5

Engineering Notebooks

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Section 5 – Engineering Notebooks

5.1 – Overview

This section describes the requirements for creating the Engineering Notebook, including formatting guidelines, Judge's tips, and the use of various forms of engineering support. It also provides sample pages from an award winning *FIRST* Tech Challenge Engineering Notebook.

5.2 – What is an Engineering Notebook?

One of the goals of *FIRST* and the *FIRST* Tech Challenge is to recognize the engineering design process and "the journey" that a team makes during the phases of the problem definition, concept design, system-level design, detailed design, test and verification, and production.

Throughout the building of your robot you will come across some obstacles, lessons learned, and the need to draw things out on paper. This is where you and your team will use an engineering notebook. These notebooks will follow your team from kickoff throughout the competitions. Judges will review your Engineering Notebook to better understand your journey, design, and team.

Note: *Refer to the judging criteria section of Section 7: Awards & Judging Criteria for more details on how your Engineering Notebook will be judged.*

5.3 – The Notebook

Electronic/Online: Teams may choose to use electronic or online programs to create their Engineering Notebook. For the purposes of judging, teams must print out their Engineering Notebooks and place them in a binder, no larger than 1" . All pages must be electronically numbered and in order. Only one copy is required per team Online videos or demonstrations cannot be considered this year.

Written: Laboratory or documentation notebooks are available through your school or local stationary supply store.
There are many different types to choose from, using the following criteria:

- Use a notebook with a stitched binding.
- **Do not** use a loose leaf or spiral bound notebook.
- Numbered pages are recommended (but not necessary) so that pages cannot be substituted or deleted.
- Only **one** Engineering Notebook will be required per team.

5.4 – Guidelines/Format

The *FIRST* Tech Challenge Engineering Notebook is a complete documentation of your team's robot design. This documentation should include sketches, discussions and team meetings, design evolution, processes, the "Aha's!", obstacles and each team member's thoughts throughout the journey. So here are the guidelines:

- Document EVERYTHING!!

- Engineering Notebooks should be organized enough to have an outsider understand your team and your journey.
- Written entries should be in **Permanent Ink** – Not Pencil.
- Start your notebook by introducing each team member and mentor with a brief biography of their name, age (or school year), interests, and reasons for joining your *FIRST* Tech Challenge team.
  Tip: *Pictures along with the bios would serve as a great visual for the judges to get to know each member of your team.*
- Start a fresh page at every meeting. Your team number, date, and start/stop times should be recorded when starting a new page. Each day should start with two columns:
- Task Column – What your team is doing and discovering?
- Reflection Columns – Where your team records thoughts on what is happening and any questions that need to be answered.
- Entries should be made by every team member, initialed, and dated.
- All designs and changes to your robot should be recorded directly into your notebook. The inclusion of all elaborate details and sketches are preferable. Notes and calculations should be done in your notebook, NOT on loose paper.
  Tip: *A judging panel is always interested to see a unique design or playing strategy. On the other hand, a design without the substance to support its reasoning will not be viewed as highly.*
- In the case of an error, draw a single line through the incorrect data. Do NOT erase or use correction fluid. All corrections should be initialed and dated.
- Use both sides of a page. Never leave any white space: "X" out or Crosshatch all unused space, and don't forget to initial and date.
- To insert pictures or outside information into your notebook, tape the picture into your notebook and outline with permanent ink, to note that it was there in case it falls out.
  Tip: Pictures or sketches of your robot designs are recommended as part of a thorough documentation.

5.5 – Judge's Tips

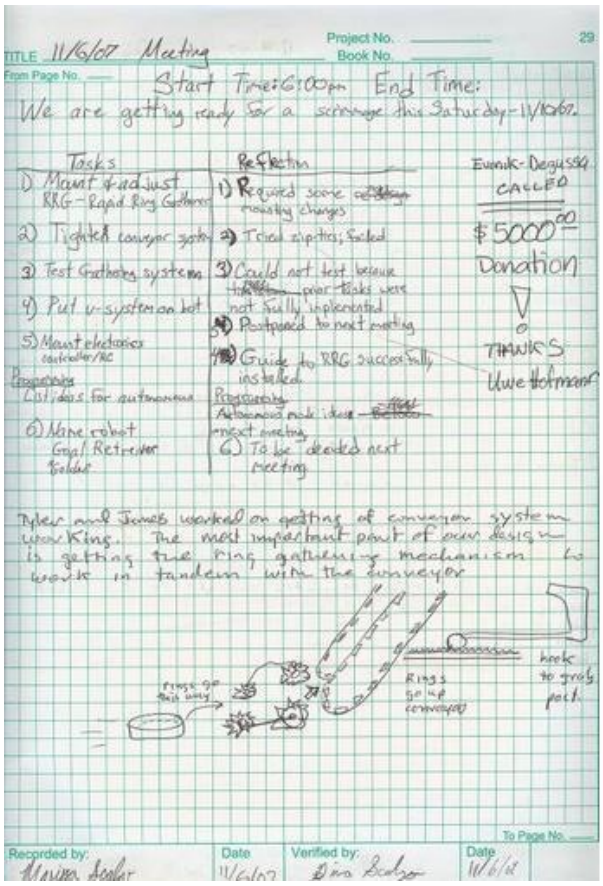
- Every notebook is a work in progress, forever changing and developing. Judges do **not** want to see a "final" copy notebook; they want the **real thing** complete with misspellings, stains, worn edges and wrinkled pages. Just remember to keep it real!
- When turning notebooks into the judges at your event, place sticky tabs at the top of the page on your top 6-12 best moments as a team. Judges will use these pages as their preliminary review of your notebook.
- Don't be afraid to customize your Engineering Notebook to reflect your team's personality! At the end of the season, this notebook will be a great piece of memorabilia for your team.
- Don't forget to put your team number in your Engineering Notebook, so we know who to return it to after the judges have seen it!

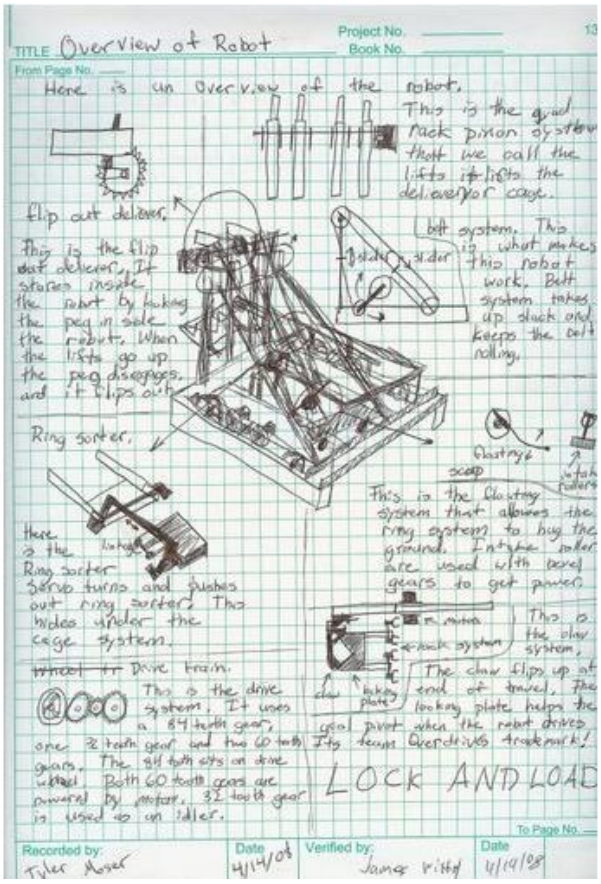
5.6 – Virtual Help

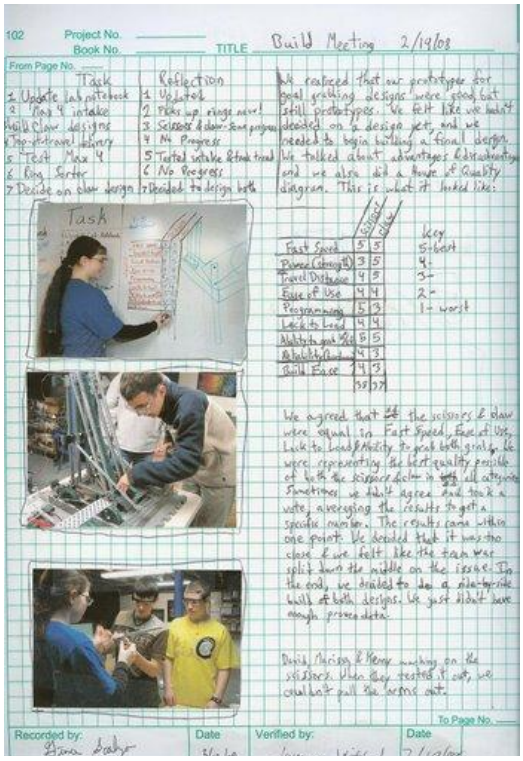
It is in the spirit of *FIRST* to bring the technical knowledge of an engineer to high school students to broaden their awareness and knowledge of the engineering world. Please ask any questions you have about the Engineering Notebook in the Official FTC Q&A system.

5.7 – Notebook Examples

The following examples were taken from Team 74 Overdrive from Bridgewater, New Jersey. They were the Amaze Award winners at the 2007 FTC World Championship, as well as members of the winning alliance.







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From Page No. _____

Task	Reflection
1 Update lab notebook	1 Updated
2 Max 4 intake	2 Picks up ringe more!
3 Build Claw designs	3 Scissors & claw done prototype
4 Top-of-travel delivery	4 M Progress
5 Test Max 4	5 Tested intake & tread
6 Ring Sorter	6 No Progress
7 Decide on claw design	7 Decided to design both

We realized that our prototypes for goal grabbing designs were good, but still prototypes. We felt like we hadn't decided on a design yet, and we needed to begin building a final design. We talked about advantages & disadvantages and we also did a House of Quality diagram. This is what it looked like:

	Scissors	Claw
Fast Speed	5	3
Power (strength)	3	5
Travel Distance	4	5
Ease of Use	4	4
Programming	5	3
Ease to Load	4	4
Ability to grab goals	5	5
Reliability	4	3
Build Ease	4	3
	38	37

Key
5=best
4=
3=
2=
1=worst

We agreed that the scissors & claw were equal in Fast Speed, Ease of Use, Ease to Load, Ability to grab goals. We were representing the best quality possible of both the scissors & claw in each all categories. Sometimes we didn't agree and took a vote, averaging the results to get a specific number. The results came within one point. We decided that it was too close & we felt like the team was split down the middle on the issue. In the end, we decided to do a mini-build of both designs. We just didn't have enough prove data.

David, Marissa & Henry working on the scissors. When they tested it out, we could not tell the scissors out.

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Recorded by: Date Verified by: Date