**1. Define a Problem**

* *Discuss possible* ***problems*** *to address with your Advisor.*
* *What is the background of these* ***problems****?*
* *What is the motivation for their* ***solution****?*
* *Details of the problem may develop/change over the course of your Capstone.*

**2. Brainstorm**

* *With your Advisor brainstorm possible smaller “****starter problems****” and steps toward the full* ***solution****.*
* *Develop preliminary ideas.*
* *Present ideas in an open forum.*
* *Record all ideas.*

**3. Research**

* *Find good resources (text books, tutorials through papers) to introduce you to the background of the* ***problem****/ subject.*
* *Find resources directly associated with the* ***problem*** *itself.*
* *Are there solutions out there?*
* *Research solutions that may already exist (products available, patents etc.)*
* *Identify shortcomings and reasons why they aren’t appropriate to a given situation.*
* *Keep good notes/references, compile ideas and report findings to the team/Advisor.*

**4. Identify Criteria and Specify Constraints**

* Identify what the **solution** should do and the degree to which the **solution** will be pursued.
* Identify constraints: e.g., time/ cost/ size/ weight/ safety/ computation time etc.
* Make a brief summary.

**5. Explore Possibilities**

* *Consider further development of brainstorming ideas with constraints and tradeoffs.*
* *Explore alternative ideas based on further knowledge.*

**7. Develop a Design Proposal**

* *Explore the idea in greater detail (sometimes with annotated sketches).*
* *Make critical decisions such as: material types, manufacturing methods, or software.*
* *Generate through computer models detailed sketches to further refine the idea.*

**8. Make a Model or Prototype**

* *Make models to help communicate the idea, and study aspects such as shape, form, fit, or texture.*
* *Construct a prototype from the working drawings, so the solution can be tested.*

**9. Test/Evaluate Design**

* *Design experiments and test the prototype in controlled and working environments.*
* *Gather performance data; analyze and check results against established criteria.*
* *Conduct a formal critique to flesh out areas of concerns, identify shortcomings, and establish any need for redesign work.*

**10. Refine the Design**

* Make design changes; modify or rebuild the prototype.
* Make refinements until accuracy and repeatability of the prototype’s performance results are consistent.
* Update documentation to reflect changes.
* Receive user’s critique to provide outside perspective to help determine if established criteria have been met.

**11. Create or Make Solution**

* *Determine custom/mass production.*
* *Consider packaging.*

**12. Communicate Processes and Results**

* *Communicate the final solution through media such as PowerPoint, poster session, technical report.*
* *What remaining work needs to be done.*