

Masters' Engineering Team Rules and Guidelines

1. Mission: To fulfill the educational objectives of robotics as a practical expression and extension of Masters' engineering program. This Mission is consistent with The Masters School pedagogical philosophy, and is approved by the school's administration.

2. Sustainability: The Masters School has defined sustainability as the careful management and wide use of the planet and its resources. It is the ability to meet present needs without compromising the survival of future generations. More simply, sustainability is being green. More specific to energy, the school is focused on reducing overall energy usage and shifting Masters' energy portfolio toward more sustainable sources. Our goal is a Masters that is sustainable and low-carbon-emission. In pursuit of this mission, every effort will be made by the Team to repair parts and systems whenever possible, use only rechargeable batteries on robots and robot controllers, minimize waste by making every effort not to cut or modify structural materials, and leverage other strategies to be more sustainable as opportunities present themselves.

3. Goals: While robotics was a precursor to the formal engineering curricula, the goal at the outset of the Masters' robotics program was and remains to introduce and educate students in engineering and the engineering design process.

4. Structure: Masters' Engineering Team is a part of the Zetetics Academic Teams Program. Like other Zetetics' programs, the Engineering Team is faculty-led, and not operated like a club.

5. Platform: Deciding to utilize the *FIRST* Tech Challenge system was an academic decision. *FIRST* is also the robotics program that best aligns with both the mission of this Team, and mission of the school. *FIRST* (For Inspiration and Recognition of Science and Technology) is an international youth organization that operates the *FIRST* Robotics Competition, *FIRST* LEGO League, *FIRST* LEGO League Jr., and *FIRST* Tech Challenge competitions. Founded by Dean Kaman (founder of Kaman Aerospace and inventor of the Segway) and Woodie Flowers (emeritus professor of mechanical engineering at the Massachusetts Institute of Technology) in 1989, its expressed goal is to develop ways to inspire students in engineering and technology fields. Its philosophy is expressed by the organization as *coopertition* and *gracious professionalism*. The *FIRST* Tech Challenge (FTC), formerly *FIRST* Vex Challenge (FVC), is a mid-level robotics competition announced by *FIRST* on March 22, 2005.

6. League: Masters' Engineering Team will only compete in the *FIRST* Tech Challenge league, and will not compete in other leagues including but not limited to VEX, Best, Botball, CREATE, Zero Robotics, RoboRave, Robogames Junior Division, Soft Robotics, Scioly, etc.

7. Tournaments: Tournaments are one way that the Team can benchmark their robots and accompanying code against teams from other schools, but it is not the only way. If the Masters' Engineering Team wins a tournament, that is great; however, winning tournaments is not nor has it ever been the focus of the program. Instead, the program focuses on the engineering process and adherence to industry-accepted engineering principles and practices.

Students can expect that the Masters' Engineering Team will compete in as many local *FIRST* Tech Challenge tournaments as are permitted by *FIRST* Tech Challenge, and as schedule and budget permits. If the Team qualifies for post-season tournaments, such participation will be limited to the *FIRST* Tech Challenge Regional Championship, *FIRST* Tech Challenge Super-Regional Championship and *FIRST* Tech

Challenge World Championship. Participation in any *FIRST* Tech Challenge scrimmage or tournament is at the sole discretion of the Coach.

Before each tournament, the coaching staff will email all members of the Team with the time when students are to check-in for the tournament at the Innovation and Entrepreneurship Center. The email will also contain the time when the Team will leave campus. It is imperative that Team members arrive on time. The Team will leave campus at the time noted on the email. In the event of bad weather or impending bad weather, The Coach(es) may cancel the Team's participation in a tournament or choose to leave a tournament early. The primary responsibility of the coaching staff is to keep Team members safe.

8. Uniforms: All Team members will be required to wear team uniforms (minimum of a team shirt and blue denim trousers) at all competitions, and other Team events. Each active Team member will be provided with one team shirt. Other Team gear will be provided as budget allows. If a Team member arrives at a tournament without his/her uniform, said Team member may accompany the Team, but only as a spectator. No other garment is to be worn that will obscure the Team uniform while at the event.

9. Program: The Masters' Engineering Team season crosses two athletic seasons: Fall and Winter. The fall season co-curricular is open to any student interested in learning more about engineering and robotics. The winter season co-curricular is reserved only for those students invited to join the Team.

10. Team Eligibility: Students participating in the Fall co-curricular a minimum of three days per week who make a full commitment to the Team's competition schedule will have met the minimum requirements for Team consideration. Exceptions may be made for those who need to complete their athletic requirement (ACR). However, any exception must be discussed with the coaching staff before Fall co-curricular begins.

Students who are interested in being part of the Team will be given an Engineering Notebook to keep during the Fall co-curricular.

The Coach(es) will make a final determination about who will and who will not be invited to join the Team. The decision will be based on: existing or developing robotics and/or coding skills; willingness to follow instructions from the coaching staff; continued three day-per-week attendance; commitment to attend all competitions; adherence to the engineering design process; and quality of a student's Engineering Notebook among other criteria.

Additionally, a student's good academic standing takes priority over any Team need. Students must put their schoolwork ahead of participating in Team work sessions and activities.

11. Absences: Whether participating in the Fall co-curricular or as a member of the Team, it is the student's responsibility to notify the Coach(es) of any absence prior to 3:15pm on the date of the co-curricular absence. If reporting an absence by text or email, the notification must be made to both Coaches. If absences are chronic such that they interfere with a student's three day per week commitment, the student may be asked to leave the Team.

Students are permitted to be absent from tournaments only in cases of illness and family emergencies.

12. Team Composition: There is one Masters' Engineering Team. While there may be multiple Squads within the Team, Team members must always keep the interests of the Team ahead of their own interests and the interests of their Squad.

- 1) No Team member may be a member of another *FIRST* Tech Challenge team.
- 2) The Team will be selected by the coaching staff, and assignment to individual Squads, if any, is at the sole discretion of the Coach(es.)
- 3) No student will be invited to join the Team who has not read and signed the acknowledgement page of this document.
- 4) There is no minimum number of Squads.
- 5) Students who form collaborative groups before the Fall co-curricular may not necessarily be assigned to the same Squad during the Fall and Winter seasons.
- 6) Past Team membership does not guarantee continued inclusion. The criteria under Team Eligibility apply to all students equally.
- 7) Team Captains, *if any*, will be selected by the coaching staff. Students interested in leadership should possess a dedication to the Team, a solid record of performance; role model characteristics; and follow through, positive attitude and maturity.
- 8) The Coach reserves the right to make Team assignment changes at any time as (s)he sees fit.
- 9) If any individual Squad should qualify for a post-season tournament, it is required that the qualifying Squad devote all of their time, attention and resources toward helping other Squads qualify as well.

13. Behaviour: Team members are expected to conduct themselves professionally at all times. All school rules of conduct apply to the Team. Failure to comply with school and/or Team rules will result in dismissal from the Team.

- 1) The school's policies on cellphones and laptops in the classroom, and expectations for community members apply to both the Fall and Winter co-curriculars. Phones are not permitted in the Team space during co-curricular time.
- 2) At events, Team members' behavior is a direct reflection on the character of the Team and School. Team members must respect each other (both in and out of the Innovation and Entrepreneurship Center) and competitors at all times.
- 3) Team members are expected to act with integrity. This includes being honest to each other as well as to the coaching staff, and must not cover up mistakes or errors in judgement.
- 4) Team members need to be cooperative at all times, including cooperating with requests of the Coach(es.) Ignoring the directions or request of a Coach is not in the Team's best interest. If a Team member feels that a request is out of order, (s)he is encouraged to complete the task and then speak to the coaching staff at a later, more appropriate time.
- 5) Inappropriate behaviours include, but are not limited to: running, pushing, shoving, negative name calling, leaving a disorderly workspace, swearing, stealing and all other activities that reflect negatively on the Team. Conversations that undermine Team unity and respect for leaders and Coaches (both in and out of the Innovation and Entrepreneurship Center) are not only counterproductive, but destructive. Words either build or tear down – if it is not constructive, it is inappropriate speech.

14. Fair Play: The Masters Engineering Team has a reputation for being polite to judges; respectful of other teams and their members regardless of their ability; willing to help other teams in need; and plays fair. These are the hallmarks of our program and must be preserved at all costs. No Squad will intentionally lose a match or in any other way "game the system" (i.e. Rank low so either no other but a predetermined team will choose the Team during alliance selection, or deliberately place low enough so as not to lead or be in the lowest ranking alliance – this is collusion and grounds for dismissal from the team.)

Masters Engineering will adhere to the *FIRST* Tech Challenge Core Values at all times:

- We display *Gracious Professionalism* with everyone we engage with and in everything we do.
- We act with integrity.
- We have fun.
- What we learn is more important than what we win.
- We respect each other and celebrate our diversity.
- Students and adults work together to find solutions to challenges.
- We honor the spirit of friendly competition.
- We behave with courtesy and compassion for others always.
- We act as ambassadors for *FIRST* and *FIRST* Tech Challenge.
- We inspire others to adopt these values.

15. Robots: The Team and any Squads must not only design, build and program their robots for driver control periods, but must also design, build and program their robots for autonomous operation. The Team will not be considered ready for a competition unless it is ready for driver control and the autonomous operation.

16. Availability of the Build Space: Co-curriculars run from 3:30pm to 4:45pm on Mondays through Thursdays. On most days, the Innovation and Entrepreneurship Center is open to the Team beginning at 3:00pm and ending at 5:00pm. Availability during additional days and hours will depend upon the availability of the Coach(es). Students are not permitted in the Innovation and Entrepreneurship Center (IEC) without a Coach present. Squads using the Robotics Testing Facility must reset the field after they are finished using it. If the Team or any Squad does not reset the field, that Team/Squad will be barred from the space for no fewer than two days.

Engineering requires that projects not only be completed to satisfy design criteria, but to satisfy those criteria on time, and with the minimum amount of waste.

17. Robotics Testing Facility: Construction of any kind is prohibited in the Robotics Testing Facility. Students are never permitted in the Robotics Storage Room without the expressed permission of the Coach.

18. Safety: The safety of students is of paramount importance. Students must wear safety glasses/goggles while working on robots or when testing the in the Robotics Testing Facility.

Students are only permitted to use the Innovation and Entrepreneurship Center Workshop if they have been cleared by the Coach(es), and only when a Coach is present in the Workshop. Students may not modify parts in any way (i.e. cutting, bending, etc.) without the expressed permission of the Coach(es) for each part they wish to modify. Students must also be cleared to use the tools that are in the space. Students must wear dust masks, work gloves, and eye and hearing protection when working in the IEC Workshop. The overhead dust filter must remain on at all times, and students must ensure that the dust collection system is turned on whenever they use bench equipment.

19. Materials and Tools: The Masters School will provide all of the necessary materials and tools to the Team. Materials and tools including, but not limited to completed robots and robot components may not be removed from the Innovation and Entrepreneurship Center for any reason other than to attend approved *FIRST* Tech Challenge tournaments. Students must treat materials and tools with care.

- 1) Students must refrain from bringing personal robotics materials and tools of any kind into the IEC unless those materials and/or tools are being donated to the school at the time when they are brought in.
- 2) Materials are finite and must remain available to all students in the Program. As such, students may only store partially completed robots and viable components/sub-components from one day to another. It is required that all students re-inventory any and all unused materials at the end of each day. If it is determined that the Team is not re-inventorying parts, the Team's robot and/or components will not be made available to the Team until re-inventorying is complete.
- 3) The tools in the Innovation and Entrepreneurship are for multiple constituencies – robotics being only one of them. Tools will be made available to the Team as deemed necessary by the Coach(es). Tools located in the cabinets under the 3D printers, at the front of the IEC classroom, and in the IEC Workshop are not to be used without the expressed consent of the Coach(es).
- 4) Materials and tools may not be altered in any way without the expressed consent of the Coach. This includes parts that are already attached to robots and stored viable components/sub-components.

20. Program Format: The Masters' Engineering Team will follow the PLTW Engineering Design Process which will have both individual and Team phases. Given that the Process is at the core of the educational mission of the program, it should neither be rushed nor assumed. Only robots designed and constructed in accordance with the Process will be deemed eligible for competition.

The Engineering Design Process is explained in Addendum F. For additional details, please consult the Coach(es).

21. Engineering Notebook: *FIRST* Tech Challenge requires that all Squads are to maintain an accurate, detailed and truthful Engineering Notebook. The Coaches require that it is prepared in accordance with PLTW standards (see Addendum E.) Engineering Notebooks will be collected and reviewed by the coaching staff at least once every week. To ensure fair play, it is incumbent upon the Coach(es) to verify that Engineering Notebooks were prepared in adherence to PLTW standards. It is also the responsibility of the Coach(es) to ensure that Team members have acted in good faith. Team members should expect that the Coach(es) will be honest with Tournament Judges at all times including informing Tournament Judges when the Team has not acted in good faith or is ineligible for judged and partially judged awards. See Appendix G for a complete list of judged or partially judged awards.

Generally accepted industry standards require that Engineering Notebooks be bound or created in a secure software environment that timestamps for each entry, and does not permit edits, deletions or erasures. 3-ring binders, electronic diaries/notes, etc. cannot be used in place of a bound engineering Notebook. An Engineering Notebook is where an engineer (or team of engineers) will formally document, in chronological order, all of his/her/their work that is associated with a specific design project, in this case the development of a robot. Entries in the Engineering Notebook must be made daily, and submitted to the Coach(es) for witnessing.

22. Adult Involvement: *FIRST* Tech Challenge's Core Values asks that students and adults work together to find solutions to challenges. Students can expect that the coaching staff will be actively involved in all aspects of the engineering process.

23. Changes to this Document: When in the interest of clarity, or when the coaching staff feels that these Rules and Guidelines require additional details, changes will be made to this document. Any and all changes will be communicated to the Team verbally and/or on the Team's website.

24. Rule and Guideline Enforcement. A member of the coaching staff not enforcing any part of the Rules and Guidelines in this document does not constitute a waiver of that Rule or Guideline.

Addendum A. Sample Team Structure

While the size of the Team will often times be determined based on the number of students on the Team. Having more people is often better than having less. There are many tasks that need to be completed before the Team is ready for competition. As such, functional groups will need to be established. These functional groups should be organized such that all aspects of the *FIRST* Tech Challenge are given the requisite resources to ensure excellence in everything the Team does. This includes engineering documentation, modeling, programming, Team binder, website, video, promotions, uniforms, displays, outreach plans, business plan and budget, sustainability plan, etc.

Team members interested in leadership positions need to be aware of the following criteria by which Team members will be evaluated and selected to be leaders:

- 1) A sense of purpose:** The values of the Team must be clear, members of the Team should know them, and leaders should exemplify and uphold those values in their own actions.
- 2) Communication and responsiveness:** The performance of a leader must be judged by his or her skills and the character of his or her performance in the many and complex roles that leadership demands. The most important of these is communication. Leaders need to be responsive to their Team members and Coach(es) and communicate clearly.
- 3) Justice:** Everyone in a Team should be held to common standards, with rules and procedures that are clear, firm, fair, and consistent.
- 4) Temperance:** A leader must strive to maintain a proper balance of emotions; this does not mean that leaders should be dispassionate. Quite the contrary - but there are times for passionate advocacy and times for quiet reflection and reconsideration. Balance is the key.
- 5) Respect:** The dignity of each individual is the concern of any leader, and this is preserved by treating all members of the Team with respect and ensuring they treat one-another similarly, regardless of differences.
- 6) Empowerment:** Leaders are just that - leaders. Leading is not the same thing as being in charge. Leaders must not be micromanaging every aspect of the Team and ordering Team members around. Most of what happens in Teams is carried out by individuals other than those in formal leadership positions. Therefore, the more skilled Team members are, the more they feel confident in their abilities and competent to make suggestions, raise questions, and see new possibilities. Leaders must empower Team members to do such things.
- 7) Courage:** Leaders set direction, not wait for direction to emerge. They have to be willing to follow their convictions and bring their team to new places.
- 8) Deep Commitment:** Leaders should have a deep commitment to their Team, the advancement of the Team's missions, and the wellbeing of everyone on the Team.

Addendum B: Design Brief Format

Engineering relies on accuracy, precision and detailed documentation. When engineering something like a bridge (or any other product for that matter), the goal is simplicity in design, economy of materials, minimization of moving parts, and reliability of the finished product. As such, detailed planning is necessary for success. Understanding the requirements of the task and preparing a Design Brief is compulsory.

Client Company:	<i>FIRST Tech Challenge</i>
Project Name:	<i>Here you would put the name of the current year's competition.</i>
Designer:	<i>Here is where you would put your name.</i>
Problem Statement:	<i>Here is where you would detail your game strategy for both the autonomous, driver control, and robot skills parts of the competition.</i>
Design Criteria:	<i>Here is where you would detail the specific needs for your design and the criteria by which you will judge the success of your design.</i>
Design Constraints:	<i>Here is where you would detail any limitations or constraints to which you must adhere in developing your design.</i>

Addendum C: Decision Matrix Format

A Decision Matrix, which is based on your Design Brief, allows you to empirically compare different concepts against the Problem Statement from the Design Brief. What follows is the basic design of a Decision Matrix although it is very likely that a robot that meets the specifications of the Design Brief will have far more than five criteria by which it will be evaluated. Likewise, since all Squad members will develop concept sketches, there will be more than four options that will need to be evaluated.

	CRITERIA					
Ideas	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5	Totals
Option 1						
Option 2						
Option 3						
Option 4						

Addendum D. Engineering Notebook Judging Criteria

Notebook Formatting		
Present?	Item Description	Comments/Goals for Improvement
	Required: Cover page, including Team name & Team number	
	Optional: Creative cover, Team photo, etc.	
	Required: No more than two binders	
	Required: Neat organization, neat presentation of information	
	Optional: Page Numbers	
	Optional: Table of Contents	
	Optional: Section dividers, clearly labelled	
	Optional: Entries made on both sides of the paper	
Notebook Sections		
Present?	Item Description	Comments/Goals for Improvement
	Required: Team Summary page	
	Required: Engineering Section	
	Engineering Section documents the design, build, & testing stages of the robot	
	Includes code development process (not just the code)	
	Required: Team Section (deeper dive of Team Summary page)	
	Optional: Outreach Section	
	Optional: Awards and Recognition Received Section	
	Required for some awards: Business Plan, Strategic Plan, and/or Sustainability Plan	
	Required for the Control Award: Control Award Content Sheet* (check with event on how this sheet will be collected)	
	Optional: Budget section (if not included already)	
Notebook Quality		
Present?	Item Description	Comments/Goals for Improvement
	Team growth and development is documented	
	Team leadership and organization is documented	
	Team failures and struggles are documented	
	Every Team member contributes to the Notebook	
	Every meeting has at least one Notebook entry	
	Entries include pictures, drawings, and text as applicable	
	Notebook is an accurate representation of the Team and journey	
	Notebook documents changes in the robot plan, including <i>WHY</i> the change was made	

* Control Award Content Sheet includes:

- Autonomous objectives;
- Sensors used;
- Key algorithms;
- Driver controlled enhancements;
- Engineering notebook references; and
- Autonomous program diagrams.

Addendum E. Engineering Notebook

Using an Engineering Notebook to record ideas, inventions, experimentation records, observations and all work details is a vital part of any laboratory process. Careful attention to how you keep your Engineering Notebook can have a positive impact on the patent outcome of a pending discovery or invention.

Following are some overall recommendations to help you keep more efficient and accurate Engineering Notebook entries. Remember, however, that these are simply a suggested set of guidelines. Only your attorney can supply the exact guidelines she would like you to follow to satisfy specific legal requirements. That is why we recommend that you consult your legal counsel.

Recording Data

Your Engineering Notebook is a vital record of your work whether it is for patent purposes, or legal records. The Engineering Notebook can help you prove:

- a. Exact details and dates of conception
- b. Details and dates of reduction to practice
- c. Diligence in reducing your invention to practice
- d. Details regarding the structure and operation of your invention
- e. Experimentation observations and results
- f. A chronological record of your work
- g. Other work details

Follow a few simple rules of thumb

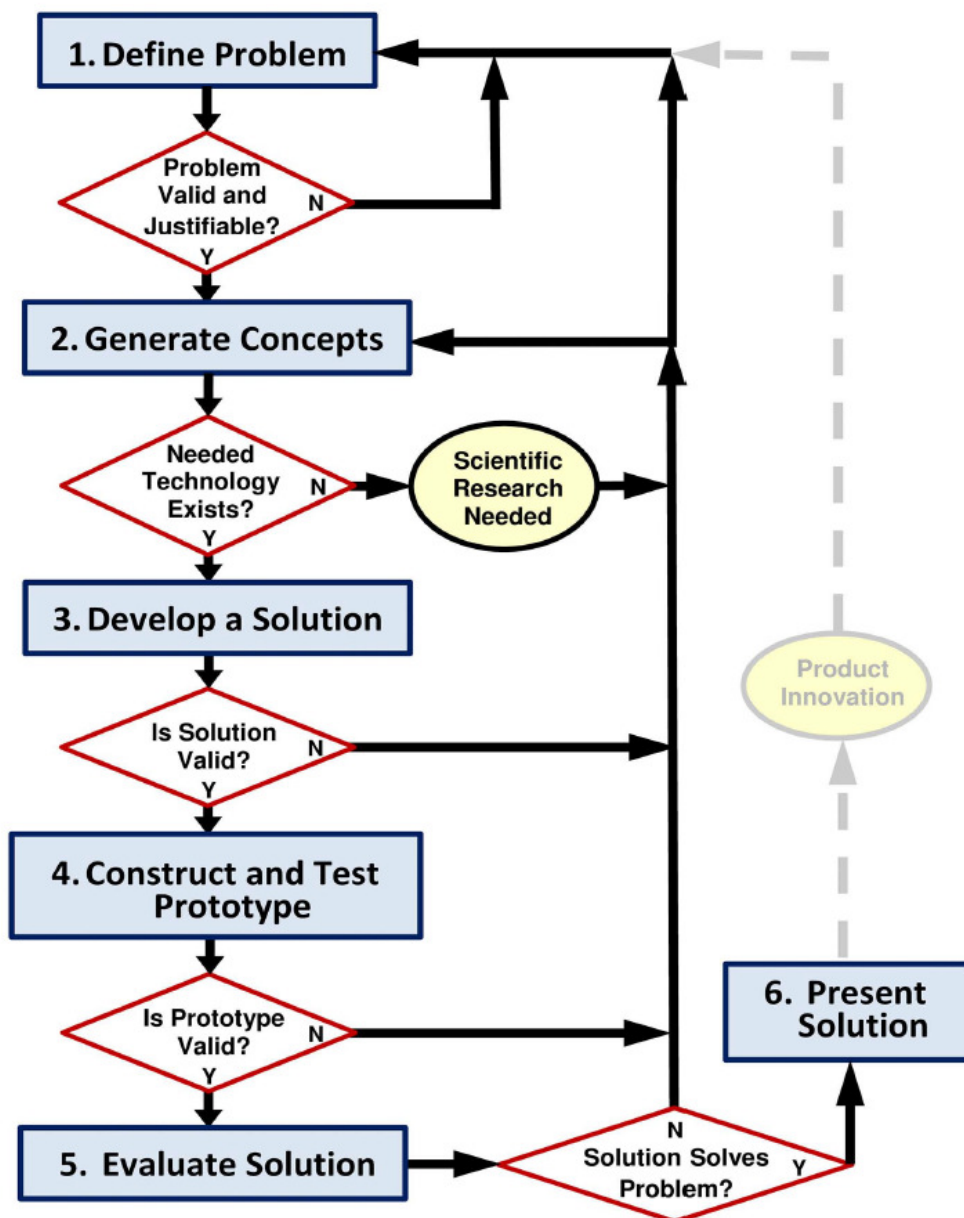
1. Always record entries legibly, neatly and in permanent ink.
2. Immediately enter into your notebook and date all original concepts, data and observations, using separate headings to differentiate each.
3. Record all concepts, results, references and other information in a systematic and orderly manner. (Language, charts and numbering systems should be maintained consistently throughout.)
4. It is acceptable to make your entries brief. Always, however, include enough details for someone else to successfully duplicate the work you have recorded.
5. Label all figures and calculations.
6. Never, under any circumstances, remove pages from your notebook.

Remember to treat your Engineering Notebook as a legal document: It records the chronological history of your activities. The following guidelines should help you maintain the consistent and accurate entries needed for future legal purposes.

1. Start entries at the top of the first page, and always make successive, dated entries, working your way to the bottom of the last page.
2. After completing a page, sign it before continuing to the next page.
3. Make sure that you record the date of each entry clearly and unambiguously.
4. Never let anyone other than yourself write in your Notebook (excluding witness signatures, discussed later).
5. Never leave blank spaces, and never erase or remove material you have added. Simply draw lines through any blank spaces at the same time you are making your entries.
6. Do not erase errors. Just draw a single line through any erroneous entry, then add your initials. Enter the correct entry nearby.

7. You can supplement your entries with supporting material (e.g., test-result printouts and other documentation). But you must permanently affix the material onto a page in its proper chronological location.
8. Never rely solely on any supplemental attachment. Always include your own entry describing the attachment and add any conclusions that you might draw from its substance.
9. Occasionally, secondary sources might be too large or inappropriate to attach directly to your notebook. In this case, you can add all secondary sources to an ancillary record maintained precisely for this purpose. However, always remember to write a description of these secondary sources, clearly and unambiguously, in your notebook.

Addendum F. Engineering Design Process



- a. **Define the Problem:** While *FIRST* Tech Challenge provides much of what is needed to define the problem in the form of rules, individuals are required to produce a Design Brief before being permitted to move to the next step in the process. (*see Appendix B for format*) The Coach must approve the Design Brief before the individual can move to the next phase.
- b. **Generate Concepts:** The best way to have a good idea is to have many ideas. As such, brainstorming should be done **individually**. In this phase, individuals will brainstorm ideas and create concept sketches of overall design and specific key components and sub-components (i.e. chassis design, motion mechanisms, etc.) Individuals should strive to create as many sketches of as many different concepts for solving the. The Coach must approve concept sketches before an individual will be assigned to a working Squad.
- c. **Develop a Solution:** This phase includes a number of steps.
 1. Prior to beginning this phase, a working Team will be chosen to share, consolidate and merge their concepts. Team Leaders and Coaches will concepts using a Decision Matrix. (*see Appendix C for format*)
 2. Once a final design is chosen, the Team will develop detailed three-dimensional models and technical sketches for all components and sub-components (i.e. chassis, robotic arm, lifts, etc.) Technical sketches must include a fully-dimensioned multi-view presentation with appropriate tolerances and an isometric representation for each component and sub-component. Modeling software will be available to those individuals who wish to do their Technical Drawings in Autodesk. Computer modeling has the advantage of allowing one to test components prior to construction.
 3. Once three-dimensional modeling and technical sketches are complete, a complete robot assembly must be created in the available CAD software installed on the IEC computers. Having a virtual robot allows for testing prior to the build, and reduction in the amount of material that is wasted during the build process.
 4. Technical sketches prior to any build also allows the Team to evaluate available materials, and order additional materials as the Program budget permits. No construction is permitted until the Coach has approved the Squad's Decision Matrix, three-dimensional models, and Technical Drawings.
- d. **Construct and Test Prototype:** Construction includes building and coding. At early stages of development, code does not need to be final, but should be sufficient to test all components and subcomponents. All construction must adhere to the specifications of the technical sketches. Once the construction is completed, the solution needs to be tested against the criteria set forth in the Decision Matrix.
- e. **Evaluate the Solution:** At this point, Squads will consider the extent to which their solution satisfies the Design Brief and the criteria in the Decision Matrix. If modifications to the solution are warranted, the Team or functional subgroup will return to the *Generate Concepts* phase of the Design Process.

Appendix G. *FIRST* Award Criteria

Gracious Professionalism: 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.

With Gracious Professionalism, fierce competition and mutual gain are not separate notions. Gracious professionals learn and compete like crazy, but treat one another with respect and kindness in the process. They avoid treating anyone like losers. No chest thumping tough talk, but no sticky-sweet platitudes either. Knowledge, competition, and empathy are comfortably blended.

Coopertition: Coopertition produces innovation. At *FIRST*, Coopertition is displaying unqualified kindness and respect in the face of fierce competition. Coopertition is founded on the concept and a philosophy that teams can and should help and cooperate with each other even as they compete.

Coopertition involves learning from teammates. It is teaching teammates. It is learning from Mentors. And it is managing and being managed. Coopertition means competing always, but assisting and enabling others when you can.

The following is a complete list of *FIRST* Tech Challenge Team awards:

Inspire Award: This award is generally given to teams who achieve greatness in all parts of *FIRST* including programming, robot design, the engineering notebook, judging presentations, gracious professionalism, and outreach. This team embodies what it is to be a *FIRST* robotics team and is a team that others can look up to as a role model. The Inspire Award is the highest ranked award as it embodies all other awards inside of it and allows a direct bid to the next level of competition.

Think Award: The winning team of this award clearly displays their engineering and design process in their engineering notebook. This award honors the team who had an engineering section of their engineering notebook that clearly displayed the mathematics, science, and design process that went into the building of their robot.

Connect Award: This award is granted to the team that most connects to their engineering community outside of *FIRST* by sharing who they are, what *FIRST* is, and how others can become involved. On top of that, this team's engineering notebook shows that they have a clear outreach plan that they will follow throughout the season.

Rockwell Collins Innovate Award: This award is given to the team with the most innovative and creative robot design. This robot must work in a consistent manner but does not need to perform well in every round to be eligible for this award.

Design Award: This award focuses on the design aspect of the robot. The team winning this award must show a thoughtful design on their robot that is both functional and aesthetic. The robot must distinguish itself from other competitors by showing off its unique design.

Motivate Award: The winning team of this award exemplifies what it means to be a *FIRST* team. This team works together by showing gracious professionalism at competitions and by recruiting and assisting other teams and members at home.

Control Award: This programming centered award commends the team that had the best use of unique programs and successful sensors used in their rounds. This team's engineering notebook must have had a very detailed in explaining their implementation of software, sensors, and mechanical control.

Promote Award: This award is given to the team who created the best 60-second video message for the public and other members of *FIRST*. This video should be inspirational in the way of our changing culture of science, technology, engineering, and mathematics.

Judges Award: This award is given to teams who exemplify traits that should receive recognition by do not fit into any other category of awards.