

The Design Process

or how to build something you
need and not regret it later

Overview of the Design Process

- Identify the problem
- Lay the foundations for design (time constraints, \$, etc)
- Find the best solution
- Implement the best solution
- Reflect to learn from what you've done (and redesign if necessary)

Step 1:

Identify the Problem

Identify the Problem

- What do you need to accomplish?
- Break it up into small pieces
 - Some small pieces might already have solutions!
- Ask others for input if you are unfamiliar with the topic

Step 2:

Identify Constraints

Constraints

- Advisor wants this done by...
- It must cost less than...
- I want to graduate by...

Have a plan of how to spend your time:

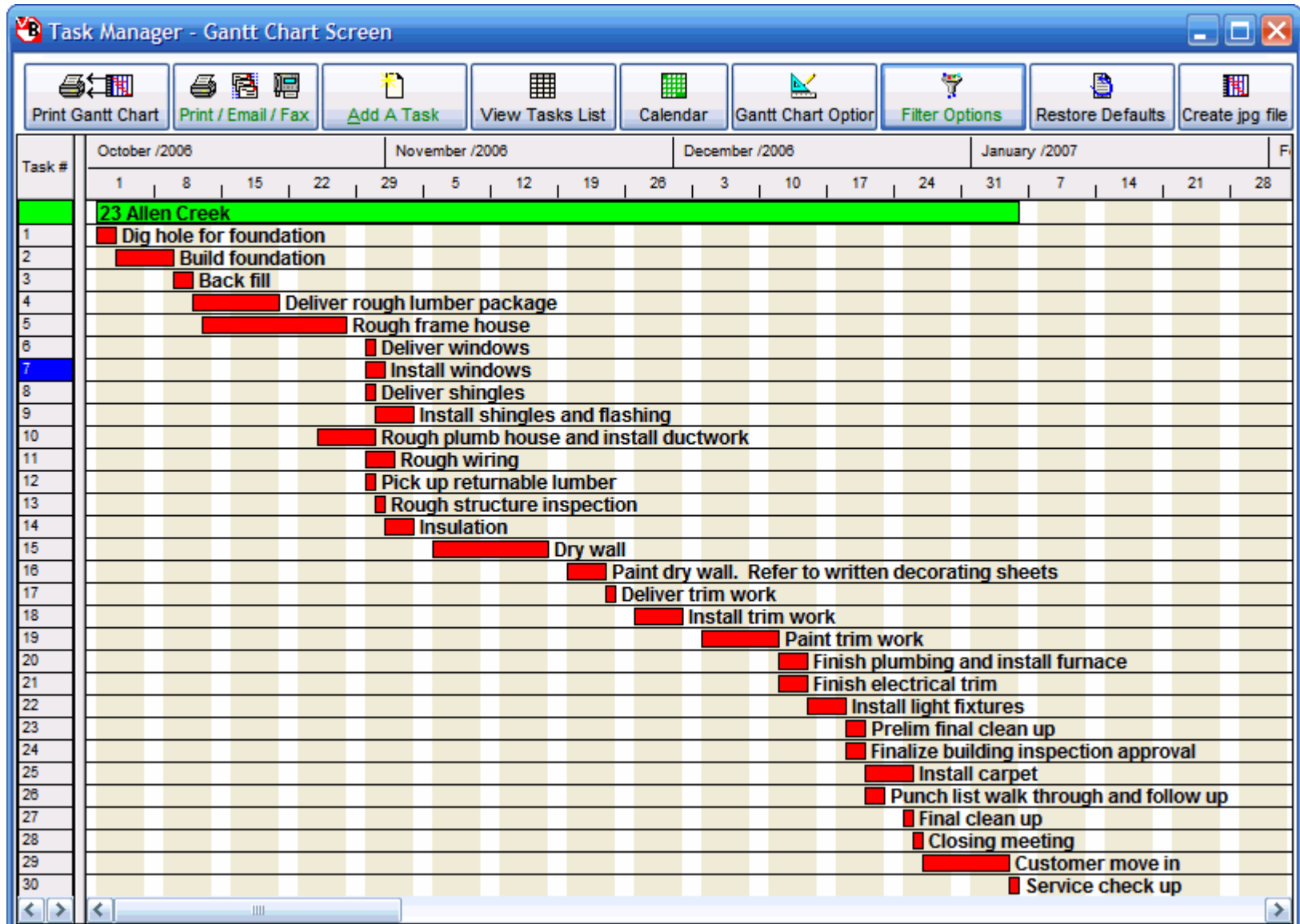
Gantt Chart

Gantt Chart

- A graphical representation of WHAT and WHEN
- Can also be used to show the “critical path”

Critical path: the sequence of activities with the longest overall duration, determining the shortest time possible to complete the project. Any delay of an activity on the critical path directly impacts the planned project completion date (i.e. there is no float on the critical path). *(from Wikipedia)*

Gantt Chart: Building a House



Finding the best solution:

FRDPARRC Chart

FRDPARRC Chart

- Functional Requirements (events)
- Design Parameters (design ideas)
- Analysis
- References
- Risks
- Countermeasures

FRDPARRC Chart

<i>Functional Requirements (Events) Words</i>	<i>Design Parameters (Idea) Words & Drawings</i>	<i>Analysis Experiments, Words, FEA, Equations, Spreadsheets...</i>	<i>References Historical documents, www...</i>	<i>Risk Words, Drawings, Analysis...</i>	<i>Counter- measures Words, Drawings, Analysis...</i>

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<i>Example</i>					

Picking the best solution:

Pugh Chart

Pugh Chart

- Compares your possible solutions against a set of criteria
- Great for organizing complicated lists of pros and cons

Pugh Chart

	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5
Idea 1					
Idea 2					
Idea 3					

Pugh Chart

	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5
Idea 1	1				
Idea 2	0				
Idea 3	-1				

Pugh Chart: carrying textbooks

	Confortble straps	Weather-proof	Stylish	Padded laptop pocket	TOTAL
backpack	1	1	-1	1	2
Messenger bag	0	1	0	0	1
Leather briefcase	-1	-1	1	-1	-2

Implementing the best solution:

Just Do It

That's what the rest of this class is about!

For more information

- pergatory.mit.edu/2.007 -> Fundamentals of Design (FRDPARRC chart)
- Wikipedia.com (Gantt chart)

- **4pm: Material selection**

Tuesday

- 3-4pm: Design basics
- 4-5pm: Design tips and mistakes

Wednesday

- 3-4pm: Manufacturing: metal removal
- 4-5pm: Design for milling/turning/drilling

Thursday

- 3-4pm: Manufacturing: rapid prototyping, molding, forming, casting
- 4-5pm: Drawing, dimensioning, tolerancing, and working with outside shops

Friday

- 3-4pm: Effective use of drills, saws, taps, and dies
- 4-5pm: Motion control