ENGINEERING FOLIO TEMPLATE
FIRST Tech Challenge Malaysia

Please take a moment to review the instruction, requirements, and recommendation before proceeding.

General Instruction

1. This engineering folio represents the **progress** which was made by the team in throughout the **building season**
    a. Engineering Folio will be divided into 2 sections for this season:
        i. **Part 1 – Idea Brainstorming, Game Strategy Implementation, Robot Designing, Mechanical Construction & Consideration**
        ii. **Part 2 – Electronics Functionality & Working Principle, Electronics Attachment & Objective Synchronization, Programming & Debugging, Field Testing and Experimental Data**
2. Teams shall fully document **each detail, activities, problems, and challenges faced throughout the building process, and their innovative solution.**
3. This engineering folio should follow the team from the **first day** of competition (Briefing Session), to **a week before the championship** (Pre-Championship), where it is submitted for marking purposes
4. Engineering Folio would be the ultimate assessment medium in determining Special Awards for teams
    a. Teams that compete in FTC without a complete robot, but with an Engineering Folio **IS** eligible for Special Awards consideration; teams with a complete robot, but without an Engineering Folio **WILL NOT** be considered for any placing awards and Special Awards
5. Teams are encouraged to present information regarding their team's robot in a creative, yet attractive way
6. Sketches/Pictures of robot design AND robot building by the team, together with the programming steps and process MUST be included in respective portions
7. Engineering Folio can be submitted in virtual form, OR physical form
    a. For those who opt to submit in physical form, please inform FTC personal
8. Engineering Folio must be submitted one (1) week prior to competition date for virtual submissions in giving judges sufficient time to review
9. Teams are encouraged to portray information in their ***Engineering Folio*** in **a creative, yet interesting way** within the requirements and recommendations listed below.

Engineering Portfolio Requirements

1. To be considered for judges awards, a team **must submit** an engineering folio.
    a. Teams who do not submit an engineering folio will not be considered for judged awards.
2. The total number of pages for an engineering folio will **not** exceed 16 pages including the cover page.
    a. Cover page may include the team information and a table of contents.
    b. Cove page may not include other content except mention in **a.**
        i. Additional content on the cover page adds to the page count of the folio, meaning content on the last page of the folio will not be reviewed or considered.
3. Pages must be the equivalent of Standard A4 size.
4. Fonts used must be a minimum of size 10.
5. Judges are instructed to only review the 16 pages of the folio including the cover page. Information beyond the 16 pages will **not** be reviewed or considered.
6. Team name/Team number & content creator name on top of every page makes it easier for judges to know who created the engineering folio they are reviewing. The team number on the cover page is a **required** component of the engineering folio.
7. Engineering folio must **not** include links to other documents, videos, or any other additional content.

a. Please note that judges will **not** review linked content in the folio, including websites or videos.

8. Control Award Form is not part of the folio and is not included in the total page count.

Engineering Portfolio Recommendations

1. We strongly recommend the team number & creator name is at the top of each page.
2. The engineering folio is not a presentation. Teams should consider that this is a document that is meant to be read by the judges.
3. The folio **could** include:
   a. Summary of the engineering content that includes the robot design processes.
   b. Summary of the team information that includes information about the team and outreach activities.
   c. Summary of the team plan and information about the team overall. The team plan could be a business plan, fundraising plan, a strategic plan, a sustainability plan or a plan for the development of new skills.
4. Teams are recommended to use this template to complete the Engineering Folio (page 4 onwards).
5. Teams can refer to the chart below to be sure their engineering folio provides answers for each of the requirements for specific awards.

Engineering Portfolio Requirements by Award

The chart below provides a quick outline of the engineering portfolio requirements by award:

Engineering Portfolio Requirements and Recommendations by Award **Requirements are indicated using the word "must."** **Recommendations are indicated using words like "could" or "should."**	
Inspire Award	• Team **must** submit an engineering portfolio. The engineering portfolio **must** include summary information about the robot design, information about the team, and a team plan. The entire engineering portfolio **must** be high quality, thoughtful, thorough, concise, and well-organized. The team **should** be able to describe specific, detailed information to support the information in the portfolio.
Think Award	• Engineering portfolio **must** have engineering content. The engineering content **could** include entries describing examples of the underlying science, mathematics, and game strategies in a summary fashion. • The engineering portfolio **must** provide examples that show the team has a clear understanding of the engineering design process including an example of lessons learned. • The portfolio **could** inspire the judges to ask about specific, detailed engineering information. • Portfolio format is less important but enables the judges to understand the team's design maturity, organizational capabilities, and overall team structure. • Portfolio **could** reference specific experiences and lessons learned but **should** capture the summary of the status of the team and their robot design. • Portfolio **could** summarize experiences and lessons learned from

	outreach with concise tables of outcomes. • Portfolio **could** summarize how they acquired new mentors and/or acquired new knowledge and expertise from their mentors. • Portfolio **could** contain a summary of overall team plan. • Portfolio **could** contain information about the plans to develop skills for team members. • Portfolio **could** be organized in a logical manner.
Connect Award	• Team **must** submit an engineering portfolio. • Portfolio **must** include a team plan. The team plan **could** list the teams' goals for the development of team member skills, and the steps the team has or will take to reach those goals. Other examples of what the plan **could** include are timelines, outreach to science, engineering, and math communities, and training courses. • Portfolio **must** include a summary of how they acquired new mentors or acquired new knowledge and expertise from their mentors.
Innovate Award, sponsored by Raytheon Technologies	• Team **must** submit an engineering portfolio. • The engineering portfolio **must** include examples of the team's engineering content that illustrate how the team arrived at their design solution. • The portfolio **could** inspire the judges to ask about specific, detailed engineering information.
Control Award, sponsored by Arm	• The team **must** submit an engineering portfolio. The engineering portfolio **must** include engineering content that documents the control components. • The team **must** submit a Control Award submission form as a separate document. Teams **should** identify the control aspects of their robot of which they are most proud. • The Control Award submission form **must not** exceed two pages.
Motivate Award	• Team **must** submit an engineering portfolio. • The engineering portfolio **must** include a team organization plan, which could describe their future goals and the steps they will take to reach those goals. Other examples of what the plan **could** include are team identity, fund-raising goals, sustainability goals, timelines, outreach to non-technical groups, finances, and community service goals. • The team is an ambassador for *FIRST* programs. • Team can explain the individual contributions of each team member, and how these apply to the overall success of the team.
Design Award	• Team **must** submit an engineering portfolio that includes examples of robot CAD (Computer Aided Design) images or detailed robot design drawings. • The portfolio **could** inspire the judges to ask about specific, detailed engineering information.

(Contents above this line should not be included in Engineering Folio, but as an internal reference only)

(Cover Page)

(Paste or Draw Group Logo)

(Team Name / Team Number)

(Group Member 1)

(Group Member 2)

(Group Member 3)

(Group Member 4)

(Group Member 5)

(Group Member 6)

(Group Member 7)

(Group Member 8)

(Group Member 9)

*Adjust spacing accordingly in your creative manner

1.0 Team Introduction (One Page Description)

- Introduction to ***Team Name*** □ selection and definition of team name
- Introduction to ***Team Members*** □ what they do and background etc
- Introduction to ***Mentor(s)*** assigned □ background, speciaties etc
- **Reason/ objective in joining competition** (Why this competition?)
- Where do you **see yourself in 5 months**?
- Group photo of the team line-up

2.0 Briefing Session and Robot Planning

- Describe in detail the briefing session
    - What is the session for?
    - Who hosted it? Why team members need to attend it?
- What should the robot do? What tasks it shall complete?
    - Are there any constrains in the robot design?
    - What are the materials given in the FTC Starter Kit V3?
- What action items to be assigned to each team members? Are they suited and up for the tasks?
    - Develop a plan to utilize all team members in the most efficient way
    - Why are members chosen for that specific role? Justify
- What is the team methodology in completing the task or the competition for the season?
    - In detail, describe the plans of the team for robot scoring at each phase of the competition
    - Are there any mechanical principles which was brainstormed for the execution of task?
    - Briefly describe the mechanical principle(s) which was brainstormed, and how will it assist in the overall scoring
- Are there multiple robot designs/ideas involved? Is it chosen? Compare and justify why it isn't chosen.
- Which CAD software is used for the building (prototyping) of the robot in digital? Do you know any other software(s) available? Why don't you use it? Compare and justify in this report.
- Sketches and drawings in CAD is highly recommended, and will benefit, & ease teams for Special Awards shortlisting
- Sketches and design of the robot methodology used
- Special features? Additional materials or equipment used to complete task?
- More information related to the planning of robot building based on tasks…
- Describe any challenges and how to solve it.
- Kindly include screenshots OR pictures OR sketches of drawing ideas on respective area, and with description on each picture and step.

3.0 Robot Building Progress – Mechanical

- Briefly bring through what was given by the organizers, comparing towards the designed robot picture, is it sufficient?
    - If it isn't, what are the external materials/electronics needed to build the robot?
- Bill of material used for robot construction
- Special techniques used for the building of robot? Explained how you managed to complete some difficult assemblies
- Any special or common tool you would like to highlight and how it works?
- Did you all encounter mechanical problems during build? How you all solved it?
- Did the robot come out according to design? If no, why it was changed? How will it works based on the new concept?
- Estimated total elapsed time for building of robot
- Do you think that the robot is able to outrage other robots in the field? Why?
- Where do you attach different electronics on the robot build? Will it possess any hazard to the electronics?
- For each of the steps above, please attach related picture with caption in explaining it
- Did your team incorporate any creative or innovative design in your robot to make it attractive?

4.0 Robot Electronics

- Briefly bring though, and explain the functionality of Electronics Components which was provided to you team
- Explain in detail the specifications of the electronics components that your robot will be using during the competition
- Explain the attachment methodology of each of the electronics to the robot, as well as its objective and expected functionality after attaching with the robot
- Describe on how your deal with the connection of electronics on the robot.
- Explain on how the electronics component should be operated, and what variables are to be changed in changing it operability
- Provide picture of robot electronics wiring schematic diagram, and explain briefly the team's effort in reducing wiring issues at the robot
- Please provide pictures of robot actual build for each step, as well as some interrelated diagrams for this section

5.0 Robot Programming & Debugging

- Bring though the types of programming options provided in the REV Control Hub
    - Compare between both programming options, and justify why your team chose that programming option
- Show on how to program different type of electronics components on board your robot
- Explain the portion of programming for autonomous period, versus the tasks to be completed
- List out your robot programming portion, in side by side, or under section by section to the team strategy plan for robot scoring
    - If can state down different case options for the program to execute based on different input, or sensor received information
- Are there any issues faced during the programming of the team's robot?
    - What are the solutions in solving it? Share it under this section

6.0 Robot Field Testing & Experimental Data

- Does the robot react well during the field testing on actual FTC map?
- Does the programming which was done in the programming section fits in into the robot performance on field?
    - If no, how much tuning or change is required on the program made? Will it affect the team overall timeline?
- Any new last-minute Eureka new concept ideas raised from your team members? Is it feasible, and accepted?
    - Or any last-minute part-assembly removal from the robot in adhering to certain rules?
- What is the maximum score that robot can achieve in a trial run?
- Perform accuracy-accountability testing on different assembly-part of the robot to determine its accountability, and percentage success
- Any dangerous or liability parts of the robot in terms of its usability and scoring?
    - Determine its failure rate through experimenting
- Describe the worst case scenario of the robot, and what can be done in preventing such situation

7.0 Conclusion

- How do you think the robot build by the team will perform during the competition day?
- How do you felt the team performed throughout the building session?
- What was learned throughout the building season for the FTC?
- Any improvements that you would like to do in the future?
- Team photo with final robot build