Table of Contents

1 INTRODUCTION.................................................................................................................. 3
  1.1 Selection of Project Area and Project Proposal......................................................... 4
  1.2 General Classification of Final Year Project.............................................................. 5
  1.3 Academic Research Projects..................................................................................... 6
  1.4 Application Development Projects........................................................................... 6
  1.5 Combining Project Categories................................................................................... 7

2 PROJECT MILESTONE AND PROCEDURES...................................................................... 8
  2.1 Pre-Project Schedule............................................................................................... 8
  2.2 Introduction to Inventive Problem Solving and Proposal Writing (UCCD 2502) ................................................................................................................................. 9
  2.3 Project I Schedule................................................................................................... 10
  2.4 Project II Schedule.................................................................................................. 11

3 PITFALLS AND PROBLEMS............................................................................................... 14

4 PROJECT REPORT CONTENTS AND ARRANGEMENT.................................................. 15
  4.1 Report Contents and Arrangement Guidelines for UCCD2502 Introduction to Inventive Problem Solving and Proposal Writing......................................................... 15
  4.2 Report Contents and Arrangement Guidelines for Project I.................................... 17
  4.3 Report Contents and Arrangement Guidelines for Project II................................... 22
  4.4 Poster Content and Arrangement Guidelines for Project I and Project II............. 25

5 PROJECT REPORT FORMAT............................................................................................. 26
  5.1 Report Format for Introduction to Inventive Problem Solving and Proposal Writing Project I.......................................................................................................................... 26
  5.2 Report Format for Project II.................................................................................. 28
  5.3 Other Points to Note on Writing Report................................................................. 31

6 VIVA: ORAL PRESENTATION AND PRODUCT DEMONSTRATION............................ 32

7 FYP GUIDELINES FOR SUPERVISOR AND MODERATORS.......................................... 33

APPENDICES.......................................................................................................................... 34
  Appendix A: Final Year Project Titles List..................................................................... 35
  Appendix B: Final Year Project Registration Form......................................................... 37
  Appendix C: Final Year Project Biweekly Report.............................................................. 39
  Appendix D: Report Front Cover.................................................................................... 42
  Appendix E: Sample of Report Arrangement................................................................. 44
  Appendix F: Harvard Style Referencing......................................................................... 58
Important Notice to All Students

Plagiarism is a serious offence. Copy and paste for the report content is prohibited.

You must sign the report submission declaration to confirm that your FYP report has been done by your own efforts without any plagiarism.
1 Introduction

Every student undertaking the degree is required to complete a project under the supervision of a FICT (Perak) academic staff or an external supervisor from the industry. In the case whereby an external supervisor is appointed, an FICT (Perak) staff shall be appointed as a co-supervisor for the student. The project should provide students with the opportunity to bring together the academic knowledge and skills acquired from the range of modules already studied. In general the whole project can be divided into three parts, namely Introduction to Inventive Problem Solving and Proposal Writing, Project I and Project II, which are to be completed by Year 3. The objectives and learning outcomes of the three modules are listed as follows. (Note: The students are encouraged to undertake Introduction to Inventive Problem Solving and Proposal Writing prior to Project I)

The objectives of Introduction to Inventive Problem Solving and Proposal Writing
[1] To enable students to apply inventive problem solving techniques to generate ideas and solutions to innovative problems.
[2] To equip students with relevant skills in planning, writing, and presenting project proposals
[3] To prepare students to develop problem statements, conduct efficient literature search, review literature, and design research studies to address different types of problems

The objectives of Introduction to Inventive Problem Solving and Proposal Writing
After completing this unit, students will be able to:
[1] Describe basic models and tools for solving inventive problems;
[2] Perform systematic analysis to gain knowledge of product characteristics and evolution trends;
[3] Identify the technical contradiction of a problem and use the contradiction matrix to determine the inventive principles which could lead to an innovative solution;
[4] Identify the key components in a proposal and explain how they relate to the justification for a project;
[5] Conduct effective search and critical review of the relevant literature;
[6] Write and present a structured proposal for an ICT research and development project.

The objectives of Project I:
[1] To introduce a general approach in starting a project, the need for proper documentation and reporting, and professional presentation of work undertaken.
[2] To equip students with the relevant research and technical skills that may be utilized for the formulation and development of a project.

The learning outcomes of Project I:
After completing this unit, students will be able to:
[1] Identify a topical or problem area of interest for an ICT final year project (FYP).
[2] Define the scope and objectives of the FYP.
[3] Develop a project plan for the FYP.
[4] Write formal documentations, such as proposal, literature search summary, work log, and report, required for the FYP.
[5] Determine suitable research methods and tools for problem analysis and project development.
[6] Demonstrate formal presentation skills for a proposal and technical work.

The objectives of Project II:
[1] To encourage students to demonstrate their technical skills, and put in practice their experience and knowledge.
[2] To provide an opportunity for students to highlight and realise in projects, their grasp of interdisciplinary knowledge, including business domain knowledge.
[3] To provide an opportunity for students to further their research, in their discipline and that of the industry, and report their findings appropriately.
[4] To provide an avenue for students to document and showcase their project work, e.g. to potential employers.

The learning outcomes of Project II:
After completing this unit, students will be able to:
[1] Review and re-evaluate the project scope, objectives, and project plan proposed in Project I.
[2] Compile and perform literature and technical review for the project.
[3] Formulate project requirements into specifications or models.
[4] Analyse the specifications or models and select suitable tools or methods for project development.
[5] Develop a system or theorem based on the stated specifications or models.
[6] Evaluate the system or prove the theorem.
[8] Present or demonstrate the project results.

Although students are required to take the modules from Year 2 semester 3, they are encouraged to explore the areas of interest, identify the project supervisors and define a project topic if possible, as early as in the second semester of Year 2. The detailed planning of the project is described in the following sections.

Generally, all projects will involve elements of preliminary investigation, project design, realization of design and evaluation.

1.1 Selection of Project Area and Project Proposal
A starting point to tackle the final year project is the identification and selection of an area of interest by the student. A session will be held whereby relevant lecturers are invited to give a short talk to the students of Year 2 Semester 2. This will expose students to the areas available and the people involved. To know better an area of work, students can later seek out potential project supervisors for further discussion. Also, students can look into the internet for more information on the areas of interest. After agreeing with
the supervisor on the area of study (and perhaps with a tentative title), students can then
make use of the holidays for background reading for their final year project endeavour.

A list of suitable project topics or areas offered by the lecturers will be made known to
eligible students through the faculty website, and/or other means. This is done during
Year 2 Semester 2. Students are also encouraged to suggest their own projects or projects
in collaboration with firms in the industry (where appropriate). To do so, students must
prepare a draft proposal and discuss with the relevant lecturer to ensure that the proposal
is of a suitable level and standard.

In Year 2 Semester 3, students are expected to register for the subject; Inventive Problem
Solving and Proposal Writing. Among the objectives of this course is to equip students
with relevant skills in planning, writing and presenting project proposals. By the end of
this course, students will have identified and confirmed their project titles with the
respective potential supervisors together with a completed preliminary proposal report.
Students are required to register their project title with the approval of an academic staff
as the supervisor. Students may wish to modify their preferred projects to be re-cast to
their preferred project scope. They can do so subject to the agreement of the relevant
supervisor.

A FULL proposal is to be submitted on the mid-semester of Year 3 Semester 1 for
evaluation by the supervisor, after which students would start working toward the
completion of a prototype for their project. Also, students need to attend weekly (2 hours)
classes for Project 1. Students need to meet their individual supervisors on regular basis,
at least, once per fortnight.

By the end of Year 3 Semester 1, students will hand in their project prototype for
evaluation by the supervisor.

1.2 General Classification of Final Year Project
The following is a guide and framework for setting up and running your project. There
are two broad categories:

- Academic research projects;
- Application development projects.

These categories are merely a guide to help you design your project. While most projects
will fit neatly into one of these 2 types, others will have characteristics of several project
categories. It is important for students to recognise what project category that their
project might fit into so as to enable them to address the relevant learning outcomes and
requirements in which will help defining a clear and concise project objectives.

1.3 Academic Research Projects
Academic research projects are undertaken to investigate a research question. An academic research project must contain a research contribution from the student, for example, the development of a model or the design of an algorithm towards analysing/solving a problem. A research projects might include more data gathering, the gathering of this data in itself will not constitute an acceptable level of research effort by the student. Rather some rigorous analysis of the data and/or the development of some deliverable based on the data will be required.

The deliverable should have the potential for further research used by a third party, for example the supervisor, an external body or other stakeholders in the project. Furthermore, academic research projects must be designed so that it is clear what factors affect the validity and generability of the results.

In developing Academic Research projects, your proposal should state:

- The research question to be addressed;
- Any research initiative or project that your project is a part of;
- The research methods and tools to be used;
- How you will judge the validity and generality of your results;
- In what ways the project may contribute to related research activities.

### 1.4 Application Development Projects

These types of projects involve design and construction of a prototype for an application that can be in the form of hardware or software or a mixed hardware/software. The design and construction must be non-trivial. The development should follow an established hardware/software engineering method. In exceptional cases, we will permit projects that involve analysis and design without a construction. Our intention is that the design can be implemented by a third party in the future. Alternatively, a formal theory may be built and its soundness and application demonstrated. In developing Application Development projects and producing the project proposal you should state:

- The purpose of the hardware/software;
- In what way the project is novel;
- What theory (if any) underpins the project;
- Applicable hardware/software engineering methods;
- What tools will be used, so far as decided;
- Methods envisaged for testing and evaluating the hardware/software;
- How the complexity of the work merits it being a final year project.

### 1.5 Combining Project Categories
For students’ projects that do not fit neatly with one of the two project categories, the union of the respective lists of details must be clearly stated in the proposal.
## 2 Project Milestone and Procedures

### 2.1 Pre-Project Schedule\(^1\)

<table>
<thead>
<tr>
<th>Milestones</th>
<th>Date</th>
<th>Action Required (AR) by Supervisor/Moderator/Student</th>
</tr>
</thead>
</table>
| Posting of project titles and supervisors | Year 2 Semester 1 | **Supervisor AR:** Supervisor to submit proposed final year project titles to the FYP committee. The titles will be reviewed by FYP committee to ensure its uniqueness and contribution.  
**FYP Committee AR:** To consolidate and post the Final Year Project titles for student’s reference  
**Students AR:** Visit FYP website to view all project titles offered (refer to Appendix A) |
| Selection of project area.         | Year 2 Semester 1 | **Student AR:** Students to look for potential supervisors and simultaneously do background reading.  
**Supervisor AR:** Supervisors to hold discussion sessions with students. |

\(^1\) To be done prior the undertaking of Introduction to Inventive Problem Solving and Proposal Writing
### 2.2 Introduction to Inventive Problem Solving and Proposal Writing (UCCD 2502)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Deadline</th>
<th>Action Required (AR) by Supervisor/Moderator/Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting to discuss the process of the Project, TRIZ</td>
<td>Beginning from Week 1</td>
<td><strong>Student AR:</strong> Attend scheduled lecture classes</td>
</tr>
<tr>
<td>Lecturers present their topics</td>
<td>Week 4</td>
<td><strong>Student AR:</strong> Select a topic of interest and look for the relevant lecturers for further discussion about the project. Students to sign two copies of the Final Year Project Registration form to undertake the proposed project title under the supervision of the chosen supervisor. Both forms must also be signed by the supervisor. Students to submit the completed Final Year Project Registration forms to the supervisor (1 copy) and FGO (1 copy).</td>
</tr>
<tr>
<td>Students approach and identify supervisors</td>
<td>Week 4 to Week 6</td>
<td><strong>Student AR:</strong> Students to meet with their supervisor on a regular basis to update their progress.</td>
</tr>
<tr>
<td>FYP committee assigns supervisors</td>
<td>Week 7</td>
<td><strong>FGO AR</strong> Consolidate all Project Registration forms. <strong>FYP Committee AR:</strong> Assign supervisor to students who have not got a project yet.</td>
</tr>
<tr>
<td>Students perform the literature search, fact findings, and discussion with their supervisors about the project scopes, objectives and planning</td>
<td>Week 4 to Week 6</td>
<td><strong>Student AR:</strong> Students to meet with their supervisor on a regular basis to update their progress.</td>
</tr>
</tbody>
</table>

*Specific schedule will be posted in the FYP website.*
| Submission of TWO(2) preliminary proposal report | Week 12 | **Student AR:**
| Students to submit a Preliminary Proposal report to the UCCD 2502 subject lecturer and the supervisor. |
| Oral proposal presentation | Week 14 | **Supervisor AR:**
| Supervisor to arrange for the oral presentation time and venue with their respective students. Supervisor to evaluate their students oral presentation using the marking scheme provided |
| Supervisors submission of presentation marks | Week 15 | **Supervisor AR:**
| Supervisor to submit the oral presentation marks to the FGO |

Note:
1 Datelines for each milestone is shorten by half if the subject is conducted during the short (7 weeks) semester

### 2.3 Project I Schedule

<table>
<thead>
<tr>
<th>Milestones</th>
<th>Dateline</th>
<th>Action Required (AR) by Supervisor/Moderator/Student</th>
</tr>
</thead>
</table>
| Meeting to discuss the process of the Final Year Project | Year 3 Semester 1 (14 Weeks) | **Student AR:**
| 2 hours discussion for 14 weeks with supervisor |
| Bi-Weekly Log | Bi-weekly | Students to submit a biweekly log to report the progress of the student’s project work. |
| Submit TWO (2) comb-bound Project Proposal (to Supervisor) | Week 7 | **Student AR:**
| Students to submit a Project Proposal Report. |
| **Supervisor AR:** | Students to ensure that report has been checked by TURNITIN |
Supervisors to evaluate the report according to the Project Proposal Marking Scheme.

**Moderator AR:**
Moderator has to read the submitted report.

| Oral presentation / Prototype Demonstration | Week 13, 14 | **Student:**
|                                           |             | Student has to present their Project Proposal

**Supervisor AR:**
Supervisors to make the necessary arrangement with their students and moderators to evaluate the oral presentation according to the Report Proposal Marking Scheme.

**Moderator AR:**
Moderator has to attend and assess the oral presentation.

| Submission of results | Week 15 | **Supervisor AR:**
|                       |         | Supervisors to submit the evaluation result to FGO.

**FGO AR:**
FGO to collect the results.

Note:
3 Datelines for each milestone is shorten by half if the subject is conducted during the short (7 weeks) semester.
4 Please refer to the related appendices for the forms.

### 2.3 Project II Schedule

| Milestones                      | Dateline \(^5\)  
| Year 3 Semester 2 (14 weeks)   | Action Required (AR) by Supervisor/Moderator/Student/Faculty Office |
| *Specific schedule will be posted in the FYP website* |
| Meeting with supervisor        | Bi-weekly  
<p>| Bi-Weekly Log                  | <strong>Student AR:</strong> Students to submit a biweekly log to report the progress of the student’s project work. |</p>
<table>
<thead>
<tr>
<th>Task</th>
<th>Week</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit draft reports to the supervisor.</td>
<td>Week 6 to week 10.</td>
<td><strong>Supervisor AR:</strong> Supervisors to verify and sign on the biweekly log and keep them for the record.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Supervisor AR:</strong> Supervisors to advice and make correction to the draft and returns it back to the student.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Student AR:</strong> Students to revise the draft based on the advice (major/minor corrections).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Students to ensure that report has been checked by TURNITIN</td>
</tr>
<tr>
<td>Submit TWO (2) corrected comb-bound full report copies to the supervisor. (Marked by Supervisor only)</td>
<td>Week 12.</td>
<td><strong>Supervisor AR:</strong> Supervisors to pass a comb-bound copy to their moderator for review. Supervisors to mark report according to the Full Report Marking Scheme. Supervisors to make minor corrections on the report, if any.</td>
</tr>
<tr>
<td>Oral Presentation and Product Demonstration. (Assessed by Supervisor and Moderator)</td>
<td>Week 12 and Week 13.</td>
<td><strong>Supervisor and Moderator AR:</strong> Supervisors to liaise with their respective moderators to arrange the venue, time, tools, equipment, marking sheet etc for the viva. Supervisor and Moderator to assess and evaluate the student's project work. Supervisor and moderator to finish evaluating/marking the student's final year project work. Moderator to mark and pass the hardcopy of the mark to supervisor (Moderator has to examine the oral presentation and report using the same marking scheme). Supervisor to staple the mark sheets and pass to the FYP committee. Any disagreement (more than 10%) on the marks allocation can be brought forth to the FYPC for further discussion. The Supervisor to pass the comb-bound report to the student for final <strong>minor correction</strong> before collecting it back from the student. The Supervisor and Moderator keep their respective comb-bound copies for their own future use.</td>
</tr>
</tbody>
</table>
All marks must remain confidential and not to be disclosed.

**Student AR:**
Student to do the final **minor correction** on the report before sending it for comb bound. Students to return the comb-bound report to the Supervisor.

<table>
<thead>
<tr>
<th>Task</th>
<th>Week</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submission of Results</td>
<td>14</td>
<td><strong>Supervisor AR:</strong> Supervisors to submit the evaluation result to FGO.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>FGO AR:</strong> FGO to collect the results.</td>
</tr>
</tbody>
</table>
| Submit TWO (2) sets of softcopy to FGO.  | 15    | **Student AR:** Students to submit TWO(2) sets of softcopy to the FGO. The softcopies should contain the following (if any):
| (include the poster in the softcopy)      |       | • The complete executable program
|                                           |       | • The source codes
|                                           |       | • The full report in Microsoft Word                                         |
|                                           |       | **FGO:** To collect and keep the softcopies.                                |

Note:
5 Datelines for each milestone is shorten by half if the subject is conducted during the short (7 weeks) semester.
6 Please refer to the related appendices for the forms.
3 Pitfalls and Problems

The final year project will be a demanding but exciting learning experience. However, it is not without problems which, if not identified and addressed, could seriously affect the final result and ultimately reduce your grade. In this section we mention some of these problems and how to avoid them.

a. The “Overachiever” Problem. A common problem is selecting a topic that is far too ambitious for the allotted time. Remember that you have only 12-13 weeks to finish the coding, debugging, and testing. Be careful not to select a topic that is unrealistically large. This can lead to frustration as well as errors caused by “cutting corners” and hurrying through the implementation. Discuss with your advisor the scale of what you are planning. If he or she thinks it may be too large, consider implementing the project in stages, each complete in itself. When stage I is working move on to stage II. If you do not finish stage II, however, you will still have a functioning system.

b. The “Do It Tomorrow” Problem. Thirteen weeks sounds like a long time, but it goes by quickly. You need an implementation schedule that allocates reasonable amounts of work throughout the entire semester. Then you must stick to that schedule. Don’t be tempted to postpone work on the project because week 13 seems so far off. All that happens is that during the final few weeks you rush madly to get something working, and software implemented in a rush rarely works correctly!

c. The “Sleeping Member” Problem. In the ideal world, all team members have equal ability, equal interest in the problem, and work equally hard. In the real world that may not happen. You may have one (or more) team members who do not carry their share of the workload, not because of a lack of ability, but rather lack of interest or motivation. This is a serious problem because, although part of your grade is based on each individual’s effort, another part is based on successfully finishing the project. A non-contributing team member can slow down or prevent completion of the work. If you have a teammate who is not doing his or her share of the work, talk to them and stress the importance of everyone doing their job. If this does not solve the problem then talk to your supervisor. Don’t let the failure of others prevent you from completing the work and receiving a good grade.

d. The “Poop Out At The End” Problem. You have worked hard for 13 weeks to complete this project. You have spent many late nights and chased down hundreds of bugs, but it is now working, so are you done? Absolutely not! The project grade is not based only on the programs you develop but also on your written reports and oral presentations. Remember that even though you may be “burned out” from implementation, there is still work to be done. Don’t produce a poorly written paper or give a poorly organized presentation. That will negate much of your good work. Put in the time needed to prepare both a well written, high-quality final report and a well organized, polished presentation. A good job on these last steps will insure that you receive a grade that fairly represents the work you have done.
4 Project Report Contents and Arrangement

Students should not copy large sections of books and/or reports. The change in writing style can be easily detected. Students will be penalised for copying. Whenever values of short passages have been quoted, the full reference should be given. Students will be penalised for not referencing previous work.

4.1 Report Contents and Arrangement Guidelines for UCCD2502 Inventive Problem Solving and Proposal Writing

Ensure the report is presentable, free from grammatical and writing errors.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Arrangement of the Proposal</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Title Page</td>
<td>1 page. Refer to Appendix E.</td>
</tr>
<tr>
<td>2</td>
<td>Table of Contents</td>
<td>Refer to Appendix E. It should list all the chapters and their corresponding sections and subsections found in the report.</td>
</tr>
<tr>
<td>3</td>
<td>List of Tables</td>
<td>Refer to Appendix E. It should list all the tables and their corresponding page numbers found the report.</td>
</tr>
<tr>
<td>4</td>
<td>List of Figures</td>
<td>Refer to Appendix E. It should list all the figures and their corresponding page numbers found the report.</td>
</tr>
<tr>
<td>5</td>
<td>List of Symbols</td>
<td>Refer to Appendix E. It should list all the symbols found in the report and their corresponding meaning.</td>
</tr>
<tr>
<td>6</td>
<td>List of Abbreviations</td>
<td>Refer to Appendix E. It should list all the abbreviations found in the report and their corresponding meaning.</td>
</tr>
<tr>
<td>7</td>
<td>Sectioning</td>
<td>Number of pages should be between 10 to 15 pages. Students should familiarize themselves with report writing skills such as division of work and report sectioning. Each chapter should begin on a new page. Within a chapter, use as many sections and subsections as possible and where appropriate. Subsection is limited to 3 levels only.</td>
</tr>
</tbody>
</table>

Chapter 1: Project Background
- Give a descriptive view on the field (or sub-field) of the project and historical development prior to the project. This includes answering the following questions:
  - What is the problem domain of this project?
  - Who have the problem and need a solution?
  - Why is the problem so important?
Chapter 2: Literature Review
- Highlight what is the current practice or existing research/results towards the problem. Discussions should include:
  - What have other researchers/developers done to resolve the problem?
  - What are the strengths of their solutions?
  - What are the weaknesses/limitations of their solutions?
  - How these weaknesses/limitations can be resolved?

Chapter 3: Project Scope and Objectives
- Describe what you are going to deliver at the end of the project. (e.g. a piece of software, a piece of hardware, an improvement plan of a system, a development framework, a research survey, a model of a system, or simulation result, etc). Give a general overview of your solution of the problem. For the Project Objectives, describe the purpose and aims of the project which give more detailed information than the project scope. Other questions to consider in this section:
  - Is the title clear and specific enough?
  - What is the proposed solution of this project to tackle the above problem/limitations?
  - What is the scope?
  - What is the main objective, and how this objective can be divided into sub-objectives of the project?
  - What is the innovation/contribution of the project?

Chapter 4: Methods/Technologies Involved
- A brief statement of the methodology for the realization of the project. It could define the general approach to how the project and its output(s) will be realized. Discussions should include:
  - What are the proposed methods/technologies involved in the solutions?
  - How to justify the objective/sub-objectives can be achieved with these methods/technologies
### Bibliography
Refer to Appendix F. It should list all the reference materials used for the project.

### Appendices
The appendices are supplementary materials which because of their length would break up the main flow of the report. The following is a guideline on the arrangement of appendices and what may be included as part of the appendices.

- Specifications, data sheets and drawings of equipment or components used.
- Data used for analysis.
- Survey sheets.
- Charts and data tables.
- Lengthy mathematical derivations.
- etc

---

### 4.2 Report Contents and Arrangement Guidelines for Project I

The essential components of the content of the final year project proposal should include the items listed below. They should also be arranged in the top-down order as listed. The proposal should not exceed 30 pages.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Arrangement of the Proposal</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Title Page</td>
<td>1 page. Refer to Appendix E.</td>
</tr>
<tr>
<td>11</td>
<td>Abstract</td>
<td>Maximum 2 pages. Refer to Appendix E. It should describe the format / outline of the proposal.</td>
</tr>
</tbody>
</table>

Abstracts are formal summaries of your completed work:
- Abstracts, like all summaries, cover the main points of a piece of writing that includes the field of study, problem definition, methodology adopted, research process, conclusion and planning of the project work, etc.
- Unlike executive summaries written for non-specialist audiences, abstracts use the same level of technical language and expertise found in the article itself.
- Unlike general summaries which can be adapted in many ways to meet various readers' and writers' needs.

Abstracts typically serve the following goals:
- Help readers decide if they should read an entire article.
- Help readers to see your key findings and achievement of your project.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Table of Contents</td>
</tr>
<tr>
<td>13</td>
<td>List of Tables</td>
</tr>
<tr>
<td>14</td>
<td>List of Figures</td>
</tr>
<tr>
<td>15</td>
<td>List of Symbols</td>
</tr>
<tr>
<td>16</td>
<td>List of Abbreviations</td>
</tr>
<tr>
<td>17</td>
<td>Sectioning</td>
</tr>
</tbody>
</table>

Chapter 1: Introduction

- Motivation and Problem Statement (1 to 2 paragraphs)
  - It should be short and concise, emphasizes on overview of problems and the motivation of the whole project. At the very minimum, students should present a summary of the problem and the problem domain of the project.
  
  - You need to justify the existence of your project. Problem statement - state the existing problem to be solved. Motivation - why want to solve it, why the project is needed? Writing up on problem statement and motivation: you need to solve some problems. You need to improve something. You need to develop something that previously have not existed or carry out enhancement work. Example: You want to develop a Mandarin voice recognition software, because the software does not exist. Or, you improve on the existing Mandarin voice recognition software because the existing often misinterprets some words.
• Common mistake: students normally confuse problem statement (or motivation) with technical difficulties.

• Project Scope (1-2 paragraph)
  o Describe what you are going to deliver at the end of the project. (e.g. a piece of software, a piece of hardware, an improvement plan of a system, a development framework, a research survey, a model of a system, or simulation result, etc). Give a general overview of your solution of the problem.

  o Example: This project develops a model on the social behavior of Internet with various simulation results on some scenarios. This project involves a new algorithm design to speed up the grid computing.

• Project Objectives (1-4 paragraph)
  o Describe the purpose and aims of the project which give more detailed information than the project scope.

  o For example: The project aims to improve at least 10% in processing performance over the current Sun Solaris grid computing engine with our new algorithm.

  o The following questions are applicable:
    - What in general will this project try to achieve?
    - What will this project focus on?
    - What IS NOT covered by this project?

  o Common mistakes:
    - Stating learning objectives instead of project objectives. For example, learning programming languages, tools etc.
    - Treating project timelines as project objectives.

• Impact, significance and contribution (1-2 paragraph)
  o Describe how the project is going to benefit the readers or anybody.
Describe the reasons for solving the problems mentioned in the problem statement.

Why are the problem and solution of your project interesting? Why is your project worth your readers’ time to read it?

Make your readers feel that your project is important or “desirable”.

This is where you need to “sell” or “promote” your project.

For example: By having this educational software, the student will visualize better on how the processor works.

For example: This survey has to be carried because it will form the basis to anticipate and project the market trend ahead of time.

Background information (> 3 paragraphs)
- A brief section giving background information may be necessary, especially if your work spans two or more traditional fields.
- Give a descriptive view on the field (or sub-field) of the project and historical development prior to the project.
- Give your readers who may not have any experience with some of the material needed to follow your project.
- It may be a good practice to give some definition of some key terms, or impart some key technical knowledge to the readers at this point.
- The ultimate question: What my readers, especially those who are not the same field as I do, need to know before they continue to read the rest of the document?
• Literature Review
  o Highlight what is the current practice or prior arts towards the problem. It can be structured or non-structured (for unexplored areas)
  o If there are prior arts, students should refer or cite them and include the referenced art in the references section.

• Fact Finding
  o Scientific method to do fact finding and analysis - reviewing existing manuals and procedures, preparing questionnaires, observations, research and conducting personal interviews.
  o Accomplished by techniques such as data element analysis; input-output analysis, including flow diagrams; recurring data analysis; and report use analysis.

• Data Collection
  o Collect relevant data and documents to justify the problems and need for solutions

• Critical Remarks of previous works
  o Describe the strength and weakness of any previous work that are similar to your project
  o Compare them with your proposed solutions.

Chapter 3
• Methodology and tools
  o Methodologies and General Work Procedures (1-2 paragraphs + figures)
  o A brief statement of the methodology for the realization of the project. It could define the general approach to how the project and its output(s) will be realized.

• Implementation Issues and Challenges (1-2 paragraphs)
  o Difficult issues and challenges in the implementation.
  o Novel aspects of this project (if any)
  o This is the point that you describe your technical
difficulties to implement your solutions.

- Timeline (1 paragraph)
  - Estimated timeline for deliverables and milestones
  - Graphical - Gantt chart format
  - Planning for current semester and next semester.

- Requirement Specifications
  - User requirements
  - System Performance Definition
  - Design and Verification Plan

Chapter 4

- Conclusion (1 paragraph)
  - Summarize the project including the problem, motivation, and proposed solutions

<table>
<thead>
<tr>
<th>18</th>
<th>Bibliography</th>
<th>Refer to Appendix F. It should list all the reference materials used for the project.</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Appendices</td>
<td>The appendices are supplementary materials which because of their length would break up the main flow of the report. The following is a guideline on the arrangement of appendices and what may be included as part of the appendices.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Specifications, data sheets and drawings of equipment or components used.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Data used for analysis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Survey sheets.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Charts and data tables.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Lengthy mathematical derivations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- etc</td>
</tr>
</tbody>
</table>

4.3 **Report Contents and Arrangement Guidelines for Project II**

The essential components of the content of the final year project report should include the items listed below. They should also be arranged in the top-down order as listed. The report should comprise between 20,000 – 40,000 words.
<table>
<thead>
<tr>
<th>Item No.</th>
<th>Arrangement of the Report</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Front Cover</td>
<td>Content same as the Title Page. Refer to Appendix D. The board used for binding should have sufficient rigidity to support the weight of the work when standing on the shelf. Note the format (font type, size, capitalization and the sentences arrangement) must be strictly adhere to. No changes are allowed. <strong>It is the responsibility of the students to remind the photocopy vendors to adhere to the format stated when binding.</strong> Any discrepancy will result in the rejection of the students' soft-bound report and thereafter students will have to re-bind at their expense.</td>
</tr>
<tr>
<td>2</td>
<td>Report Status</td>
<td>1 page. Refer to Appendix E.</td>
</tr>
<tr>
<td></td>
<td>Declaration Form</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Title Page</td>
<td>1 page. Refer to Appendix E.</td>
</tr>
<tr>
<td>4</td>
<td>Declaration of Originality</td>
<td>1 page. Refer to Appendix E.</td>
</tr>
<tr>
<td>5</td>
<td>Acknowledgements</td>
<td>1 page. Refer to Appendix E.</td>
</tr>
<tr>
<td>6</td>
<td>Abstract</td>
<td>Maximum 1 page. Refer to Appendix E. It should states the field of study, problem definition, methodology and techniques adopted, research process, results obtained and conclusion of the project work.</td>
</tr>
<tr>
<td>7</td>
<td>Table of Contents</td>
<td>Refer to Appendix E. It should list all the chapters and their corresponding sections and subsections found in the report.</td>
</tr>
<tr>
<td>8</td>
<td>List of Figures</td>
<td>Refer to Appendix E. It should list all the figures and their corresponding page numbers found the report.</td>
</tr>
<tr>
<td>9</td>
<td>List of Tables</td>
<td>Refer to Appendix E. It should list all the tables and their corresponding page numbers found the report.</td>
</tr>
<tr>
<td>10</td>
<td>List of Symbols</td>
<td>Refer to Appendix E. It should list all the symbols found in the report and their corresponding meaning.</td>
</tr>
<tr>
<td>11</td>
<td>List of Abbreviations</td>
<td>Refer to Appendix E. It should list all the abbreviations found in the report and their corresponding meaning.</td>
</tr>
</tbody>
</table>
| 12      | Chapters                 | Each chapter should begin on a new page. Within a chapter, use as many sections and subsections as possible and where appropriate. The following is a general guideline on the arrangement of chapters and what to be included as part of each chapter. Chapter 1  
  - Introduction  
    - Problem statement.  
    - Background and motivation.  
    - Objectives.  |
### Chapter 2
- Facts finding.
- Literature research and review of previous work.
- Data collection.

### Chapter 3, 4 (or more)
- Methodology and tools
- Requirement
- Specification: Analysis, Design and Verification Plan
- Implementation and Testing.

### Chapter 5
- Project Review, Discussions and Conclusions: what has been achieved, relate to Objectives, problems encountered, personal insight into the total research experience
- Future Work: indicate improvements / further developments that can be made.

<table>
<thead>
<tr>
<th>13</th>
<th>Bibliography</th>
<th>Refer to Appendix F. It should list all the reference materials used for the project.</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Appendices</td>
<td>The appendices are supplementary materials which because of their length would break up the main flow of the report. The following is a guideline on the arrangement of appendices and what may be included as part of the appendices.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Specifications, data sheets and drawings of equipment or components used.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Data used for analysis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Survey sheets.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Charts and data tables.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Lengthy mathematical derivations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- etc</td>
</tr>
</tbody>
</table>
### 4.4 Poster Content and Arrangement Guidelines for Project I and Project II

The essential components of the content of the poster report should include the items listed as follow:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Poster Presentation</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Size</td>
<td>A1,</td>
</tr>
<tr>
<td>2</td>
<td>Font</td>
<td>Use contrasting fonts for the title, text and figure legends. (Ensure the font size used are large enough)</td>
</tr>
</tbody>
</table>
| 3        | Required Elements   | - You may use photos, figures, and table  
- Determine a logical sequence for the material you will be presenting.  
- Organize that material into sections, e.g., Introduction, Methods, Results, Discussion, and Conclusions.  
- Arrange the material into columns. |
| 4        | File Type           | Softcopy, save the softcopy in any of the following format: JPEG / TIFF / BMP / EPS. |
5 Project Report Format

5.1 Report Format for Introduction to Inventive Problem Solving and Proposal Writing / Project I

The report should be written using the third person and in the past tense. For example, do not use "I" or "you" in the report.

- Font
  - Times New Roman, 12 points, 1.5 line spacing.
  - Applies to ALL, including figure caption, table caption, chapter headings and subheadings.
  - Exceptions:
    - Header, Footer, Footnote, Words in Figure/Table, font size should be within 10 to 11 points.
    - Colour: black.
    - Citing references in text: number the cross-references 1, 2, 3, and so on, font size 12.

- Language
  - British English

- Printing
  - Single side.

- Paper
  - A4 size, 80g paper.

- Header
  - Align left: chapter number and title.

- Footer
  - Align right: page number.
  - The following is to be aligned left:
    - BIS (Hons) Information Systems Engineering
    - Faculty of Information and Communication Technology (Perak Campus), UTAR.

- Page Number
  - Align right at the Footer.
  - Title, Abstract, Table of Contents and Listing – pages are numbered using small Roman numeric (i, ii, iii, etc). Note even though the Title Page is numbered i, the number is not to be printed on the page.
  - Chapters and Bibliography – pages are numbered 1, 2, 3, etc.
- Appendices – pages are numbered A-1, A-2, etc for Appendix A, B-1, B-2, etc for Appendix B and etc.

- Margins
  - Left (1.5 inches, except the front cover 1.2 inches)
  - Right (1 inch)
  - Header/Footer (0.5/0.4 inch)
  - Top/Bottom (2 inches)

- Title Page (refer to Appendix E)
  - Do not include UTAR logo.
  - The font used is Times New Roman 12.
  - Note the format (font type, size, capitalization and the sentences arrangement) of the Title Page in Appendix E must be strictly adhere to. Change the word “REPORT” to “PROPOSAL”.

- Table of Contents (refer to Appendix E)

- Tables/Figures (refer to Appendix E)
  - Should include table (figure) caption immediately below the table (figure).
  - Number the tables and figures sequentially, with respect to the chapter or section of a chapter. To be consistent, use either one format, not both.
  - For example, Table 2-2 is the second table of chapter 2.
  - For example, Table 4-2-6 is the sixth table of section 2 of chapter 4

- Citation
  - Use Harvard standard citation (please refer to Appendix F).

- Bibliography
  - Use Harvard standard citation (please refer to Appendix F).

- Binding
  - Must be comb-bound.
  - One (1) blank sheet of paper should be put before the first type page and another blank paper should be attached before the back cover.

- Softcopy (for Project 1 report only)
  - TWO (2) softcopy of reports should be submitted in CD/DVD which containing the following:
    - The proposal report is required to be saved in PDF format only and save in 1(one) PDF file, no separate files for different sections of FYP and dissertation/thesis are allowed. The file size must not be more than 100MB.
    - Attachments to the report such as complete executable program programming, set-up/installation guide and source code of program source codes (or systems and data files, art works, etc) in various file formats must be compressed and
zipped into **ONE (1)** zipped file. The file size of the zipped file must not be more than **200MB**.
– The CD/DVD should be submitted in a CD/DVD casing with appropriate labeling. The CD/DVD should be attached at the back of the report.
– The “Session” should refer to the session of the FYP1 e.g. FYP1 registered during session May 2011 – “Session: May 2011”

**Labelling for CD/DVD:**

<table>
<thead>
<tr>
<th>Name:</th>
<th>ID:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Title:</td>
<td>Supervisor:</td>
</tr>
<tr>
<td>Degree Program:</td>
<td>Faculty:</td>
</tr>
<tr>
<td>Session:</td>
<td></td>
</tr>
</tbody>
</table>

### 5.2 Report Format for Project II

The report should be written using the third person and in the past tense. For example, do not use "I" or "you" in the report.

- **Font**
  - Times New Roman, 12 points, 1.5 line spacing.
  - Applies to ALL, including figure caption, table caption, chapter headings and subheadings.
  - Exceptions:
    - Header, Footer, Footnote, Words in Figure/Table, font size should be within 10 to 11 points.
    - Colour: black.
    - Citing references in text: number the cross-references 1, 2, 3, and so on, font size 12.

- **Language**
  - British English

- **Printing**
  - Single side.

- **Paper**
  - A4 size, 80g paper.

- **Header**
- Align left: chapter number and title.

- Footer
- Align right: page number.
- The following is to be aligned left:
  BIS (Hons) Information Systems Engineering
  Faculty of Information and Communication Technology (Perak Campus), UTAR

- Page Number
- Align right at the Footer.
- Title, Declaration of Originality, Acknowledgements, Abstract, Table of Contents
  and Listing – pages are numbered using small Roman numeric (i, ii, iii, etc). Note
  even though the Title Page is numbered i, the number is not to be printed on the
  page.
- Chapters and Bibliography – pages are numbered 1, 2, 3, etc.
- Appendices – pages are numbered A-1, A-2, etc for Appendix A, B-1, B-2, etc for
  Appendix B and etc.

- Margins
- Left (1.5 inches) except the Front Cover (1.2 inches)
- Right (1 inch)
- Header/Footer (0.5/0.4 inch)
- Top/Bottom (2 inches)

- Front Cover (refer to Appendix D)
- Content same as the Title Page.
- Do not include UTAR logo.
- The font used is Times New Roman 12.
- Note the format (font type, size, capitalization and the sentences arrangement) must
  be strictly adhere to. No changes are allowed.

- Table of Contents (refer to Appendix E)
- Tables/Figures (refer to Appendix E)
  - Should include table (figure) caption immediately below the table (figure).
  - Number the tables and figures sequentially, with respect to the chapter or section of
    a chapter. To be consistent, use either one format, not both.
  - For example, Table 2-2 is the second table of chapter 2.
  - For example, Table 4-2-6 is the sixth table of section 2 of chapter 4

- Citation
  – Use Harvard standard citation (please refer to Appendix F).

- Bibliography
  – Use Harvard standard citation (please refer to Appendix F).

- Binding
– The title page should be put immediately after the front cover followed by the blank sheet. Another blank sheet should be attached before the back cover.

- **Softcopy**
  – **TWO (2)** softcopy of reports should be submitted in CD/DVD which containing the following: The FYP or dissertation/thesis is required to be saved in PDF format only and save in 1(one) PDF file, no separate files for different sections of FYP and dissertation/thesis are allowed. The file size must not be more than **100MB**.
  - Attachments to the FYP or dissertation/thesis such as complete executable program programming, set-up/installation guide and source code of program source codes (or systems and data files, art works, etc) in various file formats must be compressed and zipped into **ONE (1) zipped file.** The file size of the zipped file must not be more than **200MB**.
  - **The file naming format should be Course Code + Year of Submission + Student ID+ Copy No (eg. BA-2010-1007640-1)**
    - The CD/DVD should be submitted in a CD/DVD casing/pocket with appropriate labeling. The CD/DVD should be attached at the back of the dissertation report.
  - The “Session” should refer to the session of the FYP2 e.g. FYP2 registered during session January 2012 – “Session: January 2012”

*Labelling for CD/DVD:*

- After students have successfully completed their oral presentation and product demonstration, students are required to submit a FINALIZED copy of their CD to the FGO

### 5.3 Other Points to Note on Writing Report

1. A thesis should be written according to the intended group of reader. It should be in a logic form with strong explanation to convince the reader on the conclusion of the thesis. It should be written in good language and easy to understand. Any technical language or daily language should be avoided. As far as possible all statements must be supported by numbers and data.
2. The writer should be able to defend all statements by referring to a reliable research or the research findings.

3. Symbols or nomenclature used should be defined. Standard symbols or acronym normally accepted in engineering field can be used. International System Unit (S.I) should be used. If you use other units, SI equivalent unit should be in bracket.

4. Equations and formulae should be typed and in Italic. Avoid using more the necessary lines by giving alternatives, for example:

   \[(y/x) = ax + b\] preferred compared to:
   
   \[y/x = ax + b\]

5. Diagram can include graphs and figures. It can be numbered together or separately with photograph. Diagrams should be easy to understand. Every diagram should be numbered using the Arabic number at the bottom (if possible different for each chapter) and should be given an informative title.

6. Pictures should be pasted on the page, numbered and titled.
   i. Every diagram should have relevant title and should be numbered.
   ii. Coordinate units (abscissa) should be written clearly in the graph.
   iii. All the data points and lines should be clear - generally it should not be more than 2 or 3 curves in every diagram
   iv. Types of different data points must be shown in a legend.
   v. Every diagram should be referred and elaborated in the text.
   vi. The gridlines should be in appropriate intervals.
6 Viva: Oral Presentation and Product Demonstration
This exercise is intended to assess the students’ ability to deliver a technical presentation as a result of their project investigation. The Oral Presentation is attended and assessed by the Supervisor and Moderator.

The presentation should describe the aim of the project, an outline of the presentation, the results obtained and the extent to which the goals of the project are met. The time allocated for the presentation session is 15 to 20 minutes and an additional 10 minutes for the ‘Question and Answer’ session.

The product demonstration session can be arranged to be the subsequent session to the oral presentation session for effective assessment. Otherwise, the demonstration may be arranged separately. The time allocated for the demonstration session is not more than 30 minutes.
7 FYP Guidelines for Supervisor and Moderators

Guidelines for Supervisor

The Project Student conducts their work under the direction of the Project Supervisor. The Supervisor can be a qualified internal academic faculty staff or someone qualified external to the faculty. In the case of external supervisor, an internal supervisor will be attached to the project to act as the moderator.

The Supervisor’s role is to stimulate discussion and indicate the various avenues of approach and resources available. Although the Supervisor may serve as a guide and mentor for the project, it is emphasized that the ultimate responsibility for the project lies with the students.

Purchase of special components or equipment requires prior consent from the Supervisor, who acts as the ‘budget controller’ due to the limited funds available.

The Supervisor will evaluate the biweekly report, the project proposal, the full report, the oral presentation and product demonstration.

If the student could not manage to meet the supervisor in 4 consecutive weeks, the lecturer will have to contact the student to find out the current status of the student, and report the situation to the Final Year Project committee.

Guidelines for Moderators

Moderator is member of staff whose function is to ensure a uniform standard of assessment is applied to each project.

Moderation will take place at two stages:

- An assigned Moderator will evaluate the oral presentation and product demonstration. The moderation forms are available in the faculty’s shared drive.
Appendices
Appendix A:  Final Year Project
Titles List
Final Year Project

Every student undertaking the degree is required to complete a project under the supervision of a FICT academic staff or an external supervisor from the industry. In the case whereby an external supervisor is appointed, an FICT staff shall be appointed as a co-supervisor for the student.

The project should provide students with the opportunity to bring together the academic knowledge and skills acquired from the range of modules already studied.

In general the whole project can be divided into two parts, namely Project I and Project II, which are to be completed by the students in the first and second trimesters in Year 3.

Announcements

- Final Year Project Titles List (Last Updated: 8th January 2013)
- Schedule for Final Year Project and UCDD2502 ISPFW (Last updated: 9th January 2013)
- Supervisor-Student Assignment (May 2012 Trimester) (Last updated: 19th June 2012)
- Supervisor-Student Assignment (Oct 2012 Trimester) - Inventive Problem Solving (Last updated: 30th September 2012)
- For graduating students: Explore opportunities for Research Vacancies (Last updated: 12th November 2012)
- IMPORTANT (UPDATE): FYP Briefing for Jan 2013 will be held on 28th November 2012 (8.15-11.30pm) (Attendance is COMPULSORY for registration of Project I during Jan 2013, absent students who attended the briefing last trimester do not need to attend again)
Appendix B: Final Year Project Registration Form
FINAL YEAR PROJECT REGISTRATION FORM  
(Project I / Project II)

I hereby affirm that the originality and authenticity of the Final Year Project to be undertaken will be upheld. The report and/or the system that I submit at the conclusion of the Final Year Project will be the result of my own investigations and effort.

I understand that cheating and plagiarism constitute a serious violation of the university regulations, which will not only result in a failing grade for the Final Year Project but subject me to further disciplinary actions.

Signature of Student:

___________________

Name:  
Date:

___________________

Student Name:  
Student ID:  
Contact No:  
Email Address:  
Course:  
Year of Study:  

Area of Study:  
Proposed Project Title:  

Signature of Supervisor:

___________________

Name:  
Date
Appendix C: Final Year Project Biweekly Report
# FINAL YEAR PROJECT BIWEEKLY REPORT

* (Project I / Project II)  

<table>
<thead>
<tr>
<th>Trimester, Year:</th>
<th>Study week no.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Name &amp; ID:</td>
<td></td>
</tr>
<tr>
<td>Supervisor:</td>
<td></td>
</tr>
<tr>
<td>Project Title:</td>
<td></td>
</tr>
</tbody>
</table>

## 1. WORK DONE

[Please write the details of the work done in the last fortnight.]  

## 2. WORK TO BE DONE
3. PROBLEMS ENCOUNTERED


4. SELF EVALUATION OF THE PROGRESS

Supervisor’s signature  Student’s signature
Appendix D: Report Front Cover
ONLINE B2B AND B2C PURCHASING
BY
ANTHONY CHAN MING WAI
(REFER NEXT PAGE FOR MARGIN)

A REPORT
SUBMITTED TO
Universiti Tunku Abdul Rahman
in partial fulfillment of the requirements
for the degree of
BACHELOR OF COMPUTER SCIENCE (HONS)
Faculty of Information and Communication Technology
(Perak Campus)

MAY 2010
Appendix E: Sample of Report Arrangement
REPORT STATUS DECLARATION FORM

Title: __________________________________________________________
________________________________________________________
________________________________________________________

Academic Session: _____________

I __________________________________________________________
(CAPITAL LETTER)

declare that I allow this Final Year Project Report to be kept in
Universiti Tunku Abdul Rahman Library subject to the regulations as follows:
1. The dissertation is a property of the Library.
2. The Library is allowed to make copies of this dissertation for academic purposes.

Verified by,

_________________________  _________________________
(Author’s signature)               (Supervisor’s signature)

Address:

________________________________________________________
________________________________________________________
________________________________________________________

Supervisor’s name

Date: _____________________        Date: ____________________
ONLINE B2B AND B2C PURCHASING

By

Anthony Chan Ming Wai

A REPORT
SUBMITTED TO
Universiti Tunku Abdul Rahman
in partial fulfillment of the requirements
for the degree of
BACHELOR OF INFORMATION TECHNOLOGY (HONS)
COMPUTER ENGINEERING
Faculty of Information and Communication Technology
(Perak Campus)

MAY 2010
DECLARATION OF ORIGINALITY

I declare that this report entitled “METHODOLOGY, CONCEPT AND DESIGN OF A 2-MICRON CMOS DIGITAL BASED TEACHING CHIP USING FULL-CUSTOM DESIGN STYLE” is my own work except as cited in the references. The report has not been accepted for any degree and is not being submitted concurrently in candidature for any degree or other award.

Signature : _________________________
Name : _________________________
Date : _________________________
ACKNOWLEDGEMENTS

I would like to express my sincere thanks and appreciation to my supervisors, Dr. B.M. Armstrong and Dr. G.A. Armstrong who has given me this bright opportunity to engage in an IC design project. It is my first step to establish a career in IC design field. A million thanks to you.

To a very special person in my life, Stephanie Yuen, for her patience, unconditional support and love, and for standing by my side during hard times. Finally, I must say thanks to my parents and my family for their love, support and continuous encouragement throughout the course.

When I asked for strength, God gave me more burdens to carry.
When I asked for love, God sent me people with problems.
When I asked for wisdom, God gave me more problems to solve.
I see that I did not get the things I asked for but I have been given all the things that I needed. Thank God.
ABSTRACTS

This project is an IC design project for academic purpose. It will provide students with the methodology, concept and design of digital integrated circuit. This will be illustrated through the construction of a Teaching Chip. Since CMOS technology is well suited for digital circuits, it is therefore implemented in the project. From the design point of view, emphasis is laid on the IC design flow. A flow exists due to the fact that IC design business involves integrating four diverse major areas namely device operation, circuit analysis and design, circuit simulation and lastly, physical layout and re-simulation. Emphasis is also made on the importance of an EDA tool; how it is incorporated into the design flow and aids IC design jobs. The tool used in this project is the Tanner Tools. There are several styles to design integrated circuit and the one used here is the full-custom design style. In the area of device operation and circuit analysis/design, the circuit design job involves hand calculation for DC and transient design. These include designing the logic threshold voltage and propagation delay time of the circuit according to specification. Three common methods, Average-Current, Differential Equation and Digital Model are reviewed for their suitability in delay time hand calculation. Since hand calculation only presents an approximated circuit design, computer simulation is compulsory to verify the design. In the area of circuit simulation, SPICE MOSFET Level 2 model is used due to its suitability for teaching. Thus, at minimum, 2.0 micron CMOS is chosen. Beyond 2.0 micron, more complicated SPICE MOSFET model is required for simulation and is therefore avoided. Suitable CMOS processes are reviewed and consequently, MOSIS/Orbit 2.0 micron process is chosen. In the areas of physical layout and re-simulation, the designed circuit was laid out, design rule check was performed on the layout followed by layout extraction to obtain the equivalent SPICE netlist for re-simulation. The re-simulation includes the effect of parasitic capacitance and resistance, which are not included in the earlier circuit design. Re-simulation is necessary since parasitic affects the transient characteristics. Lastly, suitable digital circuits for teaching will be designed and packed onto the Teaching Chip. Examples include inverter, ring oscillator, NAND, NOR, static CMOS, etc.
The output material of the project would be SPICE programs, DC and transient simulation results, cell level, block level and chip level layouts.
TABLE OF CONTENTS

TITLE i
DECLARATION OF ORIGINALITY ii
ACKNOWLEDGEMENTS iii
ABSTRACT iv
TABLE OF CONTENTS vi
LIST OF FIGURES x
LIST OF TABLES xi
LIST OF SYMBOLS xii
LIST OF ABBREVIATIONS xiii

CHAPTER 1 INTRODUCTION 1
1-1 Problem Statement and Motivation 1
1-2 Objectives 1
1-3 Project Scope and Direction 2
1-4 Dissertation Summary

CHAPTER 2 LITERATURE REVIEW: IC DESIGN 7
ENVIRONMENT
2-1 IC Design Flow 7
2-2 Microprocessor Design Flow 10
2-3 Memory IC Design Flow 12
2-4 Digital CMOS IC Design Flow 14
2-5 CAD Tools as Part of Flow 16

CHAPTER 3 LITERATURE REVIEW: LAYOUT DESIGN 17
3-1 Layout Design Types 17
3-1-1 Cell Level Layout 17
3-1-2 Block Level Layout 17
3-1-2 Chip Level Layout 18
3-2 Layout Design Flow - A General Rule 19
3-3 A Closer Look at the Layout Design Flow 20
3-3-1 Define Floorplan 20
3-3-2 Implement the Design 22
3-3-3 Layout Verification 23
3-3-4 Extraction and Re-simulation 24

CHAPTER 4 CMOS INVERTER 25
4-1 The CMOS Inverter 25
4-2 CMOS Inverter Design 26
4-3 CMOS Inverter DC Characteristics and Design 26
  4-3-1 Device Transconductance Ratio \( \beta_n/\beta_p \) Calculation 27
  4-3-2 Noise Margins \( V_{NML} \) and \( V_{NMH} \) Calculation 27
  4-3-3 Transistor Sizing Calculation for DC Design 31
4-4 CMOS Inverter Transient Characteristics and Design 41
  4-4-1 Output Parasitic Capacitance \( C_{out} \) Calculation 42
  4-4-2 Delay Time \( t_P \) Calculation using Average-Current Method 49
  4-4-3 Delay Time \( t_P \) Calculation using Differential Equation Method 53
  4-4-4 Delay Time \( t_P \) Calculation using Digital MOSFET Model 57
4-5 Layout and Re-simulation with Parasitic 62
4-6 Construction of CMOS Inverter Design Flow 68
4-7 Use of Step-Input Waveform 71
4-8 Ring Oscillator 76

CHAPTER 5 CHIP LEVEL LAYOUT 87
5-1 General 87
5-2 Power Supply 87
  5-2-1 Factors to be Considered for Power Lines 87
APPENDIX A  THE TANNER TOOLS SYSTEM  A-1
A-1  Simulation Tools  A-1
A-2  Front End and Netlist Tools  A-1
A-3  Mask-Level Tools  A-2

APPENDIX B  MOSIS/ORBIT 2.0 MICRON PROCESS  B-1
B-1  General  B-1
B-2  Process Specifications  B-2
B-3  Modeling of MOSFET using SPICE  B-3
   B-3-1  Basic MOSFET Model  B-4

APPENDIX C  TECHNOLOGY SPECIFICATION  C-1
C-1  SCNA Technology  C-1
C-2  Process Design Rules  C-3

APPENDIX D  TRANSISTOR LAYOUT DESIGN  D-1
D-1  Factors to be Consider for Transistor Layout  D-1

APPENDIX E  INTERCONNECTS LAYOUT DESIGN  E-1
E-1  Interconnect Layout Design  E-1
   E-1  Factors to be Consider for Routed Signals  E-1
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 2-1-F1</td>
<td>IC design flow.</td>
<td>8</td>
</tr>
<tr>
<td>Figure 2-2-F1</td>
<td>Full-custom flow for a microprocessor.</td>
<td>10</td>
</tr>
<tr>
<td>Figure 2-3-F1</td>
<td>Memory IC design flow.</td>
<td>13</td>
</tr>
<tr>
<td>Figure 2-3-F2</td>
<td>Full-custom design flow.</td>
<td>14</td>
</tr>
<tr>
<td>Figure 3-2-F1</td>
<td>Layout design procedure.</td>
<td>19</td>
</tr>
<tr>
<td>Figure 3-3-F1</td>
<td>Layout floor planning procedure.</td>
<td>20</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table Number</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 4-1-T1</td>
<td>CMOS 2-Input NAND Timing Comparison.</td>
<td>71</td>
</tr>
<tr>
<td>Table 4-2-T1</td>
<td>CMOS 3-Input NAND Timing Comparison.</td>
<td>73</td>
</tr>
<tr>
<td>Table 4-3-T1</td>
<td>CMOS 3-Input NOR Timing Comparison.</td>
<td>75</td>
</tr>
</tbody>
</table>
# LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMOS</td>
<td>Complementary Metal Oxide Semiconductor</td>
</tr>
<tr>
<td>MOSFET</td>
<td>Metal Oxide Semiconductor Field Effect Transistor</td>
</tr>
<tr>
<td>IC</td>
<td>Integrated Circuit</td>
</tr>
<tr>
<td>DRC</td>
<td>Design Rule Checker</td>
</tr>
<tr>
<td>SCNA</td>
<td>Scalable CMOS N-Well Analog</td>
</tr>
<tr>
<td>ASIC</td>
<td>Application Specific Integrated Circuit</td>
</tr>
<tr>
<td>HDL</td>
<td>Hardware Description Language</td>
</tr>
</tbody>
</table>
Appendix F: Harvard Style Referencing
Getting started

There are two components to referencing: citations in your paper and the reference list at the end of your paper.

Example of Citation within the Text:
Harvard is an 'author/date' system, so your citation consists of author(s) and year of publication.
Citation of a book (the same format applies for a journal article)

No punctuation between surname and date

(**Smith & Bruce 1997**)

Authors’ surnames Publication date

If you quote directly from an author or to cite a specific idea or piece of information from the source you need to include the page number of the quote in your citation.

No punctuation between surname and date

(**Smith & Bruce 1997, p8**)

Authors’ surnames Publication date

The reference list:
All citations should be listed in the reference list at the end of your document.

**Reference list entry for a book**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year of Publication</th>
<th>Title</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Edition</th>
<th>Place of Publication</th>
</tr>
</thead>
</table>

**Reference list entry for a journal**

<table>
<thead>
<tr>
<th>Article Author(s)</th>
<th>Date</th>
<th>Article Title</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Volume &amp; Issue Details</th>
<th>Page Range of Article</th>
<th>Journal Title</th>
</tr>
</thead>
</table>

Reference list entries contain all the information that someone needs to follow up your source. Reference lists in Harvard are arranged alphabetically by author.
## Citation within the Text and Reference List Examples

### Books & eBooks

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
<th>Reference List Example</th>
</tr>
</thead>
</table>
### E-book: Chapter or Article in an Edited E-book

- **Example of Citation within the Text**: 'Historical thinking is actually a Western perspective' (White 2002, p. 112)

### Book: Different Works by Same Author in Same Year

- **Example of Citation within the Text**: (Bond 1991a) (Bond 1991b)

### Journal Articles

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
<th>Reference List Example</th>
</tr>
</thead>
</table>

### Internet/Websites

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
<th>Reference List Example</th>
</tr>
</thead>
</table>
### Cases and Legislation

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
<th>Reference List Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>((R v \ Tang \ (2008) \ 237 \ CLR \ 1))</td>
<td>(R v \ Tang \ (2008) \ 237 \ CLR).</td>
</tr>
<tr>
<td>Acts of Parliament</td>
<td>((Corporations \ Act \ 2001 \ (Cth) \ s \ 3))</td>
<td>Corporations Act 2001 (Cth).</td>
</tr>
<tr>
<td>Delegated Legislation</td>
<td>((Police \ Regulations \ 2003 \ (Vic) \ reg \ 6.)</td>
<td>Police Regulations 2003 (Vic) reg 6.</td>
</tr>
<tr>
<td>Bills</td>
<td>((Corporations \ Amendment \ Bill \ (No \ 1) \ 2005 \ (Cth)))</td>
<td>Corporations Amendment Bill (No 1) 2005 (Cth).</td>
</tr>
</tbody>
</table>

### Company Information

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
<th>Reference List Example</th>
</tr>
</thead>
</table>

### Conference Papers & Proceedings

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
<th>Reference List Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Type</td>
<td>Example of Citation within the Text</td>
<td>Reference List Example</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-------------------------------------</td>
<td>------------------------</td>
</tr>
</tbody>
</table>

### Newspapers

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
<th>Reference List Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newspaper: No Author</td>
<td><em>(The Sydney Morning Herald</em> 7 January 2011, p. 12)</td>
<td>Not required.</td>
</tr>
</tbody>
</table>

### Multimedia

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
<th>Reference List Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Television Programme</td>
<td><em>(Crystal 1993)</em></td>
<td>Crystal, L (executive producer) 1993, <em>The</em></td>
</tr>
<tr>
<td>Material Type</td>
<td>Example of Citation within the Text</td>
<td>Reference List Example</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------------------</td>
<td>------------------------</td>
</tr>
</tbody>
</table>

### Standards & Patents


**Audio Podcast**

(Van Nuys 2007)  

**Video Podcast**

(Kloft 2006)  

**Music Track from an Album**

(Shocked 1992)  

**Video Blog Post**

(Norton 2006)  

### Standards & Patents

**Patent**

(Cookson 1985)  

**Standard: Retrieved From a Database**

(Standards Australia 2008)  

**Standard: Published**

(Standards Australia/New Zealand Standard 1994)  
<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
<th>Reference List Example</th>
</tr>
</thead>
</table>

**Lecture Notes**

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
<th>Reference List Example</th>
</tr>
</thead>
</table>

**Theses**

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
<th>Reference List Example</th>
</tr>
</thead>
</table>

**Personal Communication**

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
</tr>
</thead>
</table>
| Telephone Call, Interview, e-mail, etc. | *If the information you are referencing was obtained by a personal communication such as a telephone call, an interview or an email that fact is usually documented in the text and are not added to the reference list. If desired you can add the abbreviation pers.comm. to the reference.*  
When interviewed on 6 June 2008, Mr M Ward confirmed... Mr M Ward confirmed this by facsimile on 6 June 2008. It has been confirmed that he will be touring Australia in the middle of next year (Mr M Ward, 2008, pers. comm., 6 June). |
Citing Information Someone Else has Cited

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Example of Citation within the Text</th>
<th>Reference List Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citing Information that Someone Else has Cited</td>
<td>(O’Reilly, cited in Byrne 2008)</td>
<td>In the reference list provide the details of the author who has done the citing.</td>
</tr>
</tbody>
</table>

A reference list: what it should look like?

Note: Please note the hanging indent for each reference makes the alphabetical sequence more obvious.


Abbreviations
Standard abbreviations may be used in your citations. A list of appropriate abbreviations can be found below:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ed./Eds.</td>
<td>editor/editors</td>
</tr>
<tr>
<td>ed.</td>
<td>edition</td>
</tr>
<tr>
<td>et al.</td>
<td>and others</td>
</tr>
<tr>
<td>no.</td>
<td>number</td>
</tr>
<tr>
<td>p./pp.</td>
<td>page/pages</td>
</tr>
<tr>
<td>para.</td>
<td>paragraph</td>
</tr>
<tr>
<td>pt.</td>
<td>part</td>
</tr>
<tr>
<td>rev.</td>
<td>revised</td>
</tr>
<tr>
<td>suppl.</td>
<td>supplement</td>
</tr>
<tr>
<td>Vol.</td>
<td>Volume (book)</td>
</tr>
<tr>
<td>vol.</td>
<td>volume (journal)</td>
</tr>
</tbody>
</table>

**Other Sources of Information**

Other sources of information

Note: This list of examples is in no way exhaustive. Only the most often-used types of references are listed here. Refer to the following publications for more information on citing references:


- End -