

Zhejiang University / University of Illinois at Urbana-Champaign Institute

ECE 445

SENIOR DESIGN LABORATORY

FINAL REPORT

Project #114

An interesting project

Team #514

Captain Price price@example.com

Ghost ghost@example.com

TA: Jim Hacker

April 20, 2023

ACKNOWLEDGEMENT

Writing an acknowledgement section is a way to express your gratitude to individuals and organizations that have contributed to your project. Below are some tips on how to write an acknowledgement section:

Begin your acknowledgement section by expressing your gratitude to the individuals or organizations that have helped you with your project. This can include your faculty advisor, project sponsor, team members, family members, and friends.

Be specific about the contributions that each person or organization has made to your project. This can include providing technical guidance, financial support, or emotional support. It's important to keep your acknowledgement section concise. Try to limit your acknowledgements to one page or less. Keep in mind that your acknowledgement section is part of a formal report, so please use a professional tone and avoid overly casual language.

ABSTRACT

The abstract is short (150 words or less) and provides enough of a summary of the report for the reader to decide whether to read the entire document. State very concisely what your device or system does, and the main findings and results of your project. Save background information (e.g., motivation, competitors) for the introduction and design details for the body of the report. Do not give an advertising pitch. Note that the abstract does not appear in the table of contents. (This achieved by stripping out the heading style.)

Keywords: xxx, xxx

CONTENTS

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1 INTRODUCTION

Briefly describe the science or engineering problem to be addressed in the report, as well as the purpose and usefulness of the device or system you have built. Summarize the contents of the upcoming chapters as well as the main conclusions of your project, to be elaborated in the last chapter.

1.1 Section head

To create a section head, type `\section{}` and put the section name into the brackets. It automatically formats as above and creates a table of contents entry (after you compile the project twice using XeTeX or LuaTeX, or once using latexmk). TeX will not make the capitalization consistent; you have to do that yourself.

Figure 1 is an example of figure and caption style. Table 1 is an example of table and table title style. A starter table for parts costs is in Chapter 4 of this template.

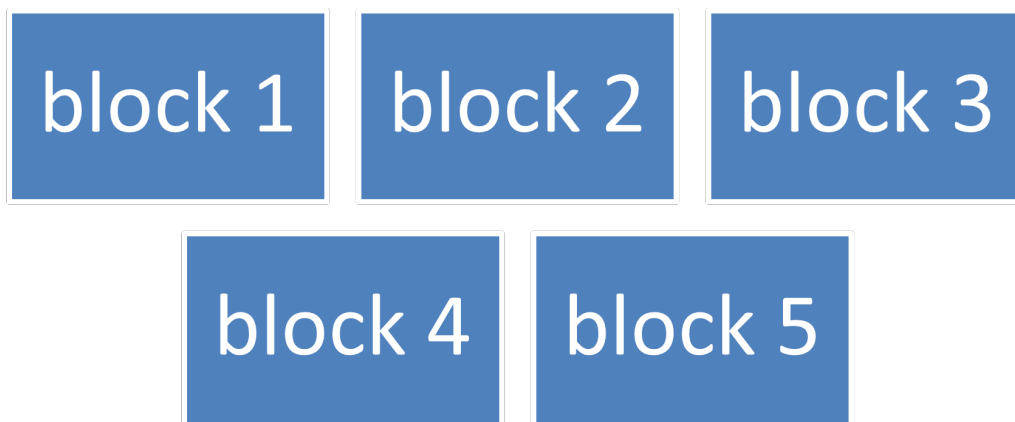


Figure 1.1: Example of placement and caption for a block diagram. Size the figure so that one-inch margins are preserved. Group the figure and caption to hold them together.

Table 1.1: Example of a Table and Its Title

Part	Electricity	Magnetism
Field intensity	E	H
Flux density	D	B
Constitutive factor	ϵ^b	μ^c

2 DESIGN

Discuss general design alternatives. Give equations, simulations, general circuits. Describe design in detail, addressing each major component. Include schematics with components, drawings, flowcharts, etc. Some teams may wish to split this chapter in two: 2. Design Procedure, and 3. Design Details. This template will not automatically update numbering systems for chapters, sections, figures, tables, etc., so keep track of them as you develop and revise the text.

2.1 Component or Block

To create a section head, use `\section{}`. It automatically formats as above and creates a table of contents entry (after you compile).

2.1.1 Subcomponent or subblock

To create a subsection head, use `\subsection{}`. It automatically formats as above and creates a table of contents entry.

Following is a “template” for displayed math. It looks much better than the Word template.

$$EQO = \sum_{i=1}^n W_j * r_{ij} \quad (2.1)$$

$$EHI = L_1 \times ESI + L_2 \times EQI \quad (2.2)$$

$$\frac{EE}{EHI} = \beta_0 + \beta_1 PCG + \beta_2 RGP + \cdots + \beta_i X_i + \quad (2.3)$$

$$\cdots + \beta_9 ICWUR + \beta_{10} ECPG + \beta_{11} WCPG + \epsilon_i \quad (2.4)$$

3 CITATION

This template uses IEEE citation style, as is required by the final report and the individual progress report. To begin with, generate your own .bib file. Below is a sample of this:

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1 @article{chen2019,
2   title = {An {{HDG Method}} for the {{Time-dependent Drift}}- {{Diffusion
3     Model}} of {{Semiconductor Devices}}},
4   author = {Chen, Gang and Monk, Peter and Zhang, Yangwen},
5   date = {2019-07-01},
6   journaltitle = {Journal of Scientific Computing},
7   shortjournal = {J Sci Comput},
8   volume = {80},
9   number = {1},
10  pages = {420--443},
11  issn = {1573-7691},
12  doi = {10.1007/s10915-019-00945-y},
13  urldate = {2023-04-14},
14  langid = {english}
15 }
16 @article{doan2019,
17   title = {Analysis of a Drift- Diffusion Model for Organic Semiconductor
18     Devices},
19   author = {Doan, Duy-Hai and Glitzky, Annegret and Liero, Matthias},
20   date = {2019-03-06},
21   journaltitle = {Zeitschrift für angewandte Mathematik und Physik},
22   shortjournal = {Z. Angew. Math. Phys.},
23   volume = {70},
24   number = {2},
25   pages = {55},
26   issn = {1420-9039},
27   doi = {10.1007/s00033-019-1089-z},
28   urldate = {2023-04-14},
29   langid = {english}
30 }
31 @online{feucht2018,
32   title = {Buffer {{Amplifiers}}: {{Design}} \& {{Applications}}},
33   shorttitle = {Buffer {{Amplifiers}}},
34   author = {Feucht, Dennis},
35   date = {2018-05-07T21:31:00+00:00},
36   url = {https://www.planetanalog.com/buffer-amplifier-design/},
37   urldate = {2023-04-16},
38   langid = {english},
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39   organization = {{Planet Analog}}
40 }
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42 @article{haynes1949,
43   title = {Investigation of {{Hole Injection}} in {{Transistor Action}}},
44   author = {Haynes, J. R. and Shockley, W.},
45   date = {1949-02-15},
46   journaltitle = {Physical Review},
47   shortjournal = {Phys. Rev.},
48   volume = {75},
49   number = {4},
50   pages = {691--691},
51   publisher = {{American Physical Society}},
52   doi = {10.1103/PhysRev.75.691},
53   urldate = {2023-04-16},
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56
57 @article{haynes1951,
58   title = {The {{Mobility}} and {{Life}} of {{Injected Holes}} and {{Electrons}}
59     in {{Germanium}}},
60   author = {Haynes, J. R. and Shockley, W.},
61   date = {1951-03-01},
62   journaltitle = {Physical Review},
63   shortjournal = {Phys. Rev.},
64   volume = {81},
65   number = {5},
66   pages = {835--843},
67   publisher = {{American Physical Society}},
68   doi = {10.1103/PhysRev.81.835},
69   urldate = {2023-04-16},
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73 @book{j.a.prufrock2009,
74   title = {Lasers and {{Their Applications}} in {{Surface Science}} and {{
75     Technology}}},
76   author = {{J. A. Prufrock}},
77   date = {2009},
78   edition = {2},
79   publisher = {{McGraw-Hill}},
80   location = {{New York, NY}}
81 }
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83 @article{li1999,
84   title = {测量半导体中少子漂移迁移率和 扩散长度的新方法 [{{New Method}} of {{
85     Determining Excess Carrier Bipolar Mobility}}]},

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83   author = {Li, Yanjing and Fang, Jiaxiong},
84   date = {1999-12},
85   journaltitle = {半导体学报 [Chinese Journals of Semiconductors]},
86   volume = {20},
87   number = {12},
88   pages = {1129--1131},
89   url = {http://www.jos.ac.cn/fileBDTXB/oldPDF/2005092734449173.pdf},
90   urldate = {2023-04-15},
91   langid = {english}
92 }
93
94 @article{li2023,
95   title = {霍尔效应测量中的不等位热扩散电势差 [Difference from Unequal
96     Potential of Thermal Diffusion Current in the Measurement on Hall Effect
97     ]},
98   author = {Li, Chaorui},
99   date = {2023},
100  journaltitle = {物理与工程 [Physics and Engineering]},
101  volume = {33},
102  number = {1},
103  pages = {83--87},
104  issn = {1009-7104},
105  langid = {chinese}
106 }
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108 @online{LiGongTanYuanQiJian,
109   title = {肖特基势垒与欧姆接触 [Schottky barrier and ohmic contact]},
110   author = {{李工谈元器件}},
111   url = {https://zhuanlan.zhihu.com/p/55749567},
112   urldate = {2023-04-16},
113   langid = {chinese},
114   organization = {{知乎专栏 [Zhihu]}}
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117 @online{microntechnologyinc.2000,
118   title = {Double {{Data Rate}} ({{DDR}}) {{SDRAM}}},
119   author = {{Micron Technology, Inc.}},
120   date = {2000},
121   url = {http://download.micron.com/pdf/datasheets/dram/ddr/512MBDDRx4x8x16.
122     pdf}
123 }
124
125 @book{streetman2015,
126   title = {Solid {{State Electronic Devices}}: {{Global Edition}}},
127   author = {Streetman, Ben G. and Banerjee, Sanjay K.},
128   date = {2015-04},
129   edition = {7},

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127 publisher = {{Pearson}},
128 location = {{Edinburgh, UK}},
129 isbn = {978-1-292-06055-2},
130 pagetotal = {632}
131 }

```

You may use zotero and its BetterBibLaTeX plugin to generate this bibliography file. To learn more about IEEE style and biblatex, go to https://www.overleaf.com/learn/latex/Bibliography_management_in_LaTeX and <https://guides.library.illinois.edu/ENG198/citationstyle>.

In the body of your report, type command `\cite{<keys>}` to cite a source. Here is an example:

“Follow the guidelines listed in the textbook [1, pp. 129-130], and calculate the result.

Note that conventional method of measuring Hall voltage requires reversal directions of the magnetic field and sample current, which aims to eliminate the error introduced by an unknown additional potential [2]. Tentatively we are going to find out how it is generated and its impact to our measurement.”

REFERENCES

- [1] B. G. Streetman and S. K. Banerjee, *Solid State Electronic Devices: Global Edition*, 7th ed. Edinburgh, UK: Pearson, Apr. 2015, 632 pp., ISBN: 978-1-292-06055-2.
- [2] C. Li, “霍尔效应测量中的不等位热扩散电势差 [Difference from Unequal Potential of Thermal Diffusion Current in the Measurement on Hall Effect],” *物理与工程 [Physics and Engineering]*, vol. 33, no. 1, pp. 83–87, 2023, ISSN: 1009-7104.