The capstone design notebook

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What is a design notebook?

Think of the notebook as your “think pad”

– The notebook helps you
  • Recall ideas you developed
  • Support decisions you made

– You are the main audience of your notebook

Records all activities relevant to the project

– Information acquired (inputs)
– Ideas developed (outputs)
Why keep a notebook?

For legal reasons

– Notebooks serve as official documents for patenting (if used properly)
– In the case of a dispute, it establishes the time when the idea originated and the history of its development
– Thus, good time keeping is essential
Why keep a notebook?

For practical reasons

– A useful resource to prepare reports
– Helps you remember what you did months/years earlier
– Provides continuity
  • Your notebook stays if you leave the team
  • Serves as a starting point for new team members
  • Prevents them from making the same mistakes you made
Contents

A notebook should capture ALL details of a project

– More informal than the final report
  • Final report documents your design
  • The notebook documents how you got there

The four basic elements

– Information
– Sketches
– Results
– Thoughts
Contents: information

Reference materials
- Background research and literature/patent searches
- Sources of information (URLs, books)
- Contact information (name, phone number, emails)
- Parts lists, specs, cost, assembly instructions

Meeting notes
- Time and date, individuals present
- Items discussed and action items
- Questions/comments from team members/advisors

Periodic assessments of the state of the project
- Are you on schedule or behind?
- What potential problems concern you the most?
Contents: sketches

Sketches

Data flow diagrams

Control flow diagrams

Block diagrams

Functional flow diagram

Data flow diagrams
Contents: results

Testing procedures
– Plans for collecting data (date, location, resources needed)
– Purpose of the experiments, expected results
– Experimental conditions during tests
– Lists of variables and measurements

Results
– Calculations, statistics
– Tables, charts and graphics

Discussion of results
– Causes and effects, correlations, outliers, trends
– Significance of the results
– Implications for future work
Contents: thoughts

Problems you’ve encountered
- Dead ends, design flaws, problematic data/experiments
- Legal and ethical issues

Potential solutions

Future work
- Limitations of your work
- Implications and applications
- Relationship to other projects

Other
- Questions for team members and instructor
- Management issues (scheduling, budget, division of labor)
Contents: other considerations

Emphasize visual elements

- Sketches of your concepts and designs
  - These should become more specific as the project progresses
- Block diagrams, data/signal flow, functional flow...
- Graphs, waveforms, tables...

Document thoroughly

- Make entries readable for others to understand
  - Explain why decisions are made
  - Include narrative explanation of calculations, not just data
  - Also explain sketches, graphics, charts, tables
- Go for volume: average of 5 pages/week
Format

Type of notebook

– Permanently-bound composition or lab notebook
– Spiral-bound notebooks, loose-leaf binders not allowed
Record directly into the notebook
– Do not use a separate “scratch pad”
– Do not keep separate pieces of paper
– Glue extra documents (e.g. printouts); no tape or staples, please

Write in ink, not in pencil
– Put your name, contact and course # on the front cover
– Number each page
– Do not erase or remove pages; instead, cross out any mistakes
– Cross out large blocks of blank space

Date ALL entries
– Title, date and time, location, people present, purpose, results...

Keep it neat
– Write legibly
– Don’t use it as a drink coaster or a food plate
Grading

Your notebook documents your work in 482/483
– Therefore, it carries a lot of weight on your final grade

Grading criteria
– Project work
– Process
– Critical thinking
– Formatting
Grading: project work

Entries that show work accomplished on the project

– Results of research (prior work, alternatives, etc.)
– Calculations, formulas, derivations
– Sketches, drawings, diagrams
– Test procedures
– Test setups
– Experimental results
– Discussion of results
– Citations of documents/code created
Grading: process

Entries that show evidence of the design process

– Plans for project work
– Identification of tasks
– Distribution of work
– Design decisions
– Problems encountered and overcome
Grading: critical thinking

Entries that show in-depth thinking

– About the project
  • Customer needs and requirements, and how they evolve
  • Intellectual property issues
  • Maintenance and feasibility issues

– About your team
  • Division of labor, team issues
  • Your role within the project and team

– About society
  • Safety, ethics, environment
Grading content: formatting

Evidence of proper use of the notebook

– Readability and clarity
– Entries for group meetings
– Dated entries, pages numbered
– Loose pages attached, entries in ink
References

Materials for this presentation were assembled from on-line sources at the following institutions

– University of California at San Diego ([URL](#), [URL](#))
– Colorado State University ([URL](#))
– University of Wisconsin ([URL](#))
– Purdue University ([URL](#))
**A good notebook page:** dated entry, narrative included, good use of graphical elements, clarity

**A bad notebook entry:** items were copied from the board with a cell phone camera, printed, cut and stapled onto the notebook