



## Suggestions for Engineering Notebooks

The following paragraphs are intended to provide the teams with some general information to be considered when creating the documentation to support the use of the engineering process in the design and development of the robot. **These are only suggestions.** Notebooks are not required to be in this format.

- 1) **Requirements Definition.** In this section of the engineering notebook, all of the requirements are documented to demonstrate a complete understanding of the problem to be solved. This information is obtained from the written rules handed out with each kit. It is important that the entire team understand all of the requirements, not only those associated with building the robot, but also the rules of the competition. This section of the notebook should demonstrate a thorough knowledge of these requirements. A matrix of requirements should be created dividing the requirements into various categories (i.e. operational rules of engagement, robot requirements, etc.) This section should also include the detailed schedule used to create the robot and the estimated timeframes to accomplish these tasks. A summary chart should be included showing the actual schedule versus the planned schedule after the design and development of the robot is completed.
- 2) **Candidate Robot Approach and Trade-Offs.** Once the team has a thorough understanding for all of the requirements, the various candidate robot approaches are documented. The team should brainstorm various robot approaches that meet the requirements defined. Each of the candidate approaches should be evaluated using a trade-off matrix to identify the strengths and weakness of each approach. These candidate approaches are a high level description of the robot and its characteristics (i.e. offensive and defensive strategies, initial design approach for the robot, and evaluation of the candidate approach against the requirements). A method for selecting the final robot approach should be documented to demonstrate that each approach was evaluated and that the selection of the final approach was based upon sound engineering decisions.
- 3) **Design Requirements for the Selected Robot.** This section of the engineering notebook should contain the detail engineering requirements for the selected robot approach. This is a decomposition of the higher level system requirements into the detailed lower level requirements. For example, the drive train requirements would be defined (i.e. the power requirements, gear train ratios, torque, etc.). Each portion of the robot design should have a definition of the requirements in enough detail so that they can be designed.
- 4) **Detailed Design.** This portion contains the documentation associated with the details of the design including engineering sketches, CAD drawings, assembly drawings, list of materials, design calculations etc. This section should include a description for each portion of the robot's design showing drawings, design analysis supporting the design and traceability back to the design requirements. A summary of the design requirements and how they were met should be included in this section.

- 5) **Producing the Design.** This section should describe how each portion of the robot's design was manufactured or produced. This section should also describe any special parts that were built and the tools used to produce that part. This section should also describe any special problems encountered in building the robot and the actions taken to solve those problems.
- 6) **Testing the Design.** This section should outline the tests to be performed on the robot or portions of the robot. This section should also describe the details on how the robot was tested and how the designs performed against the design requirements including a detailed log of the testing performed and the results of the individual tests. This section should also describe the actions taken to modify the design in the areas where the design did not perform as expected or where the design requirements had to be modified or refined. The test log should include a description of the tests performed prior to Mall Day as well as the results of the Mall Day testing. A summary of the major problems encountered during all phase of the testing should be discussed and as well as the actions taken to solve these discrepancies.

Additional information you may want to include in your notebook:

- Team meeting notes/minutes
- Team participation (e.g., meeting attendance rolls, etc.)
- Community involvement
- Team organization information (i.e., sub-team definition & responsibilities, etc.)