reflected on throughout the season
- Decide on drive base and drive type. (6 wheel tank, swerve, etc)
- **Day 3:**
 - Start thinking of designs, make sketches and discuss with the team.
 - Programming establishes baseline images for selected drivebase types, and ports anticipated code needed from prior years.
 - Begins defining and coding the software architecture for this year's robot, based on mechanism design trade options in play.
- **Day 4:**
 - Continue innovating on designs. Start considering finalizing ideas. Work on drive base and test drive base simultaneously, Programming
- **Day 5:**
 - Prototyping (cardboard, popsicle sticks, leggos, etc), begin the construction of the practice field. Only the most necessary items
- **Day 6:**
 - Prototyping (cardboard, popsicle sticks, leggos, etc) Construction of practice field, Programming

Week 2

- **Day 1.**
 - Final design ideas approved, Programming, Construction of practice field
- **Day 2:**
 - implementation, begin construction, Programming, Construction of practice field
- **Day 3:**
 - Robot Construction, Programming, Construction of practice field
- **Day 4:**
 - Robot Construction, Programming, Construction of practice field
- **Day 5:**
 - Robot Construction, Programming, Complete test drive base (duplicate of original base), Construction of practice field
- **Day 6:**
 - Robot Construction, Programming, Drive team begins testing and practice, Construction of practice field

Week 3

- **Day 1:**
 - Robot Construction, Construction of practice field, programming as possible
- **Day 2:**
 - Robot Construction, Construction of practice field, programming as possible
- **Day 3:**
 - Robot Construction, Construction of practice field, programming as possible
- **Day 4:**

- Robot Construction, Construction of practice field, programming as possible
- **Day 5:**
 - Robot Construction, Construction of practice field, programming as possible
- **Day 6:**
 - Robot Construction, Construction of practice field, programming as possible

Week 4

- Robot handed over to programming team
- Drive team works with the programming team for testing and modifications.
- Continue making adjustments and improvements to mechanisms as needed.

Week 5

- Drive team works with programmers and test driving and mechanisms
- Make any necessary mechanical Mods.

Week 6

- Drive team works with programmers and test driving and mechanisms
- Make any necessary mechanical Mods.

Week 7

- Drive team works with programmers and test driving and mechanisms
- Make any necessary mechanical Mods.

Week 8

- Go to regal eagle rampage
- Drive team works with programmers and test driving and mechanisms
- Make any necessary mechanical Mods.

Week 9

- Competition Time

All team members must agree to and sign the Team Member Contract. It is repeated here.

As part of my commitment to FIRST Team 263 I agree to the following:

Document

I have read the attached document completely and I fully understand that I am responsible to adhere to all of the information listed.

Gracious Professionalism

I agree to practice Gracious Professionalism in all my interactions with other team members, mentors, parents, and other teams.

Commitment

I agree to take an active part in the team. I agree to work hard, show up at meetings, be willing to learn, and be open to new ideas.

I commit to good attendance and punctuality. Absences and tardiness may result in loss of team privileges. I agree to notify the team leadership in advance if unforeseen circumstances prevent me from meeting this commitment.

Expectations

I understand that the team expects me to contribute at the highest level of my ability, and that in order to be an involved member of the team I understand that I need to make a commitment to spend a minimum amount of time at meetings. If at any time I have a problem meeting team expectations, I agree to discuss with the team leadership in order to resolve the situation and ensure that both the team and I are benefiting from the relationship.

I agree to discuss my expectations for my involvement in the team with the team leadership. If at any time during the season I am having a problem with another team member or with the team, I agree to bring this to the attention of the Mentors.

I understand that there are many skills required for a successful robotics team. I agree to work with the team leadership and the mentors to find a position that I find fulfilling and fun.

Safety

I agree to comply with all safety rules posted by the team leadership without exception. Safety is everyone's first priority, and everyone needs to be looking out for potentially unsafe situations. Unsafe situations must be reported to adult leaders. Repeated unsafe behavior will result in dismissal from the team.

Student

Print Name **Sign Name** **Date**

Parent

Print Name **Sign Name** **Date**

Document this year's Robot Info (e.g.):

Name: Guillotine

Weight:

Height: 4'5-½"

Drivetrain:MK4 swerve drive

Auto:

Tele-op:

Endgame: Docked and engaged

Sub-systems

Intake: roller wheels

Extender: Horizontal scissor lift

Elevator: 2 stage winch driven

AprilTag: guides robot to specific location on field using a single button

Reflective Tape: back up for AprilTag system

Team Awards:

1998-99 Sachem Robotics Founded

2001 Long Island Regional Winner, Long Island Regional Delphi "Driving Tomorrow's Technology" Award

2003 Motorola Quality Award, [Galileo Division](#)

[2004 Galileo Division](#)

2005 SPBLI General Motors Industrial Design

2007 SPBLI Judges Award

2009 Championship - Xerox Creativity

2010 Long Island Regional Winner, Galileo Division

2012 Half Hollow Hills Invitational Champions

2013 Gracious Professionalism Award

2014 Suffield Shakedown Champions

2015 South Florida Regional Winner, Excellence in Engineering Award sponsored by Delphi, SBPLI Regional Finalist

2016 SPBLI Regional Winner 2017 Woodie Flowers finalist, SPBLI Regional Winner

2018 Tech Valley Regional Finalist

2019 SPBLI Regional finalists, Wildcard

2020 All Events Canceled COVID-19

2022 Half Hollow Hills Invitational Champions

2023 Gracious Professionalism Award