



Electrical, Electromagnetic, and Optical Characterization of the InP/InGaAs Alloy System

A Capstone Project on Operational Technologies
Presented to the Faculty of the
Department of Electronics and Computer Engineering
Gokongwei College of Engineering
De La Salle University

In Partial Fulfillment of the
Operational Technologies

by
CALAGUIAN Nathan Raekel L.
ELLAR Gerald Antonio P.
MAHAIT Hans

September, 2025

20 **ABSTRACT**

21 Keep your abstract short by giving the gist/nutshell of your capstone project on operational
22 technologies. Use the following checklist questions to help you in crafting your abstract.

23 ☐ Did you briefly state what you intend to do?

24 ☐ Did you concisely discuss the problem statement?

25 ☐ Did you tersely mention the objectives in general terms?

26 ☐ Did you succinctly describe the methodology for the target audience?

27 ☐ Did you strongly describe your significant results and your conclusions?

28 *Index Terms*—alloy system, characterization, InP, InGaAs (see IEEE Taxonomy and The-
29 saurus).

TABLE OF CONTENTS

31	Abstract	ii
32	Table of Contents	iii
33	List of Figures	iv
34	List of Tables	v
35	Abbreviations and Acronyms	vi
36	Notations	vii
37	Glossary	viii
38	Listings	ix
39	Chapter 1 INTRODUCTION	1
40	1.1 Background of the Study	2
41	1.2 Prior Studies	4
42	1.3 Problem Statement	5
43	1.4 Objectives and Deliverables	6
44	1.4.1 General Objective (GO)	6
45	1.4.2 Specific Objectives (SOs)	7
46	1.4.3 Expected Deliverables	7
47	1.5 Significance of the Study	7
48	1.5.1 Technical Benefit	8
49	1.5.2 Social Impact	8
50	1.5.3 Environmental Welfare	9
51	1.6 Assumptions, Scope, and Delimitations	9
52	1.6.1 Assumptions	9
53	1.6.2 Scope	10
54	1.6.3 Delimitations	10
55	1.7 Description and Methodology of the Capstone Project on Operational	
56	Technologies	10
57	1.8 Estimated Work Schedule and Budget	11
58	1.9 Overview of the Capstone Project on Operational Technologies	12

59	Chapter 2 LITERATURE REVIEW	13
60	2.1 Existing Work	14
61	2.2 Lacking in the Approaches	16
62	2.3 Summary	18
63	Chapter 3 THEORETICAL CONSIDERATIONS	19
64	3.1 Summary	22
65	Chapter 4 DESIGN CONSIDERATIONS	23
66	4.1 Standards	26
67	4.2 Summary	27
68	Chapter 5 METHODOLOGY	28
69	5.1 Implementation	31
70	5.2 Evaluation	33
71	5.3 Summary	35
72	Chapter 6 RESULTS AND DISCUSSIONS	36
73	6.1 Summary	41
74	Chapter 7 CONCLUSIONS, RECOMMENDATIONS, AND FUTURE DI-	
75	RECTIVES	42
76	7.1 Concluding Remarks	43
77	7.2 Contributions	43
78	7.3 Recommendations	43
79	7.4 Future Prospects	45
80	Chapter 8 STUDENT RESEARCH ETHICS CLEARANCE	48
81	Chapter 9 ANSWERS TO QUESTIONS TO THIS CAPSTONE PROJECT	
82	ON OPERATIONAL TECHNOLOGIES	50
83	Chapter 10 REVISIONS TO THE PROPOSAL	63
84	Chapter 11 REVISIONS TO THE FINAL	72
85	Chapter 12 USAGE EXAMPLES	78
86	12.1 Equations	79
87	12.2 Notations	81
88	12.2.1 Math alphabets	81
89	12.2.2 Vector symbols	82

90	12.2.3 Matrix symbols	82
91	12.2.4 Tensor symbols	82
92	12.2.5 Bold math version	83
93	12.2.5.1 Vector symbols	83
94	12.2.5.2 Matrix symbols	84
95	12.2.5.3 Tensor symbols	84
96	12.3 Abbreviation	90
97	12.4 Glossary	93
98	12.5 Figure	95
99	12.6 Table	101
100	12.7 Algorithm or Pseudocode Listing	108
101	12.8 Program/Code Listing	110
102	12.9 Referencing	112
103	12.9.1 A subsection	113
104	12.9.1.1 A sub-subsection	114
105	12.10Citing	115
106	12.10.1 Books	115
107	12.10.2 Booklets	118
108	12.10.3 Proceedings	118
109	12.10.4 In books	118
110	12.10.5 In proceedings	119
111	12.10.6 Journals	120
112	12.10.7 Theses/dissertations	122
113	12.10.8 Technical Reports and Others	123
114	12.10.9 Miscellaneous	124
115	12.11Index	125
116	12.12Adding Relevant PDF Pages	126
117	Chapter 13 VITA	130
118	Chapter 14 ARTICLE PAPER(S)	131

LIST OF FIGURES

120	3.1 A quadrilateral image example.	22
121	12.1 A quadrilateral image example.	95
122	12.2 Figures on top of each other. See List. 12.6 for the corresponding \LaTeX code.	97
123	12.3 Four figures in each corner. See List. 12.7 for the corresponding \LaTeX code. .	99

LIST OF TABLES

125	1.1	Expected Deliverables per Objective	7
126	5.1	Summary of methods for reaching the objectives	29
127	6.1	Summary of results for achieving the objectives	37
128	10.1	Summary of Revisions to the Proposal	66
129	11.1	Summary of Revisions to the Capstone Project on Operational Technologies .	74
130	12.1	Feasible triples for highly variable grid	101
131	12.2	Calculation of $y = x^n$	108

ABBREVIATIONS

133	AC	Alternating Current.....	90
134	CSS	Cascading Style Sheet.....	90
135	HTML	Hyper-text Markup Language.....	90
136	XML	eXtensible Markup Language.....	90

NOTATION

138	$ \mathcal{S} $	the number of elements in the set \mathcal{S}	93
139	\emptyset	the set with no elements	93
140	$h(t)$	impulse response	79
141	\mathcal{S}	a collection of distinct objects	93
142	\mathcal{U}	the set containing everything	93
143	$x(t)$	input signal represented in the time domain	79
144	$y(t)$	output signal represented in the time domain	79

145 Throughout this capstone project on operational technologies, mathematical notations
 146 conform to ISO 80000-2 standard, e.g., variable names are printed in italics, the only
 147 exception being acronyms like, e.g., SNR, which are printed in regular font. Constants are
 148 also set in regular font like j . Standard functions and operators are also set in regular font,
 149 e.g., in $\sin(\cdot)$, $\max\{\cdot\}$. Commonly used notations are t , f , $j = \sqrt{-1}$, n and $\exp(\cdot)$, which
 150 refer to the time variable, frequency variable, imaginary unit, n th variable, and exponential
 151 function, respectively.

GLOSSARY

- | | | |
|-----|---------------------|--|
| 153 | Functional Analysis | the branch of mathematics concerned with the study of spaces of functions |
| 154 | matrix | a concise and useful way of uniquely representing and working with linear transformations; a rectangular table of elements |

LISTINGS

156	12.1 Sample \LaTeX code for equations and notations usage	80
157	12.2 Sample \LaTeX code for notations usage	85
158	12.3 Sample \LaTeX code for abbreviations usage	92
159	12.4 Sample \LaTeX code for glossary and notations usage	94
160	12.5 Sample \LaTeX code for a single figure	96
161	12.6 Sample \LaTeX code for three figures on top of each other	98
162	12.7 Sample \LaTeX code for the four figures	100
163	12.8 Sample \LaTeX code for making typical table environment	104
164	12.9 Sample \LaTeX code for algorithm or pseudocode listing usage	109
165	12.10 Computing Fibonacci numbers	111
166	12.11 Sample \LaTeX code for program listing	111
167	12.12 Sample \LaTeX code for referencing sections	112
168	12.13 Sample \LaTeX code for referencing subsections	113
169	12.14 Sample \LaTeX code for referencing sub-subsections	114
170	12.15 Sample \LaTeX code for Index usage	125
171	12.16 Sample \LaTeX code for including PDF pages	126

172 **Chapter 1**

173 **INTRODUCTION**

1.1 Background of the Study

Aside from the usual text descriptions of the background, put here figures that will cast images to your audience about the context of your work.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec

197 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
198 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
199 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
200 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
201 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
202 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
203 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

204 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
205 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
206 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
207 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
208 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
209 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
210 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
211 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
212 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

213 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
214 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
215 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
216 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
217 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
218 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
219 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
220 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit

221 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

222 1.2 Prior Studies

223 Put here a narrative and a summary (not a duplicate) of your literature review chapter. In
224 this section, summarize and highlight the gap(s) found in the literature review in Chapter 2.
225 Preferably, a table showing the summary would be helpful.

226 Prior Studies or Literature Review¹ (expansion of the Prior Studies) is basically about
227 competition. Competition.

228 So the suggested goals in writing the narrative of the Prior Studies in summative and
229 highlighted forms are, in no particular order:

- 230 1. to mention the problem briefly;
- 231 2. to show the features of the existing literature in solving the problem
- 232 3. to show the weaknesses of the solutions of existing literature
- 233 4. to show how your solution is better (can be better (for proposals))

234 If the suggested table will be placed, please discuss it in light of the above-mentioned items.

235 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
236 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
237 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
238 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
239 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla

¹The main difference between the Prior Studies and Literature Review is that the Prior Studies is done in a concise manner. By the way, this is also an example of a footnote usage.

240 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
241 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
242 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
243 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

244 **1.3 Problem Statement**

245 The problem statement needs to be very clear and to the point.

246 A persuasive problem statement from a contextualized and intended-audience-awareness
247 perspective consists of:

248 1. PS1: description of the ideal scenario for your intended audience

- 249 • Describe the goals, desired state, or the values that your audience considers
250 important and that are relevant to the problem.

251 2. PS2: reality of the situation

- 252 • Describe a condition that prevents the goal, state, or value discussed in PS1
253 from being achieved or realized at the present time.
- 254 • It is imperative to make the audience feel the pain point.

255 3. PS3: consequences for the audience

- 256 • Using specific details, show how the situation contains a little promise of
257 improvement unless something is done.

258 After the above-mentioned items, succinctly describe your solution. Please avoid describing
259 your entire solution here since you will articulate and elucidate it by showing what you want
260 to achieve through your objectives, and how you will make it through your methodology.
261 A well-constructed problem statement will convince your audience that the problem is real
262 and worth having you solve it.

263 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
264 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
265 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
266 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
267 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
268 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
269 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
270 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
271 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

272 1.4 Objectives and Deliverables

273 Your objectives are the states that you desire to achieve in solving the problem. The general
274 objective is the main state to be achieved whereas the specific ones are sub-states to be
275 achieved.

276 1.4.1 General Objective (GO)

277 GO: To Morbi quis dolor. ;

1.4.2 Specific Objectives (SOs)

- SO1: To Quisque egestas wisi eget nunc. ;
- SO2: To Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. ;
- SO3: To Nullam cursus pulvinar lectus. ;
- SO4: To Morbi blandit ligula feugiat magna. ;
- SO5: To Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. ;

1.4.3 Expected Deliverables

Table 1.1 shows the outputs, products, results, achievements, gains, realizations, and/or yields of the Capstone Project on Operational Technologies.

TABLE 1.1 EXPECTED DELIVERABLES PER OBJECTIVE

Objectives	Expected Deliverables
GO: To Morbi quis dolor.	⋮

1.5 Significance of the Study

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.

293 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
294 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
295 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
296 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
297 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

298 **1.5.1 Technical Benefit**

299

- 300 1. First itemtext
- 301 2. Second itemtext
- 302 3. Last itemtext
- 303 4. First itemtext
- 304 5. Second itemtext

305 **1.5.2 Social Impact**

306

- 307 1. First itemtext
- 308 2. Second itemtext
- 309 3. Last itemtext
- 310 4. First itemtext

311 5. Second itemtext

312 **1.5.3 Environmental Welfare**

313

314 1. First itemtext

315 2. Second itemtext

316 3. Last itemtext

317 4. First itemtext

318 5. Second itemtext

319 **1.6 Assumptions, Scope, and Delimitations**

320 Bulletize your assumptions in one group, and then bulletize the scope in another, and do
321 the same for your delimitations. The assumptions to put here are those major facts or
322 statements that are *key* for your proposed solution to work. Scope refers to the space(s)
323 for the operation of your proposed solution, whereas delimitations are the limits of the
324 operation of your proposed solution.

325 **1.6.1 Assumptions**

326 1. ...;

327 2. ...;

328 3. ...;

329 **1.6.2 Scope**

330 1. ...;

331 2. ...;

332 3. ...;

333 **1.6.3 Delimitations**

334 1. ...;

335 2. ...;

336 3. ...;

337 **1.7 Description and Methodology of the Capstone** 338 **Project on Operational Technologies**

339 A purpose of the description here is to re-steer/remind the panelist/reader again by tersely
340 describing what your thesis is about (i.e. the problem and the main goal you want to
341 achieve) in another way without sounding repetitive.

342 Your methodology is your means of achieving your stated objectives. What you put
343 here is the summary of your methodology chapter.

344 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.

345 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec

346 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
347 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
348 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
349 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
350 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
351 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
352 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

353 1.8 Estimated Work Schedule and Budget

354 The estimated work schedule can be represented as a Gantt Chart or a combination of
355 Project Network Diagram, Work Breakdown Structure, and Critical Path. The budget can
356 be made into a Bill of Materials, financial plan, or if your Capstone Project on Operational
357 Technologies is funded and part of larger project, the cost, and date for reaching each
358 milestone and/or deliverable for your part of the project.

359 For ECE Department undergraduate theses, the individual Gantt Chart or Work Break-
360 down Schedule and Bill of Materials will be included in this section and be removed in the
361 final document.

362 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
363 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
364 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
365 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
366 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
367 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue

368 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
369 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
370 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

371 **1.9 Overview of the Capstone Project on Operational** 372 **Technologies**

373 Provide here a brief summary and what the reader should expect from each succeeding
374 chapter. Show how each chapter is connected with each other.

375 **Chapter 2**

376 **LITERATURE REVIEW**

377 It is to be noted that each subsection in this chapter should discuss in narrative form
378 each table that is presented in order to point out to the reader what the author(s) intend to
379 convey.

380 **2.1 Existing Work**

381 Cite and summarize here relevant and significant literature (dissertations, theses, journals,
382 patents, notable conference papers) through a table and descriptions to prove that no one
383 has done your work yet and/or that your work is not a duplication of existing ones. Your
384 focus here is what has *been done*.

385 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
386 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
387 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
388 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
389 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
390 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
391 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
392 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
393 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

394 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
395 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
396 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
397 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
398 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla

2. Literature Review

399 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
400 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
401 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
402 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

403 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
404 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
405 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
406 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
407 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
408 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
409 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
410 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
411 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

412 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
413 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
414 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
415 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
416 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
417 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
418 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
419 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
420 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

421 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
422 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec

423 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
424 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
425 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
426 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
427 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
428 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
429 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

430 2.2 Lacking in the Approaches

431 You can summarize the weaknesses of existing approaches by a tabular comparison of the
432 literature. Your focus here is what has *not been done*, i.e. what features were missed, what
433 solutions were not considered, what the demerits are, etc. Through these items, you then
434 can introduce the necessity for doing your proposed solution.

435 It is to be noted that the degree of novelty for undergraduate thesis is lower than those
436 for graduate school. If a Ph.D. dissertation/thesis has a high degree of novelty and that for
437 an undergraduate is low, then a master's thesis is somewhere between the two.

438 Briefly include here the following in order to remind the reader why you are highlighting
439 the weaknesses of the solutions of existing literature.

- 440 • mentioning the problem
- 441 • showing how your solution is better (can be better (for proposals))

442 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
443 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec

2. Literature Review

444 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
445 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
446 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
447 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
448 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
449 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
450 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

451 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
452 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
453 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
454 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
455 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
456 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
457 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
458 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
459 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

460 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
461 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
462 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
463 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
464 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
465 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
466 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
467 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit

468 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

469 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
470 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
471 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
472 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
473 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
474 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
475 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
476 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
477 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

478 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
479 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
480 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
481 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
482 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
483 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
484 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
485 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
486 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

487 **2.3 Summary**

488 Provide the gist of this chapter such that it reflects the contents and the message.

489 **Chapter 3**

490 **THEORETICAL CONSIDERATIONS**

3. Theoretical Considerations

491 Before starting the first section, provide an overview of the purpose of this chapter and
492 its contents, and how they are relevant to your methodology. Discuss in this chapter the
493 relevant theories and concepts that should support your proposed solutions.

494 This chapter is for providing the context to your panelist/reader. It is actually an
495 expanded form of the Background of the Study that you have put in Chapter 1.

496 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
497 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
498 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
499 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
500 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
501 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
502 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
503 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
504 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

505 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
506 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
507 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
508 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
509 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
510 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
511 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
512 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
513 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

3. Theoretical Considerations

514 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
515 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
516 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
517 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
518 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
519 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
520 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
521 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
522 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

523 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
524 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
525 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
526 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
527 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
528 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
529 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
530 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
531 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

532 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
533 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
534 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
535 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
536 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
537 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue

538 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
539 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
540 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

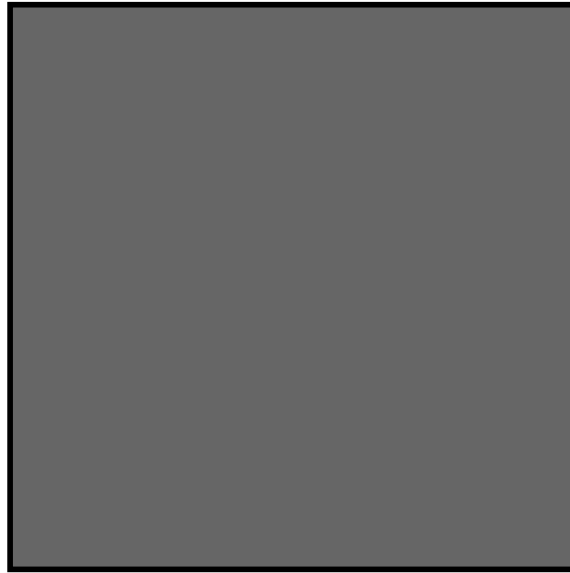


Fig. 3.1 A quadrilateral image example.

541 **3.1 Summary**

542 Provide the gist of this chapter such that it reflects the contents and the message.

543 **Chapter 4**

544 **DESIGN CONSIDERATIONS**

545 Before starting the first section, provide an overview of the purpose of this chapter and
546 its contents, and how they are relevant to your methodology.

547 Your primary goal in the Design Considerations chapter is to describe to your pan-
548 elist/readers the key topics that fall further under Theoretical Considerations, but should
549 be placed here instead since they are geared towards your Methodology. These key topics
550 are those that you have directly adopted in making your solution/methodology. You can
551 think of the connection of the Design Considerations chapter to the Theoretical Considera-
552 tions chapter in this way: if your Theoretical Considerations chapter serves as the main
553 foundation of a building, then the Design Considerations chapter functions as the columns.

554 The Design Considerations chapter is an avenue for explaining why you considered
555 the topics here for your proposed methodology. This chapter is different from your
556 methodology, because topics you discuss here are already accepted as part of the body of
557 knowledge, and may have not been developed by you.

558 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
559 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
560 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
561 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
562 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
563 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
564 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
565 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
566 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

567 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
568 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec

4. Design Considerations

569 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
570 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
571 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
572 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
573 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
574 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
575 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

576 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
577 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
578 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
579 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
580 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
581 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
582 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
583 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
584 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

585 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
586 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
587 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
588 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
589 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
590 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
591 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
592 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit

593 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

594 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
595 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
596 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
597 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
598 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
599 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
600 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
601 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
602 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

603 **4.1 Standards**

604 Standards are essential for successful projects and impactful research. They provide a
605 common framework and ensure consistency, quality, and safety across various disciplines.
606 By adhering to established standards, your work becomes more reliable, interoperable, and
607 valuable in real-world applications. Standards also demonstrate your understanding of
608 industry best practices and enhance the credibility of your research.

609 To effectively integrate standards into your project, begin by identifying relevant stan-
610 dards related to your specific field. Thoroughly research and understand the requirements
611 and guidelines outlined within these standards. Align your project objectives and method-
612 ologies to meet or exceed these standards. Document your use of standards in this section,
613 including how and why specific standards were chosen. Finally, evaluate your results
614 against the established standards, justifying any deviations from the norm with sound

615 reasoning and evidence.

616 **4.2 Summary**

617 Provide the gist of this chapter such that it reflects the contents and message.

618 **Chapter 5**

619 **METHODOLOGY**

Put an overview of the contents of chapter. Mention here your methodology flow through a figure and provide an overview of it and how your methodology achieves your objectives. How your methodology achieves each of your specific objectives is what your panelists/examiners will be looking for. Specify how your methodology achieves your general objective and specific objectives. A point-by-point comparison how your methodology achieves each of your specific objectives is expected in the final Capstone Project on Operational Technologies.

Also make sure that you refer clearly to the chapters on the Literature Review, Theoretical Considerations, and Design Considerations showing how your methodology ties with those that you have discussed in those chapters.

Make an overview of the contents of the chapter. Put here your methodology flow through a figure and provide an overview of it.

In summative form, Table 5.1 indicates the approaches, designs, modes, processes, programs, techniques, and/or ways that the Capstone Project on Operational Technologies-reaches the objectives.

TABLE 5.1 SUMMARY OF METHODS FOR REACHING THE OBJECTIVES

Objectives	Methods	Locations
GO: To Morbi quis dolor.	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31

Continued on next page

5. Methodology

Continued from previous page

Objectives	Methods	Locations
SO1: To Quisque egestas wisi eget nunc.	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31
SO2: To Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas.	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31
SO3: To Nullam cursus pulvinar lectus.	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31
SO4: To Morbi blandit ligula feugiat magna.	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31

Continued on next page

Continued from previous page

Objectives	Methods	Locations
SO5: To Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam.	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31

635 5.1 Implementation

636 Summarize the process used to create/set-up the work with an explanation of such process,
637 instruments, and materials that you used if any. If the description is lengthy, use condensed
638 bullet points.

639 *Rule of thumb:* Implementation is how you made your work; (keywords: implemented,
640 created, made, soldered, programmed, etc.).

641 If you wrote a program or made a simulation, you must state how the program or
642 simulation functions in this section. An algorithm or a pseudocode as shown in Table 12.2
643 is a good example.

644 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
645 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
646 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
647 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
648 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
649 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue

650 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
651 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
652 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

653 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
654 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
655 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
656 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
657 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
658 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
659 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
660 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
661 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

662 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
663 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
664 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
665 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
666 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
667 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
668 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
669 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
670 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

671 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
672 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
673 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus

674 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
675 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
676 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
677 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
678 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
679 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

680 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
681 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
682 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
683 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
684 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
685 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
686 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
687 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
688 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

689 5.2 Evaluation

690 Describe the procedures for evaluating the correct behavior and outcome of your work,
691 including what information you need to gather and how you will obtain or measure it.

692 *Rule of thumb:* Evaluation is how you tested your work; (keywords: measured, tested,
693 compared, simulated, etc.).

694 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
695 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec

696 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
697 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
698 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
699 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
700 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
701 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
702 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

703 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
704 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
705 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
706 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
707 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
708 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
709 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
710 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
711 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

712 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
713 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
714 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
715 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
716 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
717 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
718 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
719 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit

720 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

721 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
722 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
723 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
724 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
725 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
726 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
727 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
728 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
729 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

730 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
731 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
732 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
733 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
734 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
735 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
736 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
737 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
738 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

739 **5.3 Summary**

740 Provide the gist of this chapter such that it reflects the contents and the message.

741 **Chapter 6**

742 **RESULTS AND DISCUSSIONS**

743 Show in this chapter proofs why your proposed solution works. However, presenting
 744 results ("It worked") without an appropriate explanation does not show thorough under-
 745 standing. Aside from the data and results that you have obtained, and their explanation,
 746 the discussion includes why components of your proposed solution work did or did not
 747 work in accordance to what you described in the evaluation process, and how the proposed
 748 solution performed and faired. Interpret the results and the reasons why they were obtained.
 749 If your results are incorrect, apparent discrepancies from theory should be pointed out and
 750 explained. In essence, what do the results mean? Citing existing publication can help you
 751 compare your results and your explanations.

752 The next items below is not related to the description of this results and discussions
 753 chapter, but serves as an opener for the \LaTeX portion of this template.

754 Here is an example of a citation for ISO 80000-2 standard [?]. Another one is [?]
 755 and [?].

756 In using this template, the user is expected to have a working knowledge of \LaTeX . A
 757 good introduction is in [?]. Its latest version can be accessed at <http://www.ctan.org/tex-archive/info/lshort>. See the Appendix of document_guide.pdf for examples.

759 In aggregate form, Table 6.1 shows the outcomes and completions in applying the
 760 methodology of the Capstone Project on Operational Technologiesper objective.

TABLE 6.1 SUMMARY OF RESULTS FOR ACHIEVING THE OBJECTIVES

Objectives	Results	Locations
------------	---------	-----------

Continued on next page

6. Results and Discussions

Continued from previous page

Objectives	Results	Locations
GO: To Morbi quis dolor.	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31
SO1: To Quisque eget wisi eget nunc.	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31
SO2: To Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas.	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31
SO3: To Nullam cursus pulvinar lectus.	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31

Continued on next page

6. Results and Discussions

Continued from previous page

Objectives	Results	Locations
SO4: To Morbi blandit ligula feugiat magna.	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31
SO5: To Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam.	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31

761 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
762 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
763 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
764 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
765 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
766 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
767 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
768 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
769 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

770 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
771 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec

6. Results and Discussions

772 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
773 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
774 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
775 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
776 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
777 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
778 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

779 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
780 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
781 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
782 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
783 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
784 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
785 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
786 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
787 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

788 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
789 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
790 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
791 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
792 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
793 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
794 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
795 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit

796 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

797 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
798 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
799 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
800 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
801 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
802 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
803 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
804 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
805 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

806 **6.1 Summary**

807 Provide the gist of this chapter such that it reflects the contents and the message.

808 **Chapter 7**

809 **CONCLUSIONS, RECOMMENDATIONS, AND**

810 **FUTURE DIRECTIVES**

811 **7.1 Concluding Remarks**

812 In this Capstone Project on Operational Technologies, . . .

813 Put here the main points that should be known and learned about the work topic.
814 Summarize or give the gist of the essential principles and inferences drawn from your
815 results.

816 **7.2 Contributions**

817 The interrelated contributions and supplements that have been developed by the author(s)
818 in this Capstone Project on Operational Technologies are listed as follows. Only those that
819 are unique to the authors' work are included.

820 • the ;

821 • the ;

822 • the ;

823 **7.3 Recommendations**

824 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
825 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
826 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
827 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
828 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
829 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue

7. Conclusions, Recommendations, and Future Directives

830 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
831 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
832 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

833 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
834 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
835 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
836 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
837 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
838 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
839 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
840 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
841 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

842 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
843 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
844 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
845 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
846 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
847 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
848 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
849 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
850 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

851 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
852 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
853 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus

7. Conclusions, Recommendations, and Future Directives

854 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
855 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
856 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
857 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
858 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
859 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

860 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
861 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
862 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
863 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
864 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
865 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
866 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
867 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
868 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

869 **7.4 Future Prospects**

870 There are several prospects that may be extended for further studies. . . . So the suggested
871 topics are listed in the following.

872 1. the

873 2. the

874 3. the

7. Conclusions, Recommendations, and Future Directives

875 Note that for ECE undergraduate theses, as per the directions of the thesis adviser,
876 Recommendations and Future Directives will be removed for the hardbound copy but will
877 be retained for database storage.

REFERENCES

- [Aamport, 1986a] Aamport, L. A. (1986a). The gnats and gnus document preparation system. *G-Animal's Journal*, 41(7):73+. This is a full ARTICLE entry.
- [Aamport, 1986b] Aamport, L. A. (1986b). The gnats and gnus document preparation system. *G-Animal's Journal*.
- [Aamport, 2004] Aamport, L. A. (2004). The gnats and gnus document preparation system. In [?], pages 73+. This is a cross-referencing ARTICLE entry.
- [ABCM, 1959] ABCM (1959). *British chemicals and their manufacturers*.
- [Aksın et al., 2006] Aksın, Ö., Türkmen, H., Artok, L., Çetinkaya, B., Ni, C., Büyükgüngör, O., and Özkal, E. (2006). Effect of immobilization on catalytic characteristics of saturated pd-n-heterocyclic carbenes in mizoroki-heck reactions. *Journal of Organometallic Chemistry*, 691(13):3027–3036.
- [Almendro et al., 1998] Almendro, J. L., Martín, J., Sánchez, A., and Nozal, F. (1998). Elektromagnetisches signalhorn.
- [Angenendt, 2002] Angenendt, A. (2002). In honore salvatoris – vom sinn und unsinn der patrozienkunde. *Revue d'Histoire Ecclésiastique*, 97:431–456, 791–823.
- [Aristotle, 1877] Aristotle (1877). *The Rhetoric of Aristotle with a commentary by the late Edward Meredith Cope*.
- [Aristotle, 1907] Aristotle (1907). *De Anima*.
- [Aristotle, 1929] Aristotle (1929). *Physics*. G. P. Putnam.
- [Aristotle, 1968] Aristotle (1968). *Poetics*. Clarendon Aristotle. Clarendon Press.
- [Aslin, 1949] Aslin, E. J. (1949). Photostat recording in library work. *Aslib Proceedings*, 1:49–52.
- [Augustine, 1995] Augustine, R. L. (1995). *Heterogeneous catalysis for the synthetic chemist*. Marcel Dekker.
- [Averroes, 1982] Averroes (1982). *The Epistle on the Possibility of Conjunction with the Active Intellect by Ibn Rushd with the Commentary of Moses Narboni*. Number 7 in Moreshet: Studies in Jewish History, Literature and Thought. Jewish Theological Seminary of America.
- [Baez and Lauda, 2004a] Baez, J. C. and Lauda, A. D. (2004a). Higher-dimensional algebra v: 2-groups. *Theory and Applications of Categories*, 12:423–491.
- [Baez and Lauda, 2004b] Baez, J. C. and Lauda, A. D. (2004b). Higher-dimensional algebra v: 2-groups.
- [Bertram and Wentworth, 1996] Bertram, A. and Wentworth, R. (1996). Gromov invariants for holomorphic maps on riemann surfaces. 9(2):529–571.

- [‘Brunswick’, 1985] ‘Brunswick’ (1985). The piper and the rats: A musical experiment. Technical Report 1984, Rodent Activities Termination Section (RATS), Pest Control Division, Brunswick Public Welfare Department, Hamelin.
- [Bry and Afflerbach, 1968] Bry, I. and Afflerbach, L. (1968). In search of an organizing principle for behavioural science literature. *Community Mental Health*, 4(1):75–84.
- [BSI, 1973a] BSI (1973a). *BS 2570: Natural Fibre Twines*, Table 5. British Standards Institution, London, 3rd edition.
- [BSI, 1973b] BSI (1973b). Natural fibre twines. BS 2570, British Standards Institution, London. 3rd. edn.
- [BSI, 1976] BSI (1976). Bibliographic references. BS 1629, British Standards Institution.
- [BSI, 1978] BSI (1978). Citing publications by bibliographic references. BS 5606, British Standards Institution.
- [BSI, 1983] BSI (1983). Citation of unpublished documents. BS 6371, British Standards Institution.
- [Butcher, 1981] Butcher, J. (1981). *Copy-editing*. Cambridge University Press, 2nd edition.
- [Chapman, 1975] Chapman, J. (1975). *The Icehouse Bottom Site—40MR23*. Number 23 in University of Tennessee Department of Anthropology Publication. Univ. of Tennessee Press, Knoxville.
- [Chave, 1964] Chave, K. E. (1964). Skeletal durability and preservation. In Imbrie, J. and Newel, N., editors, *Approaches to paleoecology*, pages 377–87, New York. Wiley.
- [‘Chicago’, 1982] ‘Chicago’ (1982). *The Chicago Manual of Style*. University of Chicago Press, 13th edition.
- [Chiu and Chow, 1978] Chiu, W. W. and Chow, W. M. (1978). A hybrid hierarchical model of a multiple virtual storage (mvs) operating system.
- [Chomsky, 1973] Chomsky, N. (1973). Conditions on transformations. In Anderson, S. R. and Kiparsky, P., editors, *A festschrift for Morris Halle*, New York. Holt, Rinehart & Winston.
- [Cicero, 1995] Cicero, M. T. (1995). *De natura deorum. Über das Wesen der Götter*. Reclam.
- [Coleridge, 1983] Coleridge, S. T. (1983). *Biographia literaria, or Biographical sketches of my literary life and opinions*, volume 7 of *Bollingen Series*. Routledge and Kegan Paul.
- [Cotton et al., 1999] Cotton, F. A., Wilkinson, G., Murillio, C. A., and Bochmann, M. (1999). *Advanced inorganic chemistry*. Wiley, 6 edition.
- [Croft, 1978] Croft, W. B. (1978). *Organizing and searching large files of document descriptions*. PhD thesis, Cambridge University.
- [Doody, 1974] Doody, T. (1974). Hemingway’s style and jake’s narration. *The Journal of Narrative Technique*, 4(3):212–225.
- [Downes, 1974] Downes, W. J. (1974). Systemic grammar and structural sentence relatedness.

- 946 London School of Economics. Mimeo.
- 947 [Eckstein and Zuckermann, 1960] Eckstein, P. and Zuckermann, S. (1960). Morphology of the
 948 reproductive tract. In Parkes, A. S., editor, *Marshall's Physiology of Reproduction*, volume 1,
 949 pages 43–154. Longman, London.
- 950 [Einstein, 1905] Einstein, A. (1905). Zur Elektrodynamik bewegter Körper. (German) [On the
 951 electrodynamics of moving bodies]. *Annalen der Physik*, 322(10):891–921.
- 952 [Ellis and Walton, 1971] Ellis, B. and Walton, A. K. (1971). A bibliography on optical modulators.
 953 Technical Report RAE-TR-71009, Royal Aircraft Establishment.
- 954 [Exchequer, 1639] Exchequer (1634–1639). Act books. Edinburgh, Scottish Record Office, E.4/5.
- 955 [Feigl, 1958] Feigl, F. (1958). *Spot Tests in Organic Analysis*, chapter 6. Publisher publisher, 5th
 956 edition.
- 957 [Fletcher and Hopkins, 1907] Fletcher, W. M. and Hopkins, F. G. (1907). Lactic acid in amphibian
 958 muscle. *J. Physiol.*, 35:247–309.
- 959 [GAJ, 1986] GAJ (1986). *G-Animal's Journal*, 41(7). The entire issue is devoted to gnats and gnus
 960 (this entry is a cross-referenced ARTICLE (journal)).
- 961 [Gerhardt, 2000] Gerhardt, M. J. (2000). *The Federal Appointments Process*. Duke University
 962 Press.
- 963 [Gillies, 1933] Gillies, A. (1933). Herder and the preparation of goethe's idea of world literature.
 964 *Publications of the English Goethe Society*, 9:46–67.
- 965 [Glashow, 1961] Glashow, S. (1961). Partial symmetries of weak interactions. *Nucl. Phys.*, 22:579–
 966 588.
- 967 [Godfrey, 1959] Godfrey, G. B. (1959). Joints in tubular structures. *Struct. Eng.*, 37(4):126–135.
- 968 [Gonzalez, 2001] Gonzalez, R. (2001). *The Ghost of John Wayne and Other Stories*. The University
 969 of Arizona Press.
- 970 [Goossens et al., 1994] Goossens, M., Mittelbach, F., and Samarin, A. (1994). *The LaTeX Com-*
 971 *panion*. Addison-Wesley, 1 edition.
- 972 [Gordon, 1975] Gordon, R. (1975). The tunes of Chicken Little. In Ballet, A. H., editor, *Playwrights*
 973 *for Tomorrow: A Collection of Plays*, volume 13. University of Minnesota Press, Minneapolis.
 974 One of four plays included in vol. 13.
- 975 [Hammond, 1997] Hammond, C. (1997). *The basics of crystallography and diffraction*. Interna-
 976 tional Union of Crystallography and Oxford University Press.
- 977 [Hanlon, 1972] Hanlon, J. (1972). Designing buildings by computer. *New Scientist*, pages 429–432.
- 978 [Hanson, 1967] Hanson, C. W. (1967). Subject inquiries and literature searching. In Ashworth, W.,
 979 editor, *Handbook of special librarianship and information work*, pages 414–452. 3rd edition.
- 980 [Heller and Lederis, 1958] Heller, H. and Lederis, K. (1958). Paper chromatography of small

- 981 amounts of vasopressin and oxytocin. *Nature*, 182:1231–2.
- 982 [Herrmann et al., 2006] Herrmann, W. A., Öfele, K., Schneider, S. K., Herdtweck, E., and Hoff-
 983 mann, S. D. (2006). A carbocyclic carbene as an efficient catalyst ligand for c–c coupling
 984 reactions. 45(23):3859–3862.
- 985 [HersHKovitz, 1962] HersHKovitz, P. (1962). *Evolution of Neotropical cricetine rodents (Muridae)*
 986 *with special reference to the phyllotine group*, volume 46 of *Fieldiana: Zoology*. Field Museum
 987 of Natural History, Chicago.
- 988 [Hoel, 1971a] Hoel, P. G. (1971a). *Elementary Statistics*. Wiley series in probability and mathe-
 989 matical statistics. Wiley, New York, Chichester, 3rd edition. ISBN 0 471 40300.
- 990 [Hoel, 1971b] Hoel, P. G. (1971b). *Elementary Statistics*, pages 19–33. Wiley series in probability
 991 and mathematical statistics. Wiley, New York, Chichester, 3rd edition. ISBN 0 471 40300.
- 992 [Homer, 2004] Homer (2004). *Die Ilias*. Artemis & Winkler, 3 edition.
- 993 [Hostetler et al., 1998] Hostetler, M. J., Wingate, J. E., Zhong, C.-J., Harris, J. E., Vachet, R. W.,
 994 Clark, M. R., Londono, J. D., Green, S. J., Stokes, J. J., Wignall, G. D., Glish, G. L., Porter,
 995 M. D., Evans, N. D., and Murray, R. W. (1998). Alkanethiolate gold cluster molecules with core
 996 diameters from 1.5 to 5.2 nm. *Langmuir*, 14(1):17–30.
- 997 [Howells, 1951] Howells, W. W. (1951). Factors of human physique. *American Journal of Physical*
 998 *Anthropology*, 9:159–192.
- 999 [Howells, 1966a] Howells, W. W. (1966a). Population distances: Biological, linguistic, geographi-
 1000 cal and environmental. *Current Anthropology*, 7:531–540.
- 1001 [Howells, 1966b] Howells, W. W. (1966b). Variability in family lines vs. population variability.
 1002 *Annals of the New York Academy of Sciences*, 134:624–631.
- 1003 [Hyman, 1981] Hyman, A. (1981). Aristotle’s theory of the intellect and its interpretation by
 1004 averroes. In O’Meara, D. J., editor, *Studies in Aristotle*, number 9 in *Studies in Philosophy and*
 1005 *the History of Philosophy*, pages 161–191. The Catholic University of America Press.
- 1006 [ISO, 2009] ISO (2009). 80000-2. *Quantities and units–Part 2: Mathematical signs and symbols*
 1007 *to be used in the natural sciences and technology*.
- 1008 [Itzhaki, 1996] Itzhaki, N. (1996). Some remarks on ’t hooft’s s-matrix for black holes.
- 1009 [Jackson, 1979] Jackson, R. (1979). Running down the up-escalator: Regional inequality in Papua
 1010 New Guinea. *Australian Geographer*, 14:175–84.
- 1011 [Johnson, 1974] Johnson, G. B. (1974). Enzyme polymorphism. *Science*, 184:28–37.
- 1012 [Kant, 1968a] Kant, I. (1968a). *Kritik der praktischen Vernunft*, volume 5, pages 1–163. Walter de
 1013 Gruyter.
- 1014 [Kant, 1968b] Kant, I. (1968b). *Kritik der Urtheilskraft*, volume 5, pages 165–485. Walter de
 1015 Gruyter.
- 1016 [Knuth, 1973a] Knuth, D. E. (1973a). *The Art of Computer Programming*. Four volumes. Addison-

- Wesley. Seven volumes planned (this is a cross-referenced set of BOOKs).
- [Knuth, 1973b] Knuth, D. E. (1973b). *Fundamental Algorithms*, volume 1 of *The Art of Computer Programming*, section 1.2, pages 10–119. Addison-Wesley, Reading, Massachusetts, second edition. This is a full INBOOK entry.
- [Knuth, 1973c] Knuth, D. E. (1973c). *Fundamental Algorithms*, chapter 1.2. Addison-Wesley.
- [Knuth, 1981a] Knuth, D. E. (1981a). *Seminumerical Algorithms*, volume 2 of *The Art of Computer Programming*. Addison-Wesley, Reading, Massachusetts, second edition. This is a full BOOK entry.
- [Knuth, 1981b] Knuth, D. E. (1981b). *Seminumerical Algorithms*. Addison-Wesley.
- [Knuth, 1988] Knuth, J. C. (1988). The programming of computer art. Vernier Art Center, Stanford, California. This is a full BOOKLET entry.
- [Kowalik and Isard, 1995] Kowalik, F. and Isard, M. (1995). Estimateur d'un défaut de fonctionnement d'un modulateur en quadrature et étage de modulation l'utilisant.
- [Kullback, 1959] Kullback, S. (1959). *Information Theory and Statistics*. John Wiley & Sons.
- [Kullback, 1997a] Kullback, S. (1997a). *Information Theory and Statistics*. Dover Publications.
- [Kullback, 1997b] Kullback, S. (1997b). *Information Theory and Statistics*. Dover Publications.
- [Laufenberg et al., 2006] Laufenberg, X., Eynius, D., Suelzle, H., Usbeck, S., Spaeth, M., Neuser-Hoffmann, M., Myrzik, C., Schmid, M., Nietfeld, F., Thiel, A., Braun, H., and Ebner, N. (2006). Elektrische einrichtung und betriebsverfahren.
- [Lincoll, 1977a] Lincoll, D. D. (1977a). Semigroups of recurrences. In Lipcoll, D. J., Lawrie, D. H., and Sameh, A. H., editors, *High Speed Computer and Algorithm Organization*, number 23 in Fast Computers, part 3, pages 179–183. Academic Press, New York, third edition. This is a full INCOLLECTION entry.
- [Lincoll, 1977b] Lincoll, D. D. (1977b). Semigroups of recurrences. In *High Speed Computer and Algorithm Organization*. Academic Press.
- [Lincoll, 2004] Lincoll, D. D. (2004). Semigroups of recurrences. In [?], pages 179–183. This is a cross-referencing INCOLLECTION entry.
- [Lipcoll et al., 1977] Lipcoll, D. J., Lawrie, D. H., and Sameh, A. H., editors (1977). *High Speed Computer and Algorithm Organization*. Number 23 in Fast Computers. Academic Press, New York, third edition. This is a cross-referenced BOOK (collection) entry.
- [Loh, 1992] Loh, N. C. (1992). High-resolution micromachined interferometric accelerometer.
- [Maguire, 1976] Maguire, J. (1976). *A taxonomic and ecological study of the living and fossil Hystricidae with particular reference to southern Africa*. Ph.d. diss., Department of Geology, University of the Witwatersrand, Johannesburg.
- [Malinowski, 1972] Malinowski, B. (1972). *Argonauts of the Western Pacific*. Routledge and Kegan Paul, 8 edition.

- 1053 [Mann, 1968] Mann, A. E. (1968). *The palaeodemography of Australopithecus*. Ph.d. diss.,
1054 University of California, Berkeley.
- 1055 [Markey, 2005] Markey, N. (2005). Tame the beast.
- 1056 [Maron, 2000] Maron, M. (2000). *Animal Triste*. University of Nebraska Press.
- 1057 [Massa, 2004] Massa, W. (2004). *Crystal structure determination*. Springer, 2 edition.
- 1058 [Masterly, 1988a] Masterly, É. (1988a). Mastering thesis writing. Master's project, Stanford
1059 University, English Department. This is a full MASTERSTHESIS entry.
- 1060 [Masterly, 1988b] Masterly, É. (1988b). Mastering thesis writing. Master's thesis, Stanford
1061 University.
- 1062 [McColvin, 2004] McColvin, L. R. (2004). *Libraries in Britain*. Longmans Green, for the British
1063 Council, London.
- 1064 [McNeill, 1963] McNeill, W. H. (1963). The era of Middle Eastern dominance to 500 B.C. In *The*
1065 *Rise of the West*, part 1. University of Chicago Press, Chicago.
- 1066 [Milton, 1924] Milton, J. (1924). Paradise lost. In Moody, W. V., editor, *The Complete Poetical*
1067 *Works of John Milton*. Houghton Mifflin, Boston, Student's Cambridge edition.
- 1068 [Missilany, 2004] Missilany (2004). This is a minimal MISC entry.
- 1069 [Missilany, 1984] Missilany, J.-B. (1984). Handing out random pamphlets in airports. Handed out
1070 at O'Hare. This is a full MISC entry.
- 1071 [Moore, 1965] Moore, G. E. (1965). Cramming more components onto integrated circuits. *Elec-*
1072 *tronics*, 38(8):114–117.
- 1073 [Moore, 1998] Moore, G. E. (1998). Cramming more components onto integrated circuits. *Pro-*
1074 *ceedings of the IEEE*, 86(1):82–85.
- 1075 [Morau, 1979] Morau, P. (1979). Le *De Anima* dans la tradition grècque. In Lloyd, G. E. R. and
1076 Owen, G. E. L., editors, *Aristotle on Mind and the Senses*, pages 281–324.
- 1077 [Nietzsche, 1988a] Nietzsche, F. (1988a). *Die Geburt der Tragödie. Unzeitgemäße Betrachtungen*
1078 *I–IV. Nachgelassene Schriften 1870–1973*, volume 1. and Walter de Gruyter, 2 edition.
- 1079 [Nietzsche, 1988b] Nietzsche, F. (1988b). *Sämtliche Werke*. and Walter de Gruyter, 2 edition.
- 1080 [Nietzsche, 1988c] Nietzsche, F. (1988c). *Unzeitgemäße Betrachtungen. Zweites Stück*, volume 1,
1081 pages 243–334. and Walter de Gruyter.
- 1082 [Oaho et al., 1983a] Oaho, A. V., Ullman, J. D., and Yannakakis, M. (1983a). On notions of
1083 information transfer in VLSI circuits. In Oz, W. V. and Yannakakis, M., editors, *Proc. Fifteenth*
1084 *Annual ACM*, number 17 in All ACM Conferences, pages 133–139, Boston. Academic Press.
1085 This is a full INPROCEEDINGS entry.
- 1086 [Oaho et al., 1983b] Oaho, A. V., Ullman, J. D., and Yannakakis, M. (1983b). On notions of
1087 information transfer in VLSI circuits. In *Proc. Fifteenth Annual ACM*.

- [Oaho et al., 2004] Oaho, A. V., Ullman, J. D., and Yannakakis, M. (2004). On notions of information transfer in VLSI circuits. pages 133–139. This is a cross-referencing INPROCEEDINGS entry.
- [Oetiker et al., 2014] Oetiker, T., Partl, H., Hyna, I., and Schlegl, E. (2014). *The Not So Short Introduction to L^AT_EX 2_ε Or L^AT_EX 2_ε in 157 minutes*. n.a.
- [Ogilvy, 1965] Ogilvy, D. (1965). The creative chef. In Steiner, G. A., editor, *The Creative Organization*, pages 199–213. University of Chicago Press, Chicago.
- [Oz and Yannakakis, 1983] Oz, W. V. and Yannakakis, M., editors (1983). *Proc. Fifteenth Annual*, number 17 in All ACM Conferences, Boston. Academic Press. This is a full PROCEEDINGS entry.
- [Padhye et al., 1999] Padhye, J., Firoiu, V., and Towsley, D. (1999). A stochastic model of tcp reno congestion avoidance and control.
- [Phony-Baloney, 1988a] Phony-Baloney, F. P. (1988a). *Fighting Fire with Fire: Festooning French Phrases*. PhD dissertation, Fanstord University, Department of French. This is a full PHDTHESIS entry.
- [Phony-Baloney, 1988b] Phony-Baloney, F. P. (1988b). *Fighting Fire with Fire: Festooning French Phrases*. PhD thesis, Fanstord University.
- [Piccato, 2001] Piccato, P. (2001). *City of Suspects*. Duke University Press.
- [Pines, 1979] Pines, S. (1979). The limitations of human knowledge according to al-farabi, ibn bajja, and maimonides. In Twersky, I., editor, *Studies in Medieval Jewish History and Literature*, pages 82–109.
- [Prufer, 1964] Prufer, O. (1964). The Hopewell cult. *Scientific American*, pages 90–102.
- [Pym, 1624] Pym, J. (1624). Diary. Northampton, Northamptonshire Record Office, Finch-Hatton 50.
- [Ramsbottom, 1931] Ramsbottom, J. (1931). Fungi pathogenic to man. In *A System of Bacteriology in relation to Medicine*, volume 8, pages 11–70. HMSO, for Medical Research Council, London.
- [Ranganathan, 1951] Ranganathan, S. R. (1951). Colon classification and its approach to documentation. In Shera, J. H. and Egan, M. E., editors, *Bibliographic Organization*, pages 94–105.
- [Reese, 1958] Reese, T. R. (1958). Georgia in anglo-spanish diplomacy, 1736-1739. *William and Mary Quarterly*, 15:168–190.
- [Salam, 1968] Salam, A. (1968). Weak and electromagnetic interactions. In Svartholm, N., editor, *Elementary particle theory*, pages 367–377. Almquist & Wiksell.
- [Sarfray and Razzak, 2002] Sarfray, M. and Razzak, M. F. A. (2002). Technical section: An algorithm for automatic capturing of the font outlines. *Computers and Graphics*, 26(5):795–804.
- [Shore, 1991] Shore, B. (1991). Twice-born, once conceived. *American Anthropologist*, 93(1):9–27.

- 1124 [Sigfridsson and Ryde, 1998] Sigfridsson, E. and Ryde, U. (1998). Comparison of methods for
 1125 deriving atomic charges from the electrostatic potential and moments. *Journal of Computational*
 1126 *Chemistry*, 19(4):377–395.
- 1127 [Smart, 1976] Smart, N. (1976). *The religious experience of mankind*. Schribner, New York, 2nd
 1128 edition.
- 1129 [Sorace et al., 1997] Sorace, R. E., Reinhardt, V. S., and Vaughn, S. A. (1997). High-speed digital-
 1130 to-rf converter.
- 1131 [T rrific, 1988] T rrific, T. (1988). An $O(n \log n / \log \log n)$ sorting algorithm. Wishful Research
 1132 Result 7, Fanstord University, Computer Science Department, Fanstord, California. This is a full
 1133 TECHREPORT entry.
- 1134 [T rrific, 1988] T rrific, T. (1988). An $O(n \log n / \log \log n)$ sorting algorithm. Technical report,
 1135 Fanstord University.
- 1136 [Thomson, 1971] Thomson, V. (1971). Cage and the collage of noises. In *American Music since*
 1137 *1910*, chapter 8. Holt, Rinehart and Winston, New York.
- 1138 [Traquair, 1638] Traquair, E. (1638). Letter to Marquess of Hamilton, 28 Aug. Lennoxlove
 1139 (E. Lothian), Muniments of Duke of Hamilton and Brandon, C.1, no. 963.
- 1140 [ nderwood et al., 1988]  nderwood, U.,  net, N., and  ot, P. (1988). Lower bounds for wishful
 1141 research results. Talk at Fanstord University (this is a full UNPUBLISHED entry).
- 1142 [ nderwood et al., 2004]  nderwood, U.,  net, N., and  ot, P. (2004). Lower bounds for wishful
 1143 research results. Talk at Fanstord University (this is a minimal UNPUBLISHED entry).
- 1144 [van Gennep, 1909a] van Gennep, A. (1909a). *Les rites de passage*. Nourry.
- 1145 [van Gennep, 1909b] van Gennep, A. (1909b). *Les rites de passage*. Nourry.
- 1146 [van Gennep, 1960] van Gennep, A. (1960). *The Rites of Passage*. University of Chicago Press.
- 1147 [V zques de Parga et al., 1993] V zques de Parga, L., Lacarra, J. M., and Ur a R u, J. (1993). *Las*
 1148 *Peregrinaciones a Santiago de Compostela*. Iberdrola. Ed. facs. de la realizada en 1948–49.
- 1149 [von Brandt and Hoffmann, 1987] von Brandt, A. and Hoffmann, E. (1987). Die nordischen
 1150 l nder von der mitte des 11. jahrhunderts bis 1448. In Seibt, F., editor, *Europa im Hoch- und*
 1151 *Sp tmittelalter*, number 2 in Handbuch der europ ischen Geschichte, pages 884–917. Klett-Cotta.
- 1152 [Wassenberg and Sanders, 2010] Wassenberg, J. and Sanders, P. (2010). Faster radix sort via virtual
 1153 memory and write-combining.
- 1154 [Weinberg, 1967] Weinberg, S. (1967). A model of leptons. *Phys. Rev. Lett.*, 19:1264–1266.
- 1155 [Westfahl, 2004] Westfahl, G. (2004). The true frontier. pages 55–65.
- 1156 [Wilde, 1899] Wilde, O. (1899). *The Importance of Being Earnest: A Trivial Comedy for Serious*
 1157 *People*. English and American drama of the Nineteenth Century. Leonard Smithers and Company.
- 1158 [Winget Ltd., 1967] Winget Ltd. (1967). Detachable bulldozer attachment for dumper vehicles.

- 1159 GB Patent Specification 1060631.
- 1160 [Wood, 1961] Wood, R. H. (1961). *Plastic and Elastic Design of Slabs and Plates*. Thames &
1161 Hudson, London.
- 1162 [Worman, 2002] Worman, N. (2002). *The Cast of Character*. University of Texas Press.
- 1163 [Wright, 1963] Wright, R. C. (1963). *Report Literature*, pages 46–59.
- 1164 [Wright, 1978a] Wright, S. (1978a). *Evolution and the genetics of populations*, volume 4. Univ. of
1165 Chicago Press, Chicago.
- 1166 [Wright, 1978b] Wright, S. (1978b). Variability within and among natural populations. In *Evolution*
1167 *and the genetics of populations*, vol. 4. Univ. of Chicago Press, Chicago.
- 1168 [Yoon et al., 2006] Yoon, M. S., Ryu, D., Kim, J., and Ahn, K. H. (2006). Palladium pincer com-
1169 plexes with reduced bond angle strain: efficient catalysts for the heck reaction. *Organometallics*,
1170 25(10):2409–2411.

1171 \LaTeX -comment this and the following texts after you have implemented them. See the
1172 following references for helpful guides for the bibliography and script editing in general.
1173 Note that the links might be unavailable, but the names can be searched in the Web.

- 1174 1. IEEE Citation Reference: www.ieee.org/documents/ieeecitationref.pdf
- 1175 2. IEEE Editorial Style manual: www.ieee.org/documents/style_manual.pdf
- 1176 3. IEEE Abbreviations for Transactions, Journals, Letters, and Magazines: www.ieee.org/documents/trans_journal_names.pdf
1177



1178 Also in your BibTeX file, enclose letters or words that should all be in uppercase in curly
1179 brackets. Example: IBM, Philippines, eXtensible Markup Language.

1181 **Chapter 8**

1182 **STUDENT RESEARCH ETHICS CLEARANCE**

8. Student Research Ethics Clearance

1183

RESEARCH ETHICS CLEARANCE FORM ¹ For Thesis Proposals	
Names of Student Researcher(s):	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: left;"> <p>Dela Cruz, Juan Z.</p> </div> <div style="border: 2px solid red; padding: 5px; text-align: center; color: red; font-weight: bold;"> SAMPLE ONLY </div> </div>	
College: Gokongwei College of Engineering	
Department: Electronics and Communications Engineering	
Course: PhD-ECE	
Expected Duration of the Project: from: April 2015 to: April 2017	
Ethical considerations	
<p>None</p> <p><i>(The Ethics Checklists may be used as guides in determining areas for ethical concern/consideration)</i></p>	
<p>To the best of my knowledge, the ethical issues listed above have been addressed in the research.</p> <div style="text-align: center;">  <p>Dr. Francisco D. Baltasar</p> </div>	
<p>Name and Signature of Adviser/Mentor:</p> <p>Date: April 8, 2017</p>	
<p>Noted by:</p> <div style="text-align: center;">  <p>Dr. Rafael W. Sison</p> </div>	
<p>Name and Signature of the Department Chairperson:</p> <p>Date: April 8, 2017</p>	

¹ The same form can be used for the reports of completed projects. The appropriate heading need only be used.

1184 **Chapter 9**

1185 **ANSWERS TO QUESTIONS TO THIS**

1186 **CAPSTONE PROJECT ON OPERATIONAL**

1187 **TECHNOLOGIES**

9.1 How important is the problem to practice?

A possible answer to this question is the summary of your Significance of the Study, and that portion of the Problem Statement where you describe the ideal scenario for your intended audience.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9.2 How will you know if the solution/s that you will achieve would be better than existing ones?

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue

9. Answers to Questions to this Capstone Project on Operational Technologies

1209 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
1210 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
1211 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

1212 **9.2.1 How will you measure the improvement/s?**

1213 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
1214 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
1215 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
1216 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
1217 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
1218 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
1219 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
1220 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
1221 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

1222 **9.2.1.1 What is/are your basis/bases for the improvement/s?**

1223 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
1224 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
1225 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
1226 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
1227 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
1228 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
1229 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.

9. Answers to Questions to this Capstone Project on Operational Technologies

Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9.2.1.2 Why did you choose that/those basis/bases?

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9.2.1.3 How significant are your measure/s of the improvement/s?

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9.3 What is the difference of the solution/s from existing ones?

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9.3.1 How is it different from previous and existing ones?

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9.4 What are the assumptions made (that are behind for your proposed solution to work)?

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9.4.1 Will your proposed solution/s be sensitive to these assumptions?

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit

9. Answers to Questions to this Capstone Project on Operational Technologies

1294 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

1295 **9.4.2 Can your proposed solution/s be applied to more general** 1296 **cases when some assumptions are eliminated? If so, how?**

1297 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
1298 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
1299 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
1300 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
1301 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
1302 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
1303 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
1304 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
1305 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

1306 **9.5 What is the necessity of your approach / pro-** 1307 **posed solution/s?**

1308 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
1309 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
1310 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
1311 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
1312 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
1313 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue

9. Answers to Questions to this Capstone Project on Operational Technologies

1314 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
1315 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
1316 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

1317 **9.5.1 What will be the limits of applicability of your proposed so-** 1318 **lution/s?**

1319 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
1320 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
1321 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
1322 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
1323 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
1324 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
1325 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
1326 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
1327 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

1328 **9.5.2 What will be the message of the proposed solution to** 1329 **technical people? How about to non-technical managers and** 1330 **business people?**

1331 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
1332 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
1333 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
1334 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.

9. Answers to Questions to this Capstone Project on Operational Technologies

Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9.6 How will you know if your proposed solution/s is/are correct?

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9.6.1 Will your results warrant the level of mathematics used (i.e., will the end justify the means)?

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec

9. Answers to Questions to this Capstone Project on Operational Technologies

1355 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
1356 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
1357 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
1358 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
1359 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
1360 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
1361 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

1362 **9.7 Is/are there an/_ alternative way/s to get to the** 1363 **same solution/s?**

1364 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem.
1365 Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec
1366 ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus
1367 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
1368 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
1369 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
1370 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
1371 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
1372 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9. Answers to Questions to this Capstone Project on Operational Technologies

9.7.1 Can you come up with illustrating examples, or even better, counterexamples to your proposed solution/s?

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9.7.2 Is there an approximation that can arrive at essentially the same proposed solution/s more easily?

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9.8 If you were the examiner of your Capstone Project on Operational Technologies, how would you present the Capstone Project on Operational Technologies in another way? Give your remarks, especially for your methodology and the results and discussions.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

9.8.1 What are the weaknesses of your Capstone Project on Operational Technologies, specifically your methodology and the results and discussions?

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus

9. Answers to Questions to this Capstone Project on Operational Technologies

1415 placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor.
1416 Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla
1417 tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue
1418 a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris.
1419 Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit
1420 amet ipsum. Nunc quis urna dictum turpis accumsan semper.

1421 **Chapter 10**

1422 **REVISIONS TO THE PROPOSAL**

10. Revisions to the Proposal

1423 Make a table with the following columns for showing the summary of revisions to the
1424 proposal based on the comments of the panel of examiners.

1425 1. Examiner

1426 2. Comment

1427 3. Summary of how the comment was addressed

1428 4. Locations in the document where the changes have been reflected

10. Revisions to the Proposal

Continued on next page

10. Revisions to the Proposal

Continued from previous page

Examiner	Comment	Summary of how the comment was addressed	Locations
----------	---------	--	-----------

TABLE 10.1 SUMMARY OF REVISIONS TO THE PROPOSAL

Examiner	Comment	Summary of how the comment was addressed	Locations
Dr. Francisco D. Baltasar	<p>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan</p>	<p>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.</p> <p>First itemtext</p> <p>Second itemtext</p> <p>Last itemtext</p> <p>First itemtext</p> <p>Second itemtext</p>	<p>Sec. 5.1 on p. 31, Sec. 5.2 on p. 33, Fig. 3.1 on p. 22</p>

10. Revisions to the Proposal

Continued from previous page

Examiner	Comment	Summary of how the comment was addressed	Locations
Dr. Amado Z. Hernandez	<p>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.</p>	<p>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.</p> <p>First itemtext</p> <p>Second itemtext</p> <p>Last itemtext</p> <p>First itemtext</p> <p>Second itemtext</p>	<p>Sec. 5.1 on p. 31, Sec. 5.2 on p. 33, Fig. 3.1 on p. 22</p>

10. Revisions to the Proposal

Continued from previous page

Examiner	Comment	Summary of how the comment was addressed	Locations
Dr. Jose Y. Alonzo	<p>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.</p>	<p>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.</p> <ul style="list-style-type: none"> • First itemtext • Second itemtext • Last itemtext • First itemtext • Second itemtext 	<p>Sec. 5.1 on p. 31, Sec. 5.2 on p. 33, Fig. 3.1 on p. 22</p>

10. Revisions to the Proposal

Continued from previous page

Examiner	Comment	Summary of how the comment was addressed	Locations
Dr. Mariana X. Mercado	<p>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.</p>	<p>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.</p> <ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	<p>Sec. 5.1 on p. 31, Sec. 5.2 on p. 33, Fig. 3.1 on p. 22</p>

10. Revisions to the Proposal

Continued from previous page

Examiner	Comment	Summary of how the comment was addressed	Locations
Dr. Rafael W. Sison	<p>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.</p>	<p>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.</p>	<p>Sec. 5.1 on p. 31, Sec. 5.2 on p. 33, Fig. 3.1 on p. 22</p>

10. Revisions to the Proposal

Continued from previous page

Examiner	Comment	Summary of how the comment was addressed	Locations
----------	---------	--	-----------

1429 **Chapter 11**

1430 **REVISIONS TO THE FINAL**

11. Revisions to the Final

1431 Make a table with the following columns for showing the summary of revisions to the
1432 proposal based on the comments of the panel of examiners.

1433 1. Examiner

1434 2. Comment

1435 3. Summary of how the comment has been addressed

1436 4. Locations in the document where the changes have been reflected

TABLE 11.1 SUMMARY OF REVISIONS TO THE CAPSTONE PROJECT ON
OPERATIONAL TECHNOLOGIES

Examiner	Comment	Summary of how the comment has been addressed	Locations
Dr. Francisco D. Baltasar	1. First itemtext	1. First itemtext	Sec. 5.1 on p. 31, Sec. 5.2 on p. 33, Fig. 3.1 on p. 22
	2. Second itemtext	2. Second itemtext	
	3. Last itemtext	3. Last itemtext	
	4. First itemtext	4. First itemtext	
	5. Second itemtext	5. Second itemtext	
		First itemtext	
		Second itemtext	
		Last itemtext	
		First itemtext	
		Second itemtext	

Continued on next page

11. Revisions to the Final

Continued from previous page

Examiner	Comment	Summary of how the comment has been addressed	Locations
Dr. Amado Z. Hernandez	1. First itemtext	1. First itemtext	Sec. 5.1 on p. 31, Sec. 5.2 on p. 33, Fig. 3.1 on p. 22
	2. Second itemtext	2. Second itemtext	
	3. Last itemtext	3. Last itemtext	
	4. First itemtext	4. First itemtext	
	5. Second itemtext	5. Second itemtext	
		First itemtext	
		Second itemtext	
		Last itemtext	
		First itemtext	
		Second itemtext	

Continued on next page

11. Revisions to the Final

Continued from previous page

Examiner	Comment	Summary of how the comment has been addressed	Locations
Dr. Jose Y. Alonzo	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext <ul style="list-style-type: none"> • First itemtext • Second itemtext • Last itemtext • First itemtext • Second itemtext 	Sec. 5.1 on p. 31, Sec. 5.2 on p. 33, Fig. 3.1 on p. 22
Dr. Mariana X. Mercado	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	<ol style="list-style-type: none"> 1. First itemtext 2. Second itemtext 3. Last itemtext 4. First itemtext 5. Second itemtext 	Sec. 5.1 on p. 31, Sec. 5.2 on p. 33, Fig. 3.1 on p. 22

Continued on next page

11. Revisions to the Final

Continued from previous page

Examiner	Comment	Summary of how the comment has been addressed	Locations
Dr. Rafael W. Sison	1. First itemtext	1. First itemtext	Sec. 5.1 on p. 31, Sec. 5.2 on p. 33, Fig. 3.1 on p. 22
	2. Second itemtext	2. Second itemtext	
	3. Last itemtext	3. Last itemtext	
	4. First itemtext	4. First itemtext	
	5. Second itemtext	5. Second itemtext	

1437 **Chapter 12**

1438 **USAGE EXAMPLES**

The user is expected to have a working knowledge of \LaTeX . A good introduction is in [?]. Its latest version can be accessed at <http://www.ctan.org/tex-archive/info/lshort>.

12.1 Equations

The following examples show how to typeset equations in \LaTeX . This section also shows examples of the use of `\gls{ }` commands in conjunction with the items that are in the `notation.tex` file. **Please make sure that the entries in `notation.tex` are those that are referenced in the \LaTeX document files used by this Capstone Project on Operational Technologies. Please comment out unused notations and be careful with the commas and brackets in `notation.tex` .**

In (12.1), the output signal $y(t)$ is the result of the convolution of the input signal $x(t)$ and the impulse response $h(t)$.

$$y(t) = h(t) * x(t) = \int_{-\infty}^{+\infty} h(t - \tau) x(\tau) d\tau \quad (12.1)$$

Other example equations are as follows.

$$\begin{bmatrix} V_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} V_2 \\ I_2 \end{bmatrix} \quad (12.2)$$

$$\frac{1}{2} < \left[\text{mod} \left(\left\lfloor \frac{y}{17} \right\rfloor 2^{-17\lfloor x \rfloor - \text{mod}(\lfloor y \rfloor, 17)}, 2 \right) \right], \quad (12.3)$$

$$|\zeta(x)^3 \zeta(x + iy)^4 \zeta(x + 2iy)| = \exp \sum_{n,p} \frac{3 + 4 \cos(ny \log p) + \cos(2ny \log p)}{np^{nx}} \geq 1 \quad (12.4)$$

1451

The verbatim L^AT_EX code of Sec. 12.1 is in List. 12.1.Listing 12.1: Sample L^AT_EX code for equations and notations usage

```

1 The following examples show how to typeset equations in \LaTeX. This
  section also shows examples of the use of \verb| \gls{ } | commands
  in conjunction with the items that are in the \verb| notation.tex |
  file. \textbf{Please make sure that the entries in} \verb| notation.
  tex | \textbf{ are those that are referenced in the \LaTeX \
  document files used by this \documentType. Please comment out
  unused notations and be careful with the commas and brackets in} \
  \verb| notation.tex |.

2
3 In~\eqref{eq:conv}, the output signal \gls{not:output_sigt} is the
  result of the convolution of the input signal \gls{not:input_sigt}
  and the impulse response \gls{not:ir}.

4
5 \begin{eqnarray}
6   y\left( t \right) = h\left( t \right) * x\left( t \right)=\int_{-\infty}^{+\infty}h\left( t-\tau \right)x\left( \tau \right) \mathrm{d}\tau
7   \label{eq:conv}
8 \end{eqnarray}
9
10 Other example equations are as follows.
11
12 \begin{eqnarray}
13   \left[ \dfrac{V_{1}}{I_{1}} \right] =
14   \begin{bmatrix}
15     A & B \\
16     C & D
17   \end{bmatrix}
18   \left[ \dfrac{V_{2}}{I_{2}} \right]
19   \label{eq:ABCD}
20 \end{eqnarray}
21
22 \begin{eqnarray}
23   \dfrac{1}{2} < \left\lfloor \mathrm{mod} \left( \left\lfloor \dfrac{y}{17} \right\rfloor \right. \right.
24   \left. \left. \right\rfloor 2^{-17} \left\lfloor x \right\rfloor - \mathrm{mod} \left( \left\lfloor y \right\rfloor \right. \right.
25   \left. \left. \right\rfloor 17 \right) \right\rfloor, 2 \right) \right\rfloor,
26 \end{eqnarray}
27
28 \begin{eqnarray}
29   \left| \zeta(x)^3 \zeta(x + iy)^4 \zeta(x + 2iy) \right| =
30   \exp \sum_{n,p} \frac{3 + 4 \cos( ny \log p) + \cos( 2ny \log p)}{np^{nx}}
31   \geq 1
32 \end{eqnarray}

```

12.2 Notations

In order to use the standardized notation, the user is highly suggested to see the ISO 80000-2 standard [?].

See https://en.wikipedia.org/wiki/Help:Displaying_a_formula and https://en.wikipedia.org/wiki/List_of_mathematical_symbols for L^AT_EX maths and other notations, respectively.

The following were taken from `isomath-test.tex`.

12.2.1 Math alphabets

If there are other symbols in place of Greek letters in a math alphabet, it uses T1 or OT1 font encoding instead of OML.

<code>mathnormal</code>	$A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \alpha, \beta, \pi, \nu, \omega, v, w, 0, 1, 9$
<code>mathit</code>	$A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \textit{ff}, \textit{fi}, \beta, ^\circ, !, v, w, 0, 1, 9$
<code>mathrm</code>	$A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \text{ff}, \text{fi}, \beta, ^\circ, !, v, w, 0, 1, 9$
<code>mathbf</code>	$\mathbf{A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \text{ff}, \text{fi}, \beta, ^\circ, !, v, w, 0, 1, 9}$
<code>mathsf</code>	$A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \text{ff}, \text{fi}, \beta, ^\circ, !, v, w, 0, 1, 9$
<code>mathtt</code>	$A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \uparrow, \downarrow, \beta, ^\circ, !, v, w, 0, 1, 9$

New alphabets bold-italic, sans-serif-italic, and sans-serif-bold-italic.

<code>mathbfit</code>	$\mathbf{A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \alpha, \beta, \pi, \nu, \omega, v, w, 0, 1, 9}$
<code>mathsf</code>	$A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \alpha, \beta, \pi, \nu, \omega, v, w, 0, 1, 9$
<code>mathsfbfit</code>	$\mathbf{A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \alpha, \beta, \pi, \nu, \omega, v, w, 0, 1, 9}$

1462 Do the math alphabets match?

1463 $\alpha x \alpha \omega \alpha x \alpha \omega \alpha x \alpha \omega$ $TC\Theta\Gamma TC\Theta\Gamma TC\Theta\Gamma$

1464 12.2.2 Vector symbols

1465 Alphabetic symbols for vectors are boldface italic, $\lambda = e_1 \cdot a$, while numeric ones (e.g.
1466 the zero vector) are bold upright, $a + 0 = a$.

1467 12.2.3 Matrix symbols

1468 Symbols for matrices are boldface italic, too:¹ $\Lambda = E \cdot A$.

1469 12.2.4 Tensor symbols

1470 Symbols for tensors are sans-serif bold italic,

$$\alpha = e \cdot a \quad \Longleftrightarrow \quad \alpha_{ijl} = e_{ijk} \cdot a_{kl}.$$

1471 The permittivity tensor describes the coupling of electric field and displacement:

$$D = \epsilon_0 \epsilon_r E$$

¹However, matrix symbols are usually capital letters whereas vectors are small ones. Exceptions are physical quantities like the force vector F or the electrical field E .

1472 12.2.5 Bold math version

1473 The “bold” math version is selected with the commands `\boldmath` or `\mathversion{bold}`

`mathnormal` $A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \alpha, \beta, \pi, \nu, \omega, v, w, 0, 1, 9$
`mathit` $A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \textit{ff}, \textit{fi}, \beta, ^\circ, !, v, w, 0, 1, 9$
`mathrm` $A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \text{ff}, \text{fi}, \beta, ^\circ, !, v, w, 0, 1, 9$
`mathbf` $A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \text{ff}, \text{fi}, \beta, ^\circ, !, v, w, 0, 1, 9$
`mathsf` $\mathbf{A}, \mathbf{B}, \mathbf{\Gamma}, \mathbf{\Delta}, \mathbf{\Theta}, \mathbf{\Lambda}, \mathbf{\Xi}, \mathbf{\Pi}, \mathbf{\Sigma}, \mathbf{\Phi}, \mathbf{\Psi}, \mathbf{\Omega}, \text{ff}, \text{fi}, \beta, ^\circ, !, v, w, 0, 1, 9$
`mathtt` $A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \uparrow, \downarrow, \beta, ^\circ, !, v, w, 0, 1, 9$

1474 New alphabets bold-italic, sans-serif-italic, and sans-serif-bold-italic.

`mathbfit` $A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \alpha, \beta, \pi, \nu, \omega, v, w, 0, 1, 9$
`mathsfit` $A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \alpha, \beta, \pi, \nu, \omega, v, w, 0, 1, 9$
`mathsfbfit` $A, B, \Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega, \alpha, \beta, \pi, \nu, \omega, v, w, 0, 1, 9$

1475 Do the math alphabets match?

1476 $\alpha x \alpha \omega a x \alpha \omega a x \alpha \omega \quad TC\Theta\Gamma TC\Theta\Gamma TC\Theta\Gamma$

1477 12.2.5.1 Vector symbols

1478 Alphabetic symbols for vectors are boldface italic, $\lambda = e_1 \cdot a$, while numeric ones (e.g.
 1479 the zero vector) are bold upright, $a + 0 = a$.

1480 **12.2.5.2 Matrix symbols**1481 Symbols for matrices are boldface italic, too:² $\mathbf{A} = \mathbf{E} \cdot \mathbf{A}$.1482 **12.2.5.3 Tensor symbols**

1483 Symbols for tensors are sans-serif bold italic,

$$\boldsymbol{\alpha} = \mathbf{e} \cdot \mathbf{a} \iff \alpha_{ijl} = e_{ijk} \cdot a_{kl}.$$

1484 The permittivity tensor describes the coupling of electric field and displacement:

$$\mathbf{D} = \epsilon_0 \epsilon_r \mathbf{E}$$

²However, matrix symbols are usually capital letters whereas vectors are small ones. Exceptions are physical quantities like the force vector \mathbf{F} or the electrical field \mathbf{E} .

1485 The verbatim L^AT_EX code of Sec. 12.2 is in List. 12.2.

Listing 12.2: Sample L^AT_EX code for notations usage

```

1486
1487 1 % A teststring with Latin and Greek letters::
1488 2 \newcommand{\teststring}{%
1489 3 % capital Latin letters
1490 4 % A,B,C,
1491 5 A,B,
1492 6 % capital Greek letters
1493 7 %\Gamma,\Delta,\Theta,\Lambda,\Xi,\Pi,\Sigma,\Upsilon,\Phi,\Psi,
1494 8 \Gamma,\Delta,\Theta,\Lambda,\Xi,\Pi,\Sigma,\Phi,\Psi,\Omega,
1495 9 % small Greek letters
1496 10 \alpha,\beta,\pi,\nu,\omega,
1497 11 % small Latin letters:
1498 12 % compare \nu, \omega, v, and w
1499 13 v,w,
1500 14 % digits
1501 15 0,1,9
1502 16 }
1503 17
1504 18
1505 19 \subsection{Math alphabets}
1506 20
1507 21 If there are other symbols in place of Greek letters in a math
1508 22 alphabet, it uses T1 or OT1 font encoding instead of OML.
1509 23
1510 24 \begin{eqnarray*}
1511 25 \mbox{mathnormal} & & \teststring \\
1512 26 \mbox{mathit} & & \mathit{\teststring} \\
1513 27 \mbox{mathrm} & & \mathrm{\teststring} \\
1514 28 \mbox{mathbf} & & \mathbf{\teststring} \\
1515 29 \mbox{mathsf} & & \mathsf{\teststring} \\
1516 30 \mbox{mathtt} & & \mathtt{\teststring} \\
1517 31 \end{eqnarray*}

```



```

1518 32 New alphabets bold-italic, sans-serif-italic, and sans-serif-bold-
1519      italic.
1520 33 \begin{eqnarray*}
1521 34 \mbox{\mathbfit}      & & \mathbfit{\teststring}\\
1522 35 \mbox{\mathsf{fit}}    & & \mathsf{fit}{\teststring}\\
1523 36 \mbox{\mathsfbfit} & & \mathsfbfit{\teststring}
1524 37 \end{eqnarray*}
1525 38 %
1526 39 Do the math alphabets match?
1527 40
1528 41 $
1529 42 \mathnormal {a x \alpha \omega}
1530 43 \mathbfit    {a x \alpha \omega}
1531 44 \mathsfbfit{a x \alpha \omega}
1532 45 \quad
1533 46 \mathsfbfit{T C \Theta \Gamma}
1534 47 \mathbfit    {T C \Theta \Gamma}
1535 48 \mathnormal {T C \Theta \Gamma}
1536 49 $
1537 50
1538 51 \subsection{Vector symbols}
1539 52
1540 53 Alphabetic symbols for vectors are boldface italic,
1541 54  $\vec{\lambda}=\vec{e}_{1}\cdot\vec{a}$ ,
1542 55 while numeric ones (e.g. the zero vector) are bold upright,
1543 56  $\vec{a} + \vec{0} = \vec{a}$ .
1544 57
1545 58 \subsection{Matrix symbols}
1546 59
1547 60 Symbols for matrices are boldface italic, too:%
1548 61 \footnote{However, matrix symbols are usually capital letters whereas
1549      vectors
1550 62 are small ones. Exceptions are physical quantities like the force
1551 63 vector  $\vec{F}$  or the electrical field  $\vec{E}$ .%

```

```

1552 64 }
1553 65 $\matrixsym{\Lambda}=\matrixsym{E}\cdot\matrixsym{A}.$
1554 66
1555 67
1556 68 \subsection{Tensor symbols}
1557 69
1558 70 Symbols for tensors are sans-serif bold italic,
1559 71
1560 72 \[
1561 73   \tensorsym{\alpha} = \tensorsym{e}\cdot\tensorsym{a}
1562 74   \quad \Longleftrightarrow \quad
1563 75   \alpha_{ijl} = e_{ijk}\cdot a_{kl}.
1564 76 \]
1565 77
1566 78
1567 79 The permittivity tensor describes the coupling of electric field and
1568 80 displacement: \[
1569 81 \vec{D}=\epsilon_0\tensorsym{\epsilon}_{\mathrm{r}}\vec{E}\]
1570 82
1571 83
1572 84
1573 85 \newpage
1574 86 \subsection{Bold math version}
1575 87
1576 88 The ‘‘bold’’ math version is selected with the commands
1577 89 \verb+\boldmath+ or \verb+\mathversion{bold}+
1578 90
1579 91 {\boldmath
1580 92   \begin{eqnarray*}
1581 93   \mbox{mathnormal} & & \teststring \\
1582 94   \mbox{mathit} & & \mathit{\teststring}\\
1583 95   \mbox{mathrm} & & \mathrm{\teststring}\\
1584 96   \mbox{mathbf} & & \mathbf{\teststring}\\
1585 97   \mbox{mathsf} & & \mathsf{\teststring}

```

```

1586 98 \mbox{\mathtt} & & \mathtt{\teststring}
1587 99 \end{eqnarray*}
1588 100 New alphabets bold-italic, sans-serif-italic, and sans-serif-bold-
1589 italic.
1590 101 \begin{eqnarray*}
1591 102 \mbox{\mathbfit} & & \mathbfit{\teststring}\\
1592 103 \mbox{\mathsf} & & \mathsf{\teststring}\\
1593 104 \mbox{\mathsfbfit} & & \mathsfbfit{\teststring}
1594 105 \end{eqnarray*}
1595 106 %
1596 107 Do the math alphabets match?
1597 108
1598 109 $
1599 110 \mathnormal {a x \alpha \omega}
1600 111 \mathbfit {a x \alpha \omega}
1601 112 \mathsfbfit{a x \alpha \omega}
1602 113 \quad
1603 114 \mathsfbfit{T C \Theta \Gamma}
1604 115 \mathbfit {T C \Theta \Gamma}
1605 116 \mathnormal {T C \Theta \Gamma}
1606 117 $
1607 118
1608 119 \subsection{Vector symbols}
1609 120
1610 121 Alphabetic symbols for vectors are boldface italic,
1611 122  $\vec{\lambda} = \vec{e}_1 \cdot \vec{a}$ ,
1612 123 while numeric ones (e.g. the zero vector) are bold upright,
1613 124  $\vec{a} + \vec{0} = \vec{a}$ .
1614 125
1615 126
1616 127
1617 128
1618 129 \subsection{Matrix symbols}
1619 130

```

```

1620 131 Symbols for matrices are boldface italic, too:%
1621 132 \footnote{However, matrix symbols are usually capital letters whereas
1622 vectors
1623 133 are small ones. Exceptions are physical quantities like the force
1624 134 vector  $\vec{F}$  or the electrical field  $\vec{E}$ .%
1625 135 }
1626 136  $\matrixsym{\Lambda}=\matrixsym{E}\cdot\matrixsym{A}.$ 
1627 137
1628 138
1629 139 \subsection{Tensor symbols}
1630 140
1631 141 Symbols for tensors are sans-serif bold italic,
1632 142
1633 143 \[
1634 144 \tensorsym{\alpha} = \tensorsym{e}\cdot\tensorsym{a}
1635 145 \quad \Longleftarrow \quad
1636 146 \alpha_{ijl} = e_{ijk}\cdot a_{kl}.
1637 147 \]
1638 148
1639 149 The permittivity tensor describes the coupling of electric field and
1640 150 displacement: \[
1641 151 \vec{D}=\epsilon_0\tensorsym{\epsilon}_{\mathrm{r}}\vec{E}\]
1642 152 }

```

12.3 Abbreviation

This section shows examples of the use of \LaTeX commands in conjunction with the items that are in the `abbreviation.tex` and in the `glossary.tex` files. Please see List. 12.3. **To lessen the \LaTeX parsing time, it is suggested that you use `\acr{ }` only for the first occurrence of the word to be abbreviated.**

Again please see List. 12.3. Here is an example of first use: alternating current (ac). Next use: ac. Full: alternating current (ac). Here's an acronym referenced using `\acr` : hyper-text markup language (html). And here it is again: html. If you are used to the glossaries package, note the difference in using `\gls` : hyper-text markup language (html). And again (no difference): hyper-text markup language (html). For plural use `\glspl` . Here are some more entries:

- extensible markup language (xml) and cascading style sheet (css).
- Next use: xml and css.
- Full form: extensible markup language (xml) and cascading style sheet (css).
- Reset again.
- Start with a capital. Hyper-text markup language (html).
- Next: Html. Full: Hyper-text markup language (html).
- Prefer capitals? Extensible markup language (XML). Next: XML. Full: extensible markup language (XML).

- 1664 • Prefer small-caps? Cascading style sheet (CSS). Next: CSS. Full: cascading style
1665 sheet (CSS).
- 1666 • Resetting all acronyms.
- 1667 • Here are the acronyms again:
- 1668 • Hyper-text markup language (HTML), extensible markup language (XML) and cas-
1669 cading style sheet (CSS).
- 1670 • Next use: HTML, XML and CSS.
- 1671 • Full form: Hyper-text markup language (HTML), extensible markup language (XML)
1672 and cascading style sheet (CSS).
- 1673 • Provide your own link text: style sheet.
- 1674 The verbatim \LaTeX code of Sec. 12.3 is in List. 12.3.

Listing 12.3: Sample L^AT_EX code for abbreviations usage

```

1 Again please see List.~\ref{lst:abbrv}. Here is an example of first use:
   \acr{ac}. Next use: \acr{ac}. Full: \gls{ac}. Here's an acronym
   referenced using \verb| \acr |: \acr{html}. And here it is again: \
   acr{html}. If you are used to the \texttt{glossaries} package, note
   the difference in using \verb| \gls |: \gls{html}. And again (no
   difference): \gls{html}. Here are some more entries:
2
3 \begin{itemize}
4
5   \item \acr{xml} and \acr{css}.
6
7   \item Next use: \acr{xml} and \acr{css}.
8
9   \item Full form: \gls{xml} and \gls{css}.
10
11  \item Reset again. \glsresetall{abbreviation}
12
13  \item Start with a capital. \Acr{html}.
14
15  \item Next: \Acr{html}. Full: \Gls{html}.
16
17  \item Prefer capitals? \renewcommand{\acronymfont}[1]{\
   MakeTextUppercase{#1}} \Acr{xml}. Next: \acr{xml}. Full: \gls{xml}
   }.
18
19  \item Prefer small-caps? \renewcommand{\acronymfont}[1]{\textsc{#1}}
   \Acr{css}. Next: \acr{css}. Full: \gls{css}.
20
21  \item Resetting all acronyms.\glsresetall{abbreviation}
22
23  \item Here are the acronyms again:
24
25  \item \Acr{html}, \acr{xml} and \acr{css}.
26
27  \item Next use: \Acr{html}, \acr{xml} and \acr{css}.
28
29  \item Full form: \Gls{html}, \gls{xml} and \gls{css}.
30
31  \item Provide your own link text: \glslink{[textbf]css}{style}
32
33 \end{itemize}

```

12.4 Glossary

This section shows examples of the use of `\gls{ }` commands in conjunction with the items that are in the `glossary.tex` and `notation.tex` files. Note that entries in `notation.tex` are prefixed with “`not:` ” label (see List. 12.4).

Please make sure that the entries in `notation.tex` are those that are referenced in the L^AT_EX document files used by this Capstone Project on Operational Technologies. Please comment out unused notations and be careful with the commas and brackets in `notation.tex` .

- Matrices are usually denoted by a bold capital letter, such as \mathbf{A} . The matrix’s (i, j) th element is usually denoted a_{ij} . Matrix \mathbf{I} is the identity matrix.
- A set, denoted as \mathcal{S} , is a collection of objects.
- The universal set, denoted as \mathcal{U} , is the set of everything.
- The empty set, denoted as \emptyset , contains no elements.
- Functional Analysis is seen as the study of complete normed vector spaces, i.e., Banach spaces.
- The cardinality of a set, denoted as $|\mathcal{S}|$, is the number of elements in the set.

The verbatim L^AT_EX code for the part of Sec. 12.4 is in List. 12.4.

Listing 12.4: Sample L^AT_EX code for glossary and notations usage

```

1 \begin{itemize}
2
3   \item \Glspl{matrix} are usually denoted by a bold capital letter,
      such as  $\mathbf{A}$ . The  $\text{\gls{matrix}}$ 's  $(i,j)$ th element is
      usually denoted  $a_{ij}$ .  $\text{\Gls{matrix}}$   $\mathbf{I}$  is the
      identity  $\text{\gls{matrix}}$ .
4
5   \item A set, denoted as  $\text{\gls{not:set}}$ , is a collection of objects.
6
7   \item The universal set, denoted as  $\text{\gls{not:universalSet}}$ , is the
      set of everything.
8
9   \item The empty set, denoted as  $\text{\gls{not:emptySet}}$ , contains no
      elements.
10
11   \item  $\text{\Gls{Functional Analysis}}$  is seen as the study of complete
      normed vector spaces, i.e., Banach spaces.
12
13   \item The cardinality of a set, denoted as  $\text{\gls{not:cardinality}}$ , is
      the number of elements in the set.
14
15 \end{itemize}

```

1692 **12.5 Figure**

1693 This section shows several ways of placing figures. PDFL^AT_EX compatible files are PDF,
1694 PNG, and JPG. Please see the `figure` subdirectory.

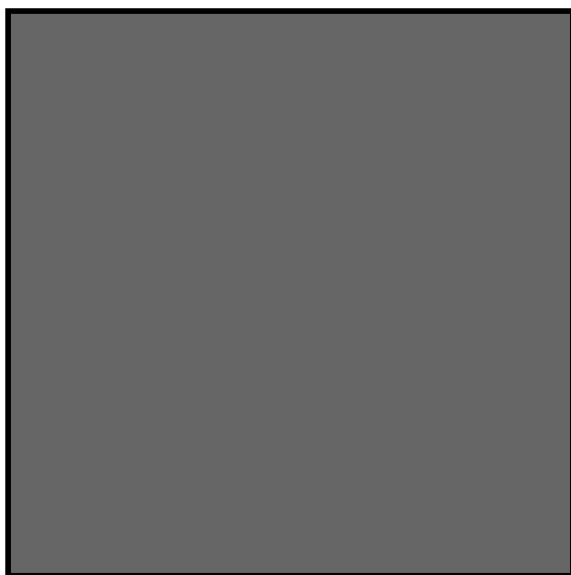


Fig. 12.1 A quadrilateral image example.

1695 Fig. 12.1 is a gray box enclosed by a dark border. List. 12.5 shows the corresponding
1696 \LaTeX code.

Listing 12.5: Sample \LaTeX code for a single figure

```
1 \begin{figure}[!htbp]
2   \centering
3   \includegraphics[width=0.5\textwidth]{example}
4   \caption{A quadrilateral image example.}
5   \label{fig:example}
6 \end{figure}
7 \cleardoublepage
8
9 Fig.~\ref{fig:example} is a gray box enclosed by a dark border. List.~\ref{lst:onefig} shows the corresponding  $\LaTeX$  \ code.
10 \end{figure}
```



(a) A sub-figure in the top row.



(b) A sub-figure in the middle row.



(c) A sub-figure in the bottom row.

Fig. 12.2 Figures on top of each other. See List. 12.6 for the corresponding \LaTeX code.

Listing 12.6: Sample L^AT_EX code for three figures on top of each other

```
1 \begin{figure}[!htbp]
2 \centering
3 \subbottom[A sub-figure in the top row.]{
4 \includegraphics[width=0.35\textwidth]{example_gray_box}
5 \label{fig:top}
6 }
7 \vfill
8 \subbottom[A sub-figure in the middle row.]{
9 \includegraphics[width=0.35\textwidth]{example_gray_box}
10 \label{fig:mid}
11 }
12 \vfill
13 \subbottom[A sub-figure in the bottom row.]{
14 \includegraphics[width=0.35\textwidth]{example_gray_box}
15 \label{fig:botm}
16 }
17 \caption{Figures on top of each other}
18 \label{fig:tmb}
19 \end{figure}
```

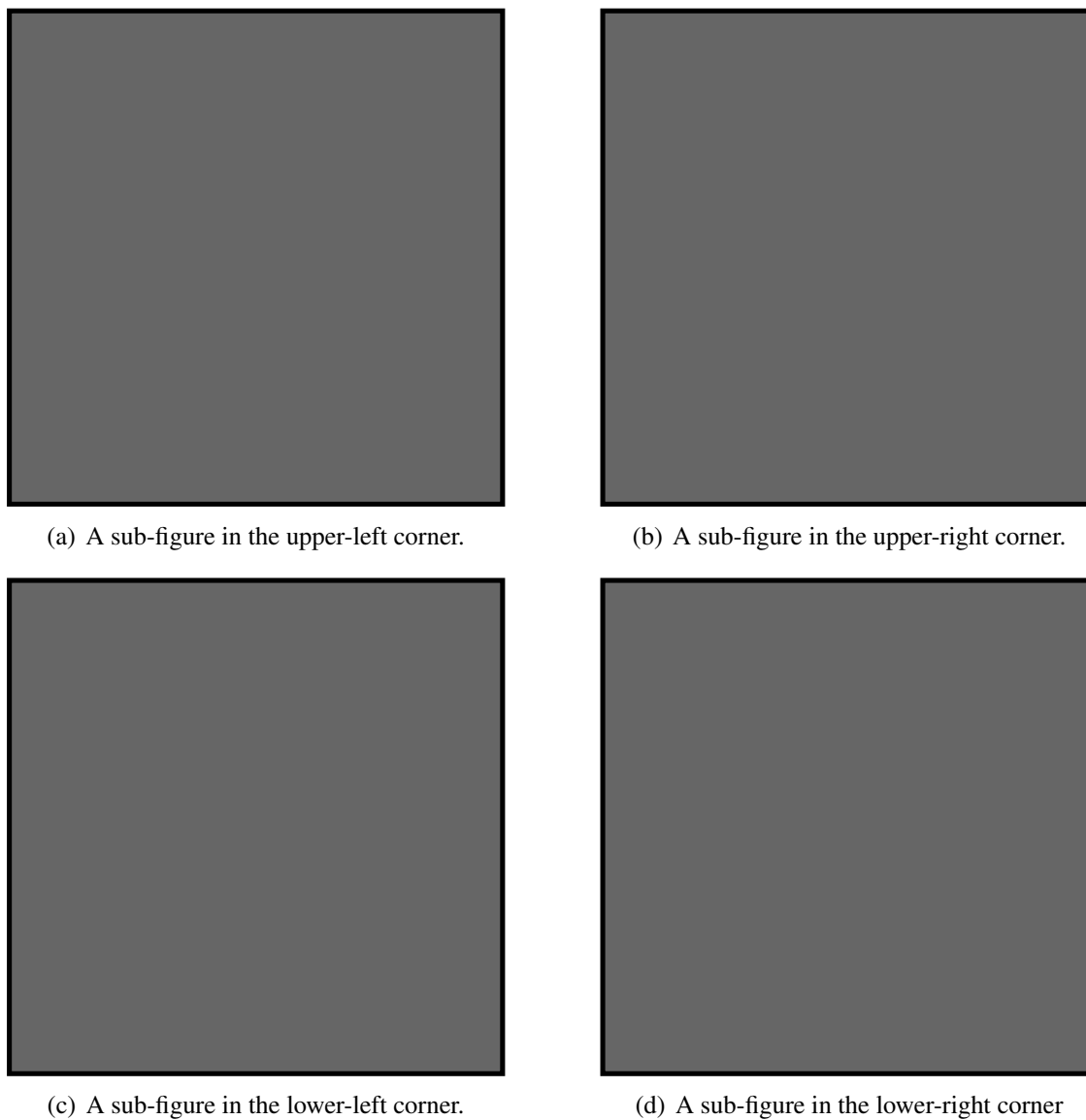


Fig. 12.3 Four figures in each corner. See List. 12.7 for the corresponding \LaTeX code.

Listing 12.7: Sample L^AT_EX code for the four figures

```

1 \begin{figure}[!htbp]
2 \centering
3 \subbottom[A sub-figure in the upper-left corner.]{
4 \includegraphics[width=0.45\textwidth]{example_gray_box}
5 \label{fig:upprleft}
6 }
7 \hfill
8 \subbottom[A sub-figure in the upper-right corner.]{
9 \includegraphics[width=0.45\textwidth]{example_gray_box}
10 \label{fig:uppright}
11 }
12 \vfill
13 \subbottom[A sub-figure in the lower-left corner.]{
14 \includegraphics[width=0.45\textwidth]{example_gray_box}
15 \label{fig:lowerleft}
16 }
17 \hfill
18 \subbottom[A sub-figure in the lower-right corner]{
19 \includegraphics[width=0.45\textwidth]{example_gray_box}
20 \label{fig:lowright}
21 }
22 \caption{Four figures in each corner. See List.\ref{lst:fourfigs} for
23 the corresponding \LaTeX \ code.}
24 \label{fig:fourfig}
25 \end{figure}

```

12.6 Table

This section shows an example of placing a table (a long one). Table 12.1 are the triples.

TABLE 12.1 FEASIBLE TRIPLES FOR HIGHLY VARIABLE GRID

Time (s)	Triple chosen	Other feasible triples
0	(1, 11, 13725)	(1, 12, 10980), (1, 13, 8235), (2, 2, 0), (3, 1, 0)
2745	(1, 12, 10980)	(1, 13, 8235), (2, 2, 0), (2, 3, 0), (3, 1, 0)
5490	(1, 12, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
8235	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
10980	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
13725	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
16470	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
19215	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
21960	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
24705	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
27450	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
30195	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
32940	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
35685	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
38430	(1, 13, 10980)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
41175	(1, 12, 13725)	(1, 13, 10980), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
43920	(1, 13, 10980)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
46665	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
49410	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
52155	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
54900	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
57645	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
60390	(1, 12, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
63135	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
65880	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
68625	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)

Continued on next page

12. Usage Examples

Continued from previous page

Time (s)	Triple chosen	Other feasible triples
71370	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
74115	(1, 12, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
76860	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
79605	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
82350	(1, 12, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
85095	(1, 12, 13725)	(1, 13, 10980), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
87840	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
90585	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
93330	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
96075	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
98820	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
101565	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
104310	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
107055	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
109800	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
112545	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
115290	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
118035	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
120780	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
123525	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
126270	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
129015	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
131760	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
134505	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
137250	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
139995	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
142740	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
145485	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
148230	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
150975	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
153720	(1, 12, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
156465	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)

Continued on next page

Continued from previous page

Time (s)	Triple chosen	Other feasible triples
159210	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
161955	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
164700	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)

1700 List. 12.8 shows the corresponding L^AT_EX code.

Listing 12.8: Sample L^AT_EX code for making typical table environment

```

1701
1702 1 \begin{center}
1703 2 {\scriptsize
1704 3 \begin{tabularx}{\textwidth}{p{0.1\textwidth}|p{0.2\textwidth}|p{0.5\textwidth}}
1705     textwidth}}
1706 4 \caption{Feasible triples for highly variable grid} \label{tab:triple_
1707     grid} \\
1708 5 \hline
1709 6 \hline
1710 7 \textbf{Time (s)} &
1711 8 \textbf{Triple chosen} &
1712 9 \textbf{Other feasible triples} \\
1713 10 \hline
1714 11 \endfirsthead
1715 12 \multicolumn{3}{c}{%
1716 13 {\textit{Continued from previous page}}} \\
1717 14 \hline
1718 15 \hline
1719 16 \textbf{Time (s)} &
1720 17 \textbf{Triple chosen} &
1721 18 \textbf{Other feasible triples} \\
1722 19 \hline
1723 20 \endhead
1724 21 \hline
1725 22 \multicolumn{3}{r}{\textit{Continued on next page}} \\
1726 23 \endfoot
1727 24 \hline
1728 25 \endlastfoot
1729 26 \hline
1730 27
1731 28 0 & (1, 11, 13725) & (1, 12, 10980), (1, 13, 8235), (2, 2, 0), (3, 1, 0)
1732    \\

```

12. Usage Examples

```

1733 29 2745 & (1, 12, 10980) & (1, 13, 8235), (2, 2, 0), (2, 3, 0), (3, 1, 0)
1734    \
1735 30 5490 & (1, 12, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \
1736 31 8235 & (1, 12, 16470) & (1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1,
1737    0) \
1738 32 10980 & (1, 12, 16470) & (1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1,
1739    0) \
1740 33 13725 & (1, 12, 16470) & (1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1,
1741    0) \
1742 34 16470 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \
1743 35 19215 & (1, 12, 16470) & (1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1,
1744    0) \
1745 36 21960 & (1, 12, 16470) & (1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1,
1746    0) \
1747 37 24705 & (1, 12, 16470) & (1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1,
1748    0) \
1749 38 27450 & (1, 12, 16470) & (1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1,
1750    0) \
1751 39 30195 & (2, 2, 2745) & (2, 3, 0), (3, 1, 0) \
1752 40 32940 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \
1753 41 35685 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \
1754 42 38430 & (1, 13, 10980) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \
1755 43 41175 & (1, 12, 13725) & (1, 13, 10980), (2, 2, 2745), (2, 3, 0), (3, 1,
1756    0) \
1757 44 43920 & (1, 13, 10980) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \
1758 45 46665 & (2, 2, 2745) & (2, 3, 0), (3, 1, 0) \
1759 46 49410 & (2, 2, 2745) & (2, 3, 0), (3, 1, 0) \
1760 47 52155 & (1, 12, 16470) & (1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1,
1761    0) \
1762 48 54900 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \
1763 49 57645 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \
1764 50 60390 & (1, 12, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \
1765 51 63135 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \
1766 52 65880 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \

```

12. Usage Examples

```

1767 53 68625 & (2, 2, 2745) & (2, 3, 0), (3, 1, 0) \\
1768 54 71370 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1769 55 74115 & (1, 12, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1770 56 76860 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1771 57 79605 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1772 58 82350 & (1, 12, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1773 59 85095 & (1, 12, 13725) & (1, 13, 10980), (2, 2, 2745), (2, 3, 0), (3, 1,
1774      0) \\
1775 60 87840 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1776 61 90585 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1777 62 93330 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1778 63 96075 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1779 64 98820 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1780 65 101565 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1781 66 104310 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1782 67 107055 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1783 68 109800 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1784 69 112545 & (1, 12, 16470) & (1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3,
1785      1, 0) \\
1786 70 115290 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1787 71 118035 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1788 72 120780 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1789 73 123525 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1790 74 126270 & (1, 12, 16470) & (1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3,
1791      1, 0) \\
1792 75 129015 & (2, 2, 2745) & (2, 3, 0), (3, 1, 0) \\
1793 76 131760 & (2, 2, 2745) & (2, 3, 0), (3, 1, 0) \\
1794 77 134505 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1795 78 137250 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1796 79 139995 & (2, 2, 2745) & (2, 3, 0), (3, 1, 0) \\
1797 80 142740 & (2, 2, 2745) & (2, 3, 0), (3, 1, 0) \\
1798 81 145485 & (1, 12, 16470) & (1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3,
1799      1, 0) \\
1800 82 148230 & (2, 2, 2745) & (2, 3, 0), (3, 1, 0)

```

12. Usage Examples

```
1801 83 150975 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1802 84 153720 & (1, 12, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1803 85 156465 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1804 86 159210 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1805 87 161955 & (1, 13, 16470) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1806 88 164700 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
1807 89 \end{tabularx}
1808 90 }
1809 91 \end{center}
1810
```

12.7 Algorithm or Pseudocode Listing

Table 12.2 shows an example pseudocode. Note that if the pseudocode exceeds one page, it can mean that its implementation is not modular. List. 12.9 shows the corresponding \LaTeX code.

TABLE 12.2 CALCULATION OF $y = x^n$

Input(s):	
n	: n th power; $n \in \mathbb{Z}^+$
x	: base value; $x \in \mathbb{R}^+$
Output(s):	
y	: result; $y \in \mathbb{R}^+$

Require: $n \geq 0 \vee x \neq 0$

Ensure: $y = x^n$

```

1:  $y \leftarrow 1$ 
2: if  $n < 0$  then
3:    $X \leftarrow 1/x$ 
4:    $N \leftarrow -n$ 
5: else
6:    $X \leftarrow x$ 
7:    $N \leftarrow n$ 
8: end if
9: while  $N \neq 0$  do
10:  if  $N$  is even then
11:     $X \leftarrow X \times X$ 
12:     $N \leftarrow N/2$ 
13:  else  $\{N \text{ is odd}\}$ 
14:     $y \leftarrow y \times X$ 
15:     $N \leftarrow N - 1$ 
16:  end if
17: end while
```

Listing 12.9: Sample L^AT_EX code for algorithm or pseudocode listing usage

```

1 \begin{table}[!htbp]
2   \caption{Calculation of  $y = x^n$ }
3   \label{tab:calcxn}
4   {\footnotesize
5     \begin{tabular}{lll}
6       \hline
7       \hline
8       {\bfseries Input(s):} & & \\
9       $n$ & : & $n$th power; $n$ \in \mathbb{Z}^{+}$ \\
10      $x$ & : & base value; $x$ \in \mathbb{R}^{+}$ \\
11      \hline
12      {\bfseries Output(s):} & & \\
13      $y$ & : & result; $y$ \in \mathbb{R}^{+}$ \\
14      \hline
15      \hline
16      \\
17    \end{tabular}
18  }
19  \begin{algorithmic}[1]
20    {\footnotesize
21      \REQUIRE $n \geq 0$ \vee $x \neq 0$
22      \ENSURE $y = x^n$
23      \STATE $y \leftarrow 1$
24      \IF{$n < 0$}
25        \STATE $X \leftarrow 1 / x$
26        \STATE $N \leftarrow -n$
27      \ELSE
28        \STATE $X \leftarrow x$
29        \STATE $N \leftarrow n$
30      \ENDIF
31      \WHILE{$N \neq 0$}
32        \IF{$N$ is even}
33          \STATE $X \leftarrow X \times X$
34          \STATE $N \leftarrow N / 2$
35        \ELSE[$N$ is odd]
36          \STATE $y \leftarrow y \times X$
37          \STATE $N \leftarrow N - 1$
38        \ENDIF
39      \ENDWHILE
40    }
41  \end{algorithmic}
42 \end{table}

```


1815 **12.8 Program/Code Listing**

1816 List. 12.10 is a program listing of a C code for computing Fibonacci numbers by calling
1817 the actual code. Please see the `code` subdirectory.

1818 List. 12.11 shows the corresponding \LaTeX code.

Listing 12.10: Computing Fibonacci numbers in C (./code/fibo.c)

```

1  /* fibo.c -- It prints out the first N Fibonacci
2  *           numbers.
3  */
4
5  #include <stdio.h>
6
7  int main(void) {
8      int n;           /* Number of fibonacci numbers we will print */
9      int i;           /* Index of fibonacci number to be printed next */
10     int current;      /* Value of the (i)th fibonacci number */
11     int next;         /* Value of the (i+1)th fibonacci number */
12     int twoaway;      /* Value of the (i+2)th fibonacci number */
13
14     printf("How many Fibonacci numbers do you want to compute? ");
15     scanf("%d", &n);
16     if (n<=0)
17         printf("The number should be positive.\n");
18     else {
19         printf("\n\n\tI\t\tFibonacci(I)\n\n\t=====");
20         next = current = 1;
21         for (i=1; i<=n; i++) {
22             printf("\t%d\t\t%d\n", i, current);
23             twoaway = current+next;
24             current = next;
25             next = twoaway;
26         }
27     }
28 }
29
30 /* The output from a run of this program was:
31
32 How many Fibonacci numbers do you want to compute? 9
33
34 I      Fibonacci(I)
35 =====
36 1      1
37 2      1
38 3      2
39 4      3
40 5      5
41 6      8
42 7      13
43 8      21
44 9      34
45
46 */

```

Listing 12.11: Sample L^AT_EX code for program listing

```

1 List.\ref{lst:fib_c} is a program listing of a C code for computing
  Fibonacci numbers by calling the actual code. Please see the \verb|
  code | subdirectory.

```

12.9 Referencing

Referencing chapters: This appendix is in Appendix 12, which is about examples in using various \LaTeX commands.

Referencing sections: This section is Sec. 12.9, which shows how to refer to the locations of various labels that have been placed in the \LaTeX files. List. 12.12 shows the corresponding \LaTeX code.

Listing 12.12: Sample \LaTeX code for referencing sections

```
1 Referencing sections: This section is Sec.~\ref{sec:ref}, which shows
   how to refer to the locations of various labels that have been
   placed in the \LaTeX \ files. List.~\ref{lst:refsec} shows the
   corresponding \LaTeX \ code.
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

12.9.1 A subsection

Referencing subsections: This section is Sec. 12.9.1, which shows how to refer to a subsection. List. 12.13 shows the corresponding \LaTeX code.

Listing 12.13: Sample \LaTeX code for referencing subsections

```
1 Referencing subsections: This section is Sec.~\ref{sec:subsec}, which
  shows how to refer to a subsection. List.~\ref{lst:refsub} shows the
  corresponding \LaTeX \ code.
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

12.9.1.1 A sub-subsection

Referencing sub-subsections: This section is Sec. 12.9.1.1, which shows how to refer to a sub-subsection. List. 12.14 shows the corresponding \LaTeX code.

Listing 12.14: Sample \LaTeX code for referencing sub-subsections

```
1 Referencing sub-subsections: This section is Sec.~\ref{sec:subsubsec},
  which shows how to refer to a sub-subsection. List.~\ref{lst:
  refsubsub} shows the corresponding \LaTeX \ code.
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

12.10 Citing

Citing bibliography content is done using BibTeX. It requires the creation of a BibTeX file (.bib extension name), and then added in the argument of `\bibliography{ }`. For each .bib file, separate them by a comma in the argument of `\bibliography{ }` without the extension name. Building your BibTeX file (references.bib) can be done easily with a tool called JabRef (www.jabref.org).

The following subsections are examples of citations.

12.10.1 Books

- [?]

- [?]

- [?]

- [?]

- [?]

- [?]

- [?]

- [?]

- [?]

- [?]

12. Usage Examples

1876 • [?]

1877 • [?]

1878 • [?]

1879 • [?]

1880 • [?]

1881 • [?]

1882 • [?]

1883 • [?]

1884 • [?]

1885 • [?]

1886 • [?]

1887 • [?]

1888 • [?]

1889 • [?]

1890 • [?]

1891 • [?]

1892 • [?]

12. Usage Examples

1893 • [?]

1894 • [?]

1895 • [?]

1896 • [?]

1897 • [?]

1898 • [?]

1899 • [?]

1900 • [?]

1901 • [?]

1902 • [?]

1903 • [?]

1904 • [?]

1905 • [?]

1906 • [?]

1907 • [?]

1908 • [?]

1909 • [?]

1910 **12.10.2 Booklets**

- 1911 • [?]

1912 **12.10.3 Proceedings**

- 1913 • [?]

1914 **12.10.4 In books**

- 1915 • [?]

- 1916 • [?]

- 1917 • [?]

- 1918 • [?]

- 1919 • [?]

- 1920 • [?]

- 1921 • [?]

- 1922 • [?]

- 1923 • [?]

- 1924 • [?]

- 1925 • [?]

- 1926 • [?]

1927 • [?]

1928 • [?]

1929 • [?]

1930 • [?]

1931 • [?]

1932 • [?]

1933 • [?]

1934 • [?]

1935 • [?]

1936 • [?]

1937 • [?]

1938 • [?]

1939 • [?]

1940 • [?]

1941 **12.10.5 In proceedings**

1942 • [?]

1943 • [?]

1944 • [?]

1945 • [?]

1946 • [?]

1947 • [?]

1948 • [?]

1949 **12.10.6 Journals**

1950 • [?]

1951 • [?]

1952 • [?]

1953 • [?]

1954 • [?]

1955 • [?]

1956 • [?]

1957 • [?]

1958 • [?]

1959 • [?]

1960 • [?]

12. Usage Examples

1961 • [?]

1962 • [?]

1963 • [?]

1964 • [?]

1965 • [?]

1966 • [?]

1967 • [?]

1968 • [?]

1969 • [?]

1970 • [?]

1971 • [?]

1972 • [?]

1973 • [?]

1974 • [?]

1975 • [?]

1976 • [?]

1977 • [?]

1978 • [?]

1979 • [?]

1980 • [?]

1981 • [?]

1982 • [?]

1983 • [?]

1984 • [?]

1985 **12.10.7 Theses/dissertations**

1986 • [?]

1987 • [?]

1988 • [?]

1989 • [?]

1990 • [?]

1991 • [?]

1992 • [?]

1993 **12.10.8 Technical Reports and Others**

1994 • [?]

1995 • [?]

1996 • [?]

1997 • [?]

1998 • [?]

1999 • [?]

2000 • [?]

2001 • [?]

2002 • [?]

2003 • [?]

2004 • [?]

2005 • [?]

2006 • [?]

2007 • [?]

2008 • [?]

2009 **12.10.9 Miscellaneous**

2010 • [?]

2011 • [?]

2012 • [?]

2013 • [?]

2014 • [?]

2015 • [?]

2016 • [?]

2017 • [?]

2018 • [?]

2019 • [?]

2020 • [?]

2021 • [?]

2022 • [?]

12.11 Index

For key words or topics that are expected (or the user would like) to appear in the Index, use `index{key}`, where `key` is an example keyword to appear in the Index. For example, Fredholm integral and Fourier operator of the following paragraph are in the Index.

If we make a very large matrix with complex exponentials in the rows (i.e., cosine real parts and sine imaginary parts), and increase the resolution without bound, we approach the kernel of the Fredholm integral equation of the 2nd kind, namely the Fourier operator that defines the continuous Fourier transform.

List. 12.15 is a program listing of the above-mentioned paragraph.

Listing 12.15: Sample L^AT_EX code for Index usage

```
1 If we make a very large matrix with complex exponentials in the rows (i.
   e., cosine real parts and sine imaginary parts), and increase the
   resolution without bound, we approach the kernel of the \index{
   Fredholm integral} Fredholm integral equation of the 2nd kind,
   namely the \index{Fourier} Fourier operator that defines the
   continuous Fourier transform.
```


12.12 Adding Relevant PDF Pages

Examples of such PDF pages are Standards, Datasheets, Specification Sheets, Application Notes, etc. Selected PDF pages can be added (see List. 12.16), but note that the options must be tweaked. See the manual of `pdfpages` for other options.

Listing 12.16: Sample \LaTeX code for including PDF pages

```
1 \includepdf[pages={8-10},%  
2 offset=3.5mm -10mm,%  
3 scale=0.73,%  
4 frame,%  
5 pagecommand={},]  
6 {./reference/Xilinx2015-UltraScale-Architecture-Overview.pdf}
```

Virtex UltraScale FPGA Feature Summary

Table 6: Virtex UltraScale FPGA Feature Summary

	VU065	VU080	VU095	VU125	VU160	VU190	VU440
Logic Cells	626,640	780,000	940,800	1,253,280	1,621,200	1,879,920	4,432,680
CLB Flip-Flops	716,160	891,424	1,075,200	1,432,320	1,852,800	2,148,480	5,065,920
CLB LUTs	358,080	445,712	537,600	716,160	926,400	1,074,240	2,532,960
Maximum Distributed RAM (Mb)	4.8	3.9	4.8	9.7	12.7	14.5	28.7
Block RAM/FIFO w/ECC (36Kb each)	1,260	1,421	1,728	2,520	3,276	3,780	2,520
Total Block RAM (Mb)	44.3	50.0	60.8	88.6	115.2	132.9	88.6
CMT (1 MMCM, 2 PLLs)	10	16	16	20	30	30	30
I/O DLLs	40	64	64	80	120	120	120
Fractional PLLs	5	8	8	10	15	15	0
Maximum HP I/Os ⁽¹⁾	468	780	780	780	650	650	1,404
Maximum HR I/Os ⁽²⁾	52	52	52	104	52	52	52
DSP Slices	600	672	768	1,200	1,560	1,800	2,880
System Monitor	1	1	1	2	3	3	3
PCIe Gen3 x8	2	4	4	4	5	6	6
150G Interlaken	3	6	6	6	8	9	0
100G Ethernet	3	4	4	6	9	9	3
GTH 16.3Gb/s Transceivers	20	32	32	40	52	60	48
GTY 30.5Gb/s Transceivers	20	32	32	40	52	60	0

Notes:

1. HP = High-performance I/O with support for I/O voltage from 1.0V to 1.8V.
2. HR = High-range I/O with support for I/O voltage from 1.2V to 3.3V.

Virtex UltraScale Device-Package Combinations and Maximum I/Os

Table 7: Virtex UltraScale Device-Package Combinations and Maximum I/Os

Package ⁽¹⁾⁽²⁾⁽³⁾	Package Dimensions (mm)	VU065	VU080	VU095	VU125	VU160	VU190	VU440
		HR, HP GTH, GTY	HR, HP GTH, GTY	HR, HP GTH, GTY	HR, HP GTH, GTY	HR, HP GTH, GTY	HR, HP GTH, GTY	HR, HP GTH, GTY
FFVC1517	40x40	52, 468 20, 20	52, 468 20, 20	52, 468 20, 20				
FFVD1517	40x40		52, 286 32, 32	52, 286 32, 32				
FLVD1517	40x40				52, 286 40, 32			
FFVB1760	42.5x42.5		52, 650 32, 16	52, 650 32, 16				
FLVB1760	42.5x42.5				52, 650 36, 16			
FFVA2104	47.5x47.5		52, 780 28, 24	52, 780 28, 24				
FLVA2104	47.5x47.5				52, 780 28, 24			
FFVB2104	47.5x47.5		52, 650 32, 32	52, 650 32, 32				
FLVB2104	47.5x47.5				52, 650 40, 36			
FLGB2104	47.5x47.5					52, 650 40, 36	52, 650 40, 36	
FFVC2104	47.5x47.5			52, 364 32, 32				
FLVC2104	47.5x47.5				52, 364 40, 40			
FLGC2104	47.5x47.5					52, 364 52, 52	52, 364 52, 52	
FLGB2377	50x50							52, 1248 36, 0
FLGA2577	52.5x52.5						0, 448 60, 60	
FLGA2892	55x55							52, 1404 48, 0

Notes:

1. Go to [Ordering Information](#) for package designation details.
2. All packages have 1.0mm ball pitch.
3. Packages with the same last letter and number sequence, e.g., A2104, are footprint compatible with all other UltraScale architecture-based devices with the same sequence. The footprint compatible devices within this family are outlined. See the [UltraScale Architecture Product Selection Guide](#) for details on inter-family migration.

Virtex UltraScale+ FPGA Feature Summary

Table 8: Virtex UltraScale+ FPGA Feature Summary

	VU3P	VU5P	VU7P	VU9P	VU11P	VU13P
Logic Cells	689,640	1,051,010	1,379,280	2,068,920	2,147,040	2,862,720
CLB Flip-Flops	788,160	1,201,154	1,576,320	2,364,480	2,453,760	3,271,680
CLB LUTs	394,080	600,577	788,160	1,182,240	1,226,880	1,635,840
Max. Distributed RAM (Mb)	12.0	18.3	24.1	36.1	34.8	46.4
Block RAM/FIFO w/ECC (36Kb each)	720	1,024	1,440	2,160	2,016	2,688
Block RAM (Mb)	25.3	36.0	50.6	75.9	70.9	94.5
UltraRAM Blocks	320	470	640	960	1,152	1,536
UltraRAM (Mb)	90.0	132.2	180.0	270.0	324.0	432.0
CMTs (1 MMCM and 2 PLLs)	10	20	20	30	12	16
Max. HP I/O ⁽¹⁾	520	832	832	832	624	832
DSP Slices	2,280	3,474	4,560	6,840	8,928	11,904
System Monitor	1	2	2	3	3	4
GTY Transceivers 32.75Gb/s	40	80	80	120	96	128
PCIe Gen3 x16 and Gen4 x8	2	4	4	6	3	4
150G Interlaken	3	4	6	9	9	12
100G Ethernet w/RS-FEC	3	4	6	9	6	8

Notes:

1. HP = High-performance I/O with support for I/O voltage from 1.0V to 1.8V.

Virtex UltraScale+ Device-Package Combinations and Maximum I/Os

Table 9: Virtex UltraScale+ Device-Package Combinations and Maximum I/Os

Package (1)(2)(3)	Package Dimensions (mm)	VU3P	VU5P	VU7P	VU9P	VU11P	VU13P
		HP, GTY	HP, GTY	HP, GTY	HP, GTY	HP, GTY	HP, GTY
FFVC1517	40x40	520, 40					
FLVF1924	45x45					624, 64	
FLVA2104	47.5x47.5		832, 52	832, 52	832, 52		
FHVA2104	52.5x52.5 ⁽⁴⁾						832, 52
FLVB2104	47.5x47.5		702, 76	702, 76	702, 76	624, 76	
FHVB2104	52.5x52.5 ⁽⁴⁾						702, 76
FLVC2104	47.5x47.5		416, 80	416, 80	416, 104	416, 96	
FHVC2104	52.5x52.5 ⁽⁴⁾						416, 104
FLVA2577	52.5x52.5				448, 120	448, 96	448, 128

Notes:

- Go to [Ordering Information](#) for package designation details.
- All packages have 1.0mm ball pitch.
- Packages with the same last letter and number sequence, e.g., A2104, are footprint compatible with all other UltraScale devices with the same sequence. The footprint compatible devices within this family are outlined.
- These 52.5x52.5mm overhang packages have the same PCB ball footprint as the corresponding 47.5x47.5mm packages (i.e., the same last letter and number sequence) and are footprint compatible.

2039 Chapter 13

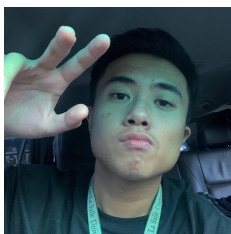
2040 VITA



2041 Nathan Raekel L. Calaguian is a BS CPE student from De La Salle
2042 University Manila.



2043 Gerald Antonio P. Ellar is a BS CPE student from De La Salle
2044 University Manila.



2045 Hans Jamee Mahait is a BS CPE student from De La Salle University
2046 Manila.

INDEX

- 2047 contributions, 43
- 2048 Fourier operator, 125
- 2049 Fredholm integral, 125
- 2050 summary, 4

2051 **Chapter 14**

2052 **ARTICLE PAPER(S)**