THESIS GUIDELINES

FIFTH EDITION

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PREFACE

The UTM Thesis Manual is prepared to guide postgraduate students of UTM for the submission of their thesis and dissertation. The guide covers the technical and language aspects related to thesis writing, which includes language to be used, typeface, font size, spacing, pagination, units, chapter format and references style. The guide is divided into five chapters that explain the above information and submission options to be followed by all postgraduate students in Universiti Teknologi Malaysia. This new edition comes with a fresh look. In our effort to reduce paper use and to support sustainable practices, UTM theses are now printed on double-sided. Apart from updating, general editing and refinement of the contents, then contents were re-arranged for easier search.

This guide serves as the 'in-house style' for all UTM theses. All the best!

CHAPTER 1

ORGANIZATION OF THESIS

1.1 Introduction

Thesis in this manual refers to a scientific documented report of original research conducted by a student in an ethical and professional manner for fulfilment of the requirement for a postgraduate degree. The thesis should be presented in a manner that will reflect credit on the student, the faculty, and the University.

1.2 Types of Thesis Format

A thesis or dissertation in UTM can be written in one of the following formats:

(a)   Conventional format

(b)   Article style format (by publications)

A thesis is made up of three main parts namely preliminary pages, main body and supplementary. The following sections provide guideline for postgraduate candidates in writing and preparing their thesis and dissertation.

1.2.1 Conventional Format

The conventional format as shown in Table 1.1 is the most common form of research project/dissertation/thesis used by most candidates.

Table 1.1   The General Structure for Conventional Thesis Format

SUBJECT	STATUS	EXAMPLE	NOTES
PRELIMINARY			
Front Cover page	Compulsory	Appendix A	For viva only. Without page number
Blank Page	Compulsory		Without page number
Declaration of Thesis	Compulsory	Appendix B	Without page number
Letter regarding status classification of thesis	Compulsory	Appendix C	Required if thesis is classified as 'Restricted'
Supervisor's declaration	Compulsory	Appendix D1	Without page number
Declaration on cooperation	Compulsory	Appendix D2	Without page number
Certification of examination	Compulsory	Appendix D2	Without page number
Title Page	Compulsory	Appendix E	Counted as (i) but page number does not appear.
Author's Declaration Page	Compulsory	Appendix F	Roman, (ii)
Dedication	Optional	Appendix G	Roman (if any)
Acknowledgement	Optional	Appendix H	Roman (if any)
Abstract	Compulsory	Appendix I	Continuing from the previous Roman number.
Abstrak	Compulsory	Appendix J	Continuing from the previous Roman number
Table of Contents	Compulsory	Appendix K	Continuing from the previous Roman number
List of Tables	Compulsory	Appendix L	Continuing from the previous Roman number
List of Figures	Compulsory	Appendix M	Continuing from the previous Roman number
List of Abbreviations	Compulsory	Appendix N	Continuing from the previous Roman number
List of Symbols	Compulsory	Appendix O	Continuing from the previous Roman number
List of Appendices	Compulsory	Appendix P	Continuing from the previous Roman number
MAIN BODY			
Chapter 1: Introduction	Compulsory	Appendix Q	Arabic, start at (1) and appear

Chapter 2: Literature Review	Compulsory		Continuing from the previous Arabic number
Chapter 3: Methodology	Compulsory		Continuing from the previous Arabic number
Chapter 4: Results	Compulsory		Continuing from the previous Arabic number
Chapter 5: Discussion	Compulsory		Continuing from the previous Arabic number
Chapter 6: Conclusion	Compulsory		Continuing from the previous Arabic number
References	Compulsory		Continuing from the previous Arabic number
Note: Depending on the needs, some thesis might combine Chapter 5 & 6.			
SUPPLEMENTARY			
Appendices	Optional		Continuing from the previous Arabic number
List of Publications and Papers Presented	Optional	Appendix U	Continuing from the previous Arabic number

1.2.2 Thesis by Publications

UTM also accept the presentation of thesis/dissertation in the format of published papers, where such papers have been published by indexed journals during the period of candidature. Papers submitted as a PhD thesis must be based on a particular theme/focus and form a cohesive research write up for the degree. Each article should address a specific research objective or a related topic of the study. Table 1.2 presents the general structure for thesis/dissertation by publications.

Table 1.2   **The General Structure for Thesis By Publications**

SUBJECT	STATUS	EXAMPLE	NOTES
PRELIMINARY			
Front Cover Page	Compulsory	Appendix A	For viva only. Without page number
Blank Page	Compulsory		
Declaration of Thesis	Compulsory	Appendix B	Without page number

Letter regarding status classification of thesis	Compulsory	Appendix C	Required if thesis is classified as
Supervisor's declaration	Compulsory	Appendix D1	Without page number
Declaration on cooperation	Compulsory	Appendix D2	Without page number
Certification of examination	Compulsory	Appendix D2	Without page number
Title Page	Compulsory	Appendix E	Counted as (i) but page number does not
Author's Declaration Page	Compulsory	Appendix F	Roman, (ii)
Dedication	Optional	Appendix G	Roman (if any)
Acknowledgement	Optional	Appendix H	Roman (if any)
Abstract	Compulsory	Appendix I	Continuing from the previous Roman
Abstrak	Compulsory	Appendix J	Continuing from the previous Roman
Table of Contents	Compulsory	Appendix K	Continuing from the previous Roman
List of Tables	Compulsory	Appendix L	Continuing from the previous Roman
List of Figures	Compulsory	Appendix M	Continuing from the previous Roman
List of Equations	Compulsory	Appendix N	Continuing from the previous Roman
List of Symbols/ Abbreviations/Notations/	Compulsory	Appendix O	Continuing from the previous Roman
List of Appendices	Compulsory	Appendix P	Continuing from the previous Roman
MAIN BODY			
Chapter 1: Introduction	Compulsory	Appendix Q	Arabic, start at (1) and appear
Chapter 2: Literature Review	Compulsory		Continuing from the previous Arabic
Chapter 3: Article 1*	Compulsory		Continuing from the previous Arabic
Chapter 4: Article 2*	Compulsory		Continuing from the previous Arabic
Chapter 5: Article 3*	Compulsory		Continuing from the previous Arabic
Chapter 5: Discussion	Compulsory		Continuing from the previous Arabic
Chapter 6: Conclusion	Compulsory		Continuing from the previous Arabic

References	Compulsory		Continuing from the previous Arabic
Note: Depending on the needs, some thesis might combine Chapter 5 & 6.			
SUPPLEMENTARY			
Appendices	Optional		Continuing from the previous Arabic
List of Publications and Papers Presented	Optional	Appendix U	Continuing from the previous Arabic

Candidate must obtain the consent from other co-authors for all papers used as part of their PhD thesis. The consent can be in the form of verification from the journal publisher or letter or email communication with the co-authors. A clear statement of the contribution made by each author in any joint published work is required and should be included in as one of the appendix. For example, a statement of contribution from a three-author academic research publication is as follows:

Publication: Wong, A.N.C., Ismail, M., & Hashim, N.H. (2012). Histological development of selected neural structures of Dark-Sided Chorus Frog, 7 Microhyla heymonsi (Amphibia: Anura). Malaysian Journal of Science, 29(1), 11-18.

Statement of Contributions: Wong, A.N.C. participated in all experiments, coordinated the data analysis and contributed to the writing of the manuscript. Ismail, M. supervised the development of work and edited the manuscript. Hashim, N.H. gave technical support, conceptual advice, and helped in data interpretation.

The format specifications of the thesis/dissertation must conform to the requirement as outline in Chapter 2.

CHAPTER 2

GENERAL REQUIREMENTS

2.1 Introduction

This chapter will explain the formatting requirements and writing conventions that need to be observed in preparation of UTM thesis.

2.2 Language

The thesis may be written either in English, Bahasa Melayu or Arabic (applicable only to candidates from School of Islamic Civilization, Faculty of Social Science and Humanities). Language use and terms of spelling (American or British) should be consistent throughout the thesis. The Roman alphabet should be use unless otherwise required by the discipline.

2.3 Printing

The thesis must be printed on a laser printer. Either single or double-sided text is permitted for submission of thesis for oral examination purposes. When producing double-sided text, please take particular care to fulfil all the requirements specified in these regulations, e.g. pagination and margin widths. Mixtures of single and double-sided text are not acceptable. However, the final hardbound thesis should be printed using double-sided text.

2.4 Thesis title

The thesis title must adhere to the following guidelines:

- The title should be a clear and concise description of the focus and contribution of the research. It should not contain more than 15 words and excludes grammatical words such as articles, conjunction and prepositions.

- The title should not contain phrases which reflect research exercise such as "An investigation of …", "A preliminary study of …", "A study of …", "Analysis of …", "On the …", "Theory of …", "Some….", and "Toward a …".

- The title should not contain formulas, symbols or subscripts, Greek letters, or other non-alphabetical symbols. Word substitutes should be used instead.

- Thesis title should not contain acronyms or even acronyms in brackets except for commonly used in the field of the study (eg: DNA, GPS). For example, "GIS" should be written as "Geographical Information System" and should not be written as "Geographical Information System (GIS)".

- Thesis title should not contain punctuations such as colon ":", semi-colon ";", etc. except commas "," when necessary.

2.5   Number of Pages

The maximum number of pages for a project report/dissertation/thesis is as follows:

Bachelor Degree Project Report	: 100 pages
Master's Report/Dissertation/Thesis	: 200 Pages
Doctorate Thesis	: 300 Pages

These limits include tables, figures and other illustrations in the text but do not include Appendices.

2.6   Page Layout

The text should be presented in portrait layout. Landscape layout may be used for figures and tables.

2.7   Type of Paper

White simile 80 gsm (grams per square meter) high-quality A4 size (for viva-voce) papers (210 x 297 mm) and B5 size (for final bound copies) must be used. Photocopies of the thesis must be on similar quality paper.

2.8   Typeface and Font Size

A thesis should be typed using a word or text processor. Font type and size that are commonly used for printed academic materials should be used (i.e: Times New Roman, Tahoma, Arial, Book Antiqua. The same font type should be used throughout the thesis. The character size should not be less than 0.2 cm for capital letters and 0.15 cm for small letters. If Microsoft Words is used, font type Times New Roman with font size 12 or bigger should be used. One and a half line spacing should be used.

2.9   Margins

All pages should be set with the same margin. The left and right margins should be 3.25 cm (for binding purposes) and 2.5 cm from the top and bottom margins.

2.10   Spacing

The following guidelines should be observed:
  i.   The spacing between the chapter number and the title follow three times SHIFT+ENTER spacing.

ii.   The spacing between the title and the first line of a text should be four (4) line spacing;

iii.   The spacing between the last line of a text with the title of a sub-section should be four (4) line spacing;

iv.   The spacing between the title of a sub-section and the first line of a text should be two (2) line spacing;

v.   The spacing between paragraphs should be two (2) line spacing;

vi.   The number and the title of sub-section should be aligned with the left margin;

vii.   The first line of a paragraph should be indented by 1.27 cm (0.5 inch) from the left margin;

viii. A new paragraph should not begin on the last line of a page;

ix.   The spacing between the last line of a text and a table, or a figure or an illustration should be two (2) line spacing;

x.   The spacing after a comma (,) should be one (1) character spacing.

2.11 Pagination

Each page of a thesis must be counted and numbered. Pages should be numbered consecutively as shown in Table 1.1. The page numbers should be printed at the bottom centre, 1.25 cm from the bottom edge. Numbering should be as follows:

i.   Preliminary pages of a thesis, starting from the title page should be numbered using small letter Roman numeric (i, ii, iii, etc.); the texts should be numbered using Arabic numeric (1, 2, 3, etc.).

ii. The first page should be the title page. This page should be counted "i" but should not be printed.

iii. The first page of each chapter should be counted and the page number should be printed and placed at odd page.

iv. If a thesis is made up of several parts, separating pages can be inserted but these pages should not be counted and numbered.

v. If a chapter ended with an odd page number, a separate blank page should be added and counted, but the page number should not be printed. (In MS Word, insert Section Breaks Odd Page under Layout Tab)

2.12   Binding

Students are required to ensure that all university requirements have been met and necessary signatures have been obtained before binding of the thesis. **Starting from 1st September 2018,** the final bound copies of the thesis must be submitted in B5 size and printed on both sides on 80gm paper. A cover of the thesis and its detail are as follows:

Figure 2.1   Thesis Cover Details for Master's Degree
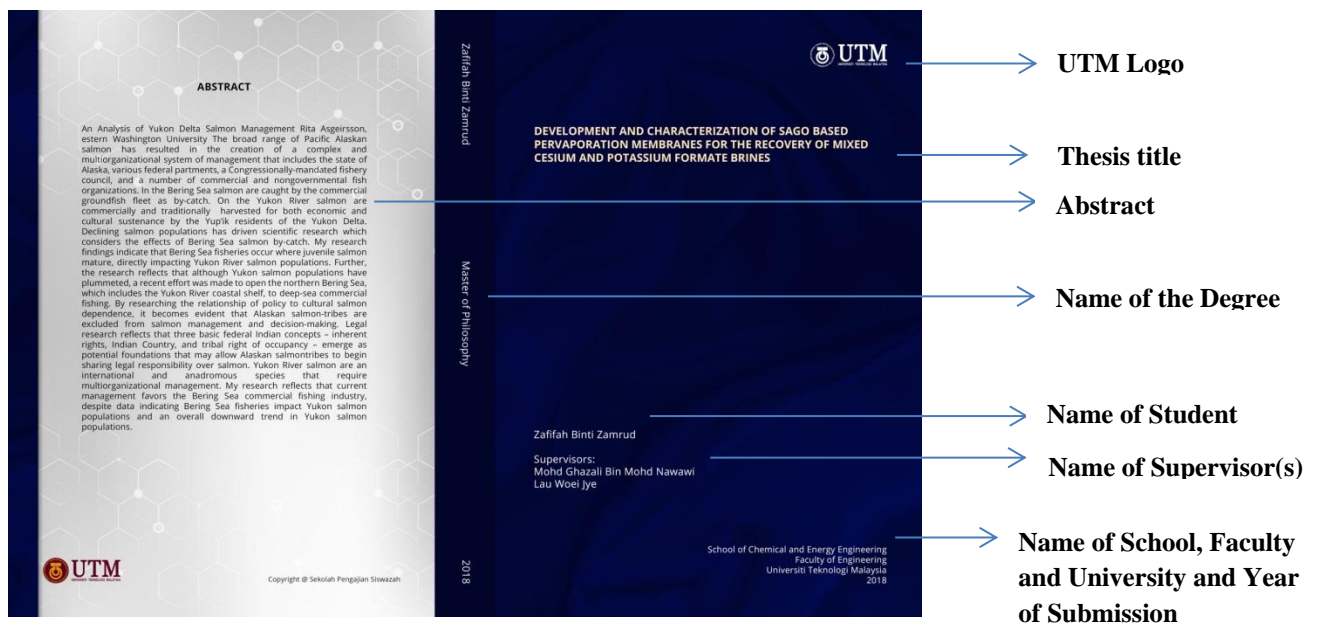
Size	: B5
Colour	: *Royal Blue*
Colour Code	: #010529
RGB Code	: R1G5B41
Paper weight (Front and Back Cover)	: 1400gsm
Type of Paper	: 80gsm
Printing	:Double Sided
Cover of the Thesis	Hardcover Perfect: Holland Art Paper + Laminate +

	Glossy

Figure 2.2   Thesis Cover Details for Doctor of Philosophy Degree
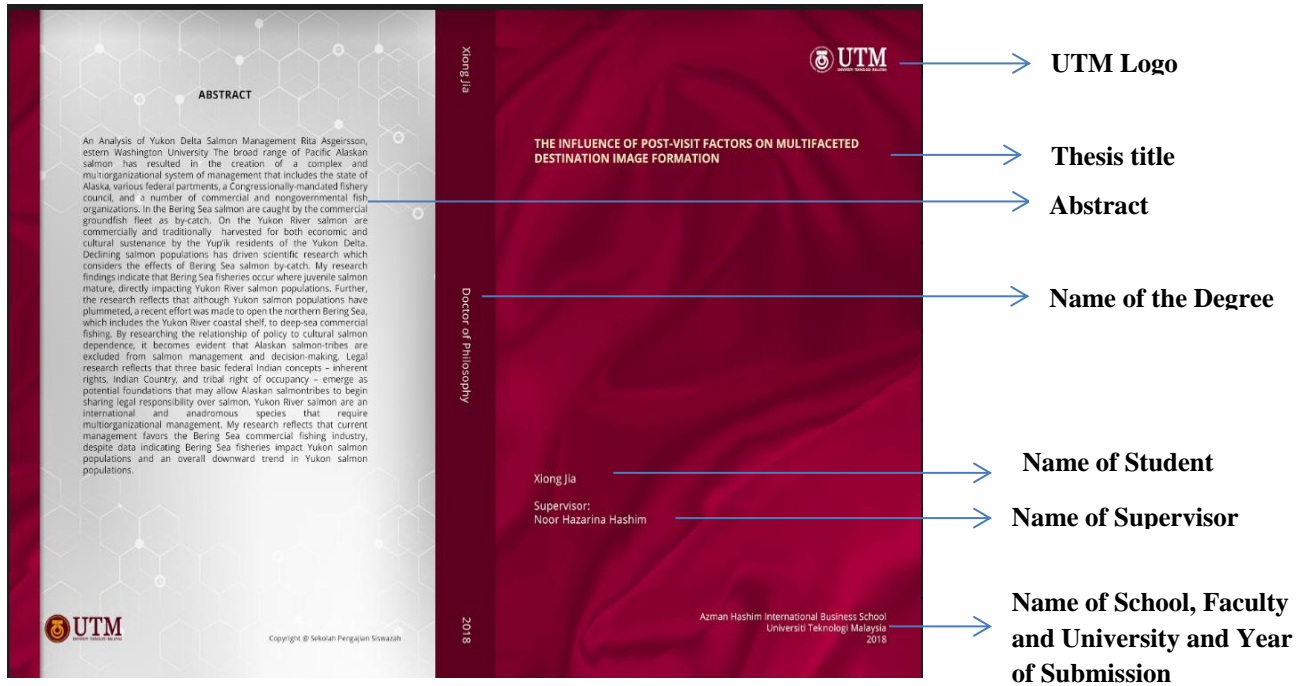
Size	: B5
Colour	: *Dark Red*
Colour Code	: #5C001F
RGB Code	: R92G0B3
Paper weight (Front and Back Cover)	: 1400gsm
Type of Paper	: 80gsm
Printing	:Double Sided
Cover of the Thesis	Hardcover Perfect: Holland Art Paper + Laminate + Glossy

CHAPTER 3

THESIS FORMAT

3.1 Declaration of Thesis

Thesis status declaration is completed using the Thesis Status Declaration form issued by Perpustakaan UTM form (see Appendix B). If the thesis is declared as 'CONFIDENTIAL' or 'RESTRICTED', a letter from the party classifying the information as confidential or restricted must be attached (see Appendix C). The letter should clearly indicate:

(i) The reasons for classification

(ii) The duration for classification

The typical duration for confidential or restricted classification is three (3) years. A thesis can be classified as confidential or restricted up to a maximum period of five (5) years. Examples can be seen in Appendices A and B.

If the status declaration form is not submitted or the form is incomplete, the University will assume the thesis is unrestricted and the thesis shall be made available for distribution as published academic exchange materials.

3.2 Declaration

3.2.1 Supervisor's Declaration

A thesis to be submitted for the purpose of examination must obtain prior declaration by the supervisor on the standard and quality of the thesis. See example in Appendix Dl.

3.2.2 Declaration on Cooperation with Outside Agencies and Certification of Examination

This section consists of two parts. Part A includes any cooperation with other outside agencies in carrying out the research project that lead to the submission of the thesis must be declared. In Part B, students must obtain certification of examination from the School of Graduate Studies (see example in Appendix D2).

3.3 Title Page

Title page must contain information listed in the following order:

- Title of the thesis;
- Student's full name as in identity card or passport for international student;
- Statement of award for the thesis (see Section 3.3.2);
- Name of School (if applicable) where the student registered;
- Name of Faculty/School where the student registered;
- Name of the University; and
- Month and Year of submission (Month and Year of submission of hard bound copy of the thesis).
- Example (see Appendix E)

3.3.1 Thesis Title

The thesis title must adhere to the following guidelines:

- The title should be a clear and concise description of the focus and contribution of the research. It should not contain more than 15 words and excludes grammatical words such as articles, conjunction and prepositions.

- The title should not contain phrases which reflect research exercise such as "An investigation of …", "A preliminary study of …", "A study of …", "Analysis of …", "On the …", "Theory of …", "Some….", and "Toward a …".

- The title should not contain formulas, symbols or subscripts, Greek letters, or other non-alphabetical symbols. Word substitutes should be used instead.

- Thesis title should not contain acronyms or even acronyms in brackets except for commonly used in the field of the study (e.g: DNA, GPS). For example, "GIS" should be written as "Geographical Information System" and should not be written as "Geographical Information System (GIS)".

- Thesis title should not contain punctuations such as colon ":", semi-colon ";", etc. except commas "," when necessary.

3.3.2 Statement of Award for the Thesis

This statement should be written on the Title Page. It should state the purpose and the award for which the thesis is submitted. Examples of statements for various purposes and awards are listed below :

1. Bachelor's Degree Project Report

A report submitted in partial fulfilment of

the requirements for the award of the degree of

Bachelor of ....

2. Master's Project Report (By course work)

A project report submitted in partial fulfilment of

the requirements for the award of the degree of

Master of .... (specialisation)

3. Master's Dissertation (By coursework and research)

A dissertation submitted in partial fulfilment of

the requirements for the award of the degree of

Master of .... (specialisation)

4. Master's Thesis (By research)

A thesis submitted in fulfilment of the

requirements for the award of the degree of

Master of .... (specialisation)

5. Doctor of Philosophy Thesis

A thesis submitted in fulfilment of the

requirements for the award of the degree of

Doctor of Philosophy (specialisation)

6. Engineering Doctorate Thesis

A dissertation submitted in partial fulfilment of

the requirements for the award of the degree of

Doctor of Engineering (specialisation)

3.4   Declaration Page

This page should contain declaration by the student on originality of the thesis. The declaration should be signed. See example in Appendix F.

3.5   Dedication Page (optional)

The dedication must be brief, not more than one paragraph, and must not contain any number, chart or photograph. See example in Appendix G.

3.6   Acknowledgement (optional)

The student may acknowledge the assistance of various individuals or organisations in successfully producing the thesis. This should be written in one page. Example can be seen in Appendix H.

3.7   Abstract

An abstract is a short summary of the thesis. The abstract should include the followings:

- The abstract has to start with a brief theme sentence to orientate the reader about the overall issue addressed in the thesis.
- The abstract should indicate the aim or purpose of the research
- The academic and/or practical importance of the study should be explained
- The methodology used in the study should also be briefly described
- The main findings of the study should be summarized
- A statement of conclusion should indicate the contribution made by the study on filling gaps in the literature
- The practical or managerial implications of the study's findings should be highlighted where appropriate.
- Abstract must be bilingual. For a thesis written in Bahasa Melayu, the abstract must first be written in Bahasa Melayu and followed by the English translation. If the thesis is written in English, the abstract must be written in English and followed by the translation in Bahasa Melayu.
- The abstract should be written in one paragraph and not exceed one (1) page.
- The abstract can be written using single or 1.5 spacing.

Example can be seen in Appendix I (English) and Appendix J (Bahasa Melayu).

3.8   Table of Contents Page

The Table of Contents page must start on a new page. It should list all sections, chapters and maximum of four sub-headings. The titles must be written using the same words as those written in the text. See example in Appendix K.

3.9   List of Tables

This page should list all the tables found in the thesis. The page number of the table must also be included. The table numbers should be arranged according to the chapters. See example in Appendix L.

3.10   List of Figures

Diagrams, photographs, drawings, graphs, charts and maps are included as figures. The list should be written similar as the List of Tables. See example in Appendix M.

3.11   List of Symbols/Abbreviations/Notations/Terminology

All symbols or abbreviations or notations or terminology found in the text should be listed on this page. They are listed in the following alphabetical order:

- Roman letters   alphabetically
- Greek letters   alphabetically
- Superscripts
- Subscripts

Universally recognised scientific symbols such as mm, cm, Ha need not be listed. See example in Appendix N and Appendix O respectively.

3.12   List of Appendices

All appendices should be listed on this page. See example in Appendix P.

3.13 Body

3.13.1 Chapter Layout

A thesis must be divided into chapters. A title must be given and it should reflect its content. A new chapter must begin on a new page. A chapter must be divided into sections. These sections must be given appropriate titles and numbered.

Texts must be written in paragraphs. Long paragraphs should be avoided. Each paragraph must describe an issue or subject. There must be continuity between paragraphs. The text should contain:

 i. An introduction and background on the study or research;

 ii. A detailed description of the study or research which include theories, model and materials and methods used;

 iii. The data collection and analysis techniques.

 iv. The main results and discussions; and

 v. The conclusions and significance of the findings.

All chapters and their sub-sections must be labelled and numbered. The chapters are numbered using Arabic numeric, i.e. Chapter 1, Chapter 2, Chapter 3, and so on. The sub-sections should not be indented but arranged in a structured manner not more than four levels as follows:

 2 First level (Title of the chapter)

 2.1 Second level (Title of the sub-section)

 2.1.1 Third level (Title of the sub-sub-section)

 2.1.1.1 Fourth level (Title of the sub-sub-sub-section)

If the length of a title of a chapter or any level is more than one line, same line spacing as in the text should be used. Sub-sections beyond level four should be labelled using characters. (eg. a, i, etc)

3.13.2   Citation in Text

Citation is a means of formally recognizing within the text, the resources from which the information or idea were obtained. The purpose is to acknowledge the work of others, to demonstrate the body of knowledge in which the work is based on and to lead others for further information.

Citation in the texts must be written according to any one of the styles described in Chapter 4. The use of software such as RefWorks, JabRef, Mendeley or EndNote for publishing and managing citation and references is encouraged. At the end of the thesis, students must supply list of references in alphabetical order by author, with consistent punctuation.

3.13.2.1   *Direct Quotations in the Text*

A direct quotation must be written in a separate paragraph. If the quotation is in a different language, it must be written in italic. Indented quotation should be single spaced with no quotation marks with 1.27 cm left and right indentation respectively. Example of writing a quotation is shown in Appendix S.

3.13.3   Tables in the Text

- All tables must be numbered using Arabic numeric and numbered with respect to the chapter. For example, Table 4.3 is the third table that appears in chapter 4.
- Students need to ensure that all tables shown in the thesis as well as in the Appendices are referred to in the text.
- A table should be on the page following the first reference to it or placed as close as possible to the original text reference. Text material should highlight analysis or findings, summarizing only important details rather than reiterating the entire table.

- A caption should be positioned at the top of the table. If the caption is written in a single line, it should be centered. If the caption is written more than one line, it should be left indented.

- Tables may be placed in landscaped orientation; in such cases, the table number, title and caption should be single-spaced and placed above the table.

- If the Table occupies more than one page, it must repeat the header rows on the next page.

- Table sources and notes should be placed directly below the table.

- Smaller font may be used for text in the table.

- The default setting for page number is applicable for page with Table presented in portrait orientation (See Appendix S1). Page number should be located bottom-center (right side in portrait) if Table is presented in landscape orientation (See Appendix S2).

- The margin for page with Table in landscape orientation is 3.25 cm while from the top and bottom, right and left margin is 2.5cm.

- Table sources and notes should be placed directly below the table. If a table has been adapted from a source, indicate using "Adapted from…".

3.13.4   Figures in the Text

- Illustrations such as maps, charts, graphs, drawings, diagrams, and photographs are referred as figures. All figures must be clear and of high quality.

- All figures must be numbered using Arabic numeric and numbered with respect to the chapter. For example, Figure 4.3 is the third figure that appears in chapter 4.

- Students need to ensure that all figures shown in the thesis as well as in the Appendices are referred to in the text.

- A figure should be on the page following the first reference to it or placed as close as possible to the original text reference. Text material should highlight analysis or findings, summarizing only important details rather than reiterating the figure.

- A caption should be positioned at the bottom of the figure. If the caption is written in a single line, it should be centered. If the caption is written more than one line, it should be left indented.
- Figure should conform to standard margin requirements.
- If the figure occupies more than one page, the continued figure on the following page should indicate that it is a continuum.
- All figures in the chapter can also be grouped together and positioned at an appropriate location.
- The default setting for page number is applicable for page with Figure presented in portrait orientation (See Appendix T). Page number should be located bottom-centre (right-side portrait) if Figure is presented in landscape orientation (See Appendix S2).
- Illustrations in the form of CD's, slides, and others should be placed in specially made pockets glued to the inner side of the back cover. Oversized illustrations in the form of plans, maps, charts, graphs, and others should be reduced to fit a single page unless the oversized materials are absolutely necessary for clarity and understanding. For illustrations other than above, please refer to the following guidelines;

(i) Photographs

Photographs should be digitally embedded in the text unless absolutely impossible.

(ii) Newspaper Cuttings or Similar Materials

Copies of newspaper cuttings or similar materials should be of high quality.

(iii) Maps and Aerial Photographs

Maps and aerial photographs to be included in the thesis should have a written approval by *Ketua Pengarah Ukur dan Pemetaan Malaysia*. Application can be made using PPN 114 (Pind. 1/11) form available at the Perpustakaan UTM.

- It is advisable to scan all illustration materials using a scanner and printing them using a high quality color printer.

3.13.5 Equations

The following tips on formatting equations can help you in writing equations:

- All equations are considered as text and numbered according to chapter (see Appendix S). If detailed derivation is needed, it is to be placed in an appendix.
- Mathematical parameters should be written in italics but not units, numbers and mathematical functions like logarithms.

- The equations that are written on a separate line should be centred and done consistently throughout the thesis. Some equations are long and tend to be multi-line equations. If an equation breaks to multiple lines, align them properly and use only one number for the whole equation as far to the right as possible.

- The equation numbers should be enclosed by parentheses and placed at the right-hand side of the page.

3.13.6 Notes and Footnotes

Notes such as footnotes and final notes are not allowed for theses in the field of Science and Technology. However, limited use of footnotes is allowed for theses in the field of Humanities and Social Sciences. The use of footnotes should follow the following format:

- Footnotes are recorded using Arabic numeric and numbered consecutively.

- Raised superscript numerals (example^2) in the text refer to explanatory notes and documented sources must be placed at the bottom of the page as footnotes or at the end of the thesis as endnotes in a notes section.

- Footnotes for references are written differently in the aspect of author's name and the use of punctuation. The author's name should be written in full. Comma or quotation mark should be used to separate author's name, title of the article and publication details. The font size used should be two (2) points smaller than the text. The style for writing reference as footnotes is shown below:

> Numeral   Author, "Title of article." publication details, year, page.
>
> *Example:*
>
> 10   Mary Duncan Carterand Rose Mary Magrill, "Building Library Collections" Fourth edition. (Metuchen, N. J.: Scarecrow Press, 1974), pp.61 - 66.

3.13.7   References

References are detailed description of items from which information were obtained in preparing the thesis. All references must be listed at the end of the text. They should be arranged using one of the methods discussed in Chapter 4.

3.13.8   Appendix

Appendices are supplementary materials to the text. These include tables, charts, computer program listings, and others. The following should be noted:

(a)   Appendix is not a must in a thesis. If necessary, data used for analysis, example of questionnaires, maps, photographs and other materials which are lengthy to be included in the text or materials that are not required implicitly to clarify matters discussed can be accompanied as appendix.

(b)   Appendix can be named as Appendix A, Appendix B, and so on, depends on types and quantity to be included. Specific titles can also be given.

3.13.9   List of Publications

This section lists all published and accepted publications only, authored/co-authored by the candidate related to his/her research. See Appendix V.

CHAPTER 4

REFERENCE STYLE

4.1   Introduction

The details of the references cited in the text should be located in the List of References. The list should be placed at the end of the thesis compiled either alphabetically (Harvard System), numerically Number (Vancouver) System or American Psychological Association (APA 6th Style). The style selected must be used consistently throughout the thesis. The following sections describe the format of referencing for each style. Cross citation are not allowed.

4.2   Harvard System

Harvard referencing' is an umbrella term for any referencing style that uses the author name and year of publication.

4.2.1   Citing in the text

In-text references are references written within the main body of text and refer to a quote or paraphrase. They are much shorter than full references. The full reference of in-text citations appears in the reference list. The references cited in the text should be indicated using the name of author and date of publication. Examples are as follows:

(a)   Single author

Using author James Cameron, this takes the form:

(i)   As part of sentence: Cameron (2017, p. 189) states..….

(ii) At the end of a sentence: (Cameron, 2017, p. 189).

(b)   Two or three authors

If there are two or three authors for a cited reference, names should be written as

below for **first appearance**:

(i)	As part of sentence:	Mitchell, Thompson and Murphy (2017, p. 189) states..….
(ii)	At the end of a sentence:	(Mitchell, Thompson and Murphy, 2017, p. 189).

And as shown below **thereafter:**

(i)	As part of sentence:	Mitchell et al (2017, p. 189) states…
(ii)	At the end of a sentence:	(Mitchell et al, 2017, p, 189)

(d)   No author

If possible, use the organisation responsible for the post in place of the author. If not,

use the title in italics:

(i)	As part of sentence:	(*A guide to citation*, 2017)
(ii)	At the end of a sentence:	(*A guide to citation*, 2017, pp. 189-201)

(e)   Multiple Works from the Same Author

References published in the **same year** by the same author are listed alphabetically

according to the title of the work and a lower-case letter (a, b, c, ...) is added immediately

after the date, in both the reference list and in-text citations.

(i)	As part of sentence:	Campbell and Shiller (1988a, b)
(ii)	At the end of a sentence:	(Campbell and Shiller,1988a, b)

References published in the **different year** by the same author are listed alphabetically and chronologically.

(iii) As part of sentence: Mitchell (2010; 2017)

(iv) At the end of a sentence: (Mitchell, 2010; 2017)

(f)   Citing Multiple Works in One Parenthesis:

List the in-text citations in the normal way but with semicolons between different references:

(i) At the end of a sentence: (Mitchell, 2017, p. 189; Smith, 200; Andrews, 1989, pp. 165-176).

4.2.2 List of References for Various Types of Publication Materials

Harvard referencing can vary in style as there is no single resource for this referencing style. All references cited should be listed in the List of References at the end of the last chapter. List the references alphabetically. If more than one published materials by the same author are cited, these materials should be listed chronologically. For example, an article by Scholfield published in 1994 should be listed before the one published in 1997.

4.2.2.1   Book

The standard reference format for a book is:

Type	Example
Books with 1 author	Greetham, B. (2001) *How to write better essays.* Basingstoke: Palgrave.
Books with 2-3 authors	Blaxter, L., Hughes, C. and Tight, M. (2010) *How to research*. Maidenhead: McGraw-Hill/Open University Press.
Books with more than 3 authors	Moore, S., Neville, C., Murphy, M. and Connolly, C. (2010) *The ultimate study skills handbook*. Maidenhead: Open University Press.
Books with later editions	Troy B.N. (2015) 'Harvard citation rules' in Williams, S.T. (ed.) *A guide to citation rules*. New York: NY Publishers, pp. 34-89.
Chapter in a book	Manning, N. (1998) *Social needs, social problems and social welfare*, in Alcock, P., Erskine, A. and May, M. (eds.) *The student's companion to social policy*. Oxford: Blackwell, pp. 31-36.
E-Book	Mitchell, J.A., Thomson, M. and Coyne, R.P. (2017) *A guide to citation*. *E-book library* [online]. Available at: https://www.mendeley.com/reference-management/reference-manager (Accessed: 10 September 2016).

4.2.2.2   *Journal articles*

The basic format to cite a journal article is:

The title of the article is written within single quotation marks.

This is the title of the newspaper, in italics. Capitalise the first letter of each word.

Author names. (year) 'Title of article', *Title*, volume(issue/season etc), page numbers.

The volume number is written outside brackets and the issue or season number is written immediately after within brackets.

Type	Example
Print	Lillis, T. and Turner, J. (2001) 'Student writing in higher education: contemporary confusion, traditional concerns', *Teaching in Higher Education*, 6(1), 57-68.
E-journal article with DOI (if available)	Lillis, T. and Turner, J. (2001) 'Student writing in higher education: contemporary confusion, traditional concerns', *Teaching in Higher Education*, 6(1), 57-68. doi: 10.1080/13562510020029608.
Books with more than 3 authors	Moore, S., Neville, C., Murphy, M. and Connolly, C. (2010) *The ultimate study skills handbook*. Maidenhead: Open University Press.

4.2.2.3 *Conference articles*

The basic format to cite a conference article is:

Author (Year) Title of the article. *Name of the conference*. Date of the conference. Place, page.

Example:

Sheta, A. F. and De Jong, K. (1996) Parameter Estimation of Nonlinear Systems in Noisy Environments Using Genetic Algorithms. *Proceedings of the 1996 IEEE International Symposium on Intelligent*

Control. 15-18 September. Dearborn, Michigan: IEEE, 360 - 365.

4.2.2.4   *Thesis*

The basic format to cite a thesis is:

Author (Year) *Title of the thesis*. Thesis award. Place published.

Example:

Adnan bin Hassan (2002) *On-line Recognition of Developing Control Chart Patterns*. PhD Thesis, Universiti Teknologi Malaysia, Skudai.

4.2.2.5   *Legislations*

The basic format to cite legislation is:

Name of the country (year) *Title of the legislation*. Legislation number.

Example:

Malaysia (1983) *Perintah Monumen Lama dan Tapak Tanah Bersejarah*. P.V. (A) 41 1983.

4.2.2.6   *Standards*

The basic format to cite a standard is:

Name of the institution (Year). *Standard number*. Place published: Publisher

Example:

British Standards Institution (1990) *B.S. 764*. London: British Standards Institution.

4.2.2.7   *Newspaper article*

Print Format

a. No Author	Gearing up to meet new challenges. (2000, February 22) *The Star*. 2.
b. With author	Izatun Shari (2000, April 18) K-economy: draft out in October. *New Straits Times*. 2-4.
Electronic Format	Rosmawati Mion (2006, June 17) Sindiket judi haram tumpas. *Utusan Malaysia.* Retrieved June 19, 2006, from http://www.utusan.com.my

4.2.2.8 Magazine

The basic format to cite a magazine is:

Author. (Year) Title of article. *Name of magazine*, Volume/Issue no., page

Example:

Smith, B. L. 1994). Biofeedback. *Science,* 62, 673 – 675.

4.3 Number (Vancouver) System

In the Number (Vancouver) Style, a number is assigned to each reference as it is used. Even if the author is named in your text, a number must still be used. The original number assigned to the reference is used each time that reference is cited in the text. The first reference you cite will be numbered 1 in the text, and the second reference you cite will be numbered 2, and so on. If you cite reference number 1 again later in the text, you will cite it using the number 1. References are listed in numerical order in a bibliography at the end of your essay.

4.3.1 Citing in the Text

All references cited in the text must be assigned numbers using Arabic numeric. The first cited reference should be assigned with number 1. Subsequent cited references should be given consecutive numbers. One of the methods below can be used when citing:

(i) If the name of an author is written as part of a sentence, the reference number should be inserted in parenthesis or square brackets or superscript after the author's name, for example:

"Genetic algorithm was introduced by Holland (1) and was extensively explored by Goldberg (2)."

OR

"Genetic algorithm was introduced by Holland [1] and was extensively explored by Goldberg [2]."

OR

"Genetic algorithm was introduced by Holland[1] and was extensively explored by Goldberg[2]."

(ii) If the name of an author is not part of a sentence, the reference number should be inserted in parenthesis or square brackets or superscript at the appropriate location; for example:

"Recently, evolutionary programming has been applied to various optimization problems (1) and it offers many advantages such as having global search characteristics."

OR

"Recently, evolutionary programming has been applied to various optimization problem [1] and it offers many advantages such as having global search characteristics."

OR

"Recently, evolutionary programming has been applied to various optimization problems[1] and it offers many advantages such as having global search characteristics."

4.3.2 List of References for Various Types of Publication Materials

In the list of references, the numbers assigned to the source of references cited in the text are listed in incremental order. The styles of writing details on cited publication in the List of References are as follows:

4.3.2.1 Book

Author. *Title of the book*. Edition (if not the first). Place published: Publisher. Year

Example:

Theusen, G. J. and Fabrycky, W. J. *Engineering Economy*. 6th ed. Englewood Cliffs, N. J.: Prentice-Hall. 1984

4.3.2.2 Article in a book

Author. Title of the article. In: Author of the book. *Title of the book.* Place published: Publisher. page; year.

Example:

Hussein, S. B., Jamaluddin, H., Mailah, M. and Zalzala, A. M. S. An Evolutionary Neural Network Controller for Intelligent Active Force Control. In: Parmee, I. C. ed. *Evolutionary Design and Manufacturing*. London: Springer-Verlag. 351-362; 2000

4.3.2.3 Journal articles

Author. Title of the article. *Title of the Journal*. Year. Volume (number):page.

Example:

Billings. S. A. Identification of Nonlinear Systems: A Survey. *Proc. IEE Part D*, 1980. 127(6): 272-287

4.3.2.4   *Conference articles*

Author. Title of the article. *Name of the conference*. Date of the

conference. Place published: Publisher. Year. page.

Example:

Sheta, A. F. and De Jong, K. Parameter Estimation of Nonlinear Systems in Noisy Environments Using Genetic Algorithms. *Proceedings of the 1996 IEEE International Symposium on Intelligent Control.* September 15-18,1996. Dearborn, Michigan: IEEE. 1996. 360-365.

4.3.2.5   *Thesis*

Author. *Title of the thesis*. Thesis award. Name of Institution; Year

Example:

Adnan bin Hassan. On-line Recognition of Developing Control Chart

Patterns. Ph.D. Thesis. Universiti Teknologi Malaysia; 2002.

4.3.2.6   *Standards*

Name of the Institution. *Title of the standard*. Place published, Standard

number. Year

Example:

British Standards Institution. *Tongued and Grooved Software Flooring*.

London, BS 1297. 1987

4.3.2.7   *Patent*

Owner's name. *Title of the patent*. Patent number. Year.

Example:

Lindgren, E. A. *Screen Room Air Inlet and Wave Guard*. V.S. Patent 2, 925,457. 1960.
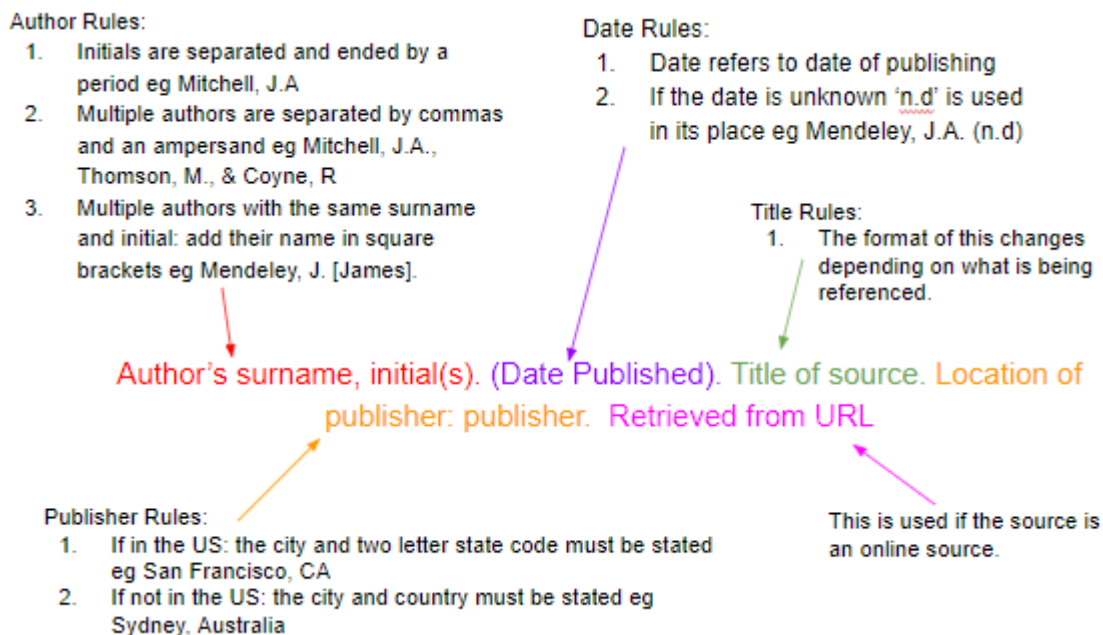
4.3.2.8   *Measured drawings*

Name. *Title*. Place published: Note. Year

Example:

Zairul Azidin Badri. *Rumah Kutai Ha}i Sahak, Kampung Tan}ung, Kampung Ga}ah, Perak*. VTM: Lukisan Terukur. 1980.

4.4   APA Reference

The APA style is most commonly used to cite sources within the social sciences. The style is now in the 6th edition. Students are advised to check for the latest versions of references styles as the style are frequently updated. The figure below shows the core component of APA reference taken from Mendeley website.

Author Rules:
1. Initials are separated and ended by a period eg Mitchell, J.A
2. Multiple authors are separated by commas and an ampersand eg Mitchell, J.A., Thomson, M., & Coyne, R
3. Multiple authors with the same surname and initial: add their name in square brackets eg Mendeley, J. [James].

Date Rules:
1. Date refers to date of publishing
2. If the date is unknown 'n.d' is used in its place eg Mendeley, J.A. (n.d)

Title Rules:
1. The format of this changes depending on what is being referenced.

Author's surname, initial(s). (Date Published). Title of source. Location of publisher: publisher. Retrieved from URL

Publisher Rules:
1. If in the US: the city and two letter state code must be stated eg San Francisco, CA
2. If not in the US: the city and country must be stated eg Sydney, Australia

This is used if the source is an online source.

CHAPTER 5

ELECTRONIC THESES AND DISSERTATIONS (ETD)

5.1   Introduction

Senate meeting No.01/2002/03 dated 12 Jun 2002 has decided that all graduate students are to submit a copy of Thesis, Dissertation and Master's Project Report in digital form beside the normal bound hardcopy after approval. Students are required to submit three (3) bound hardcopies and three (3) CD containing digital thesis.

The main purpose of implementing digital thesis is to enable theses submitted to UTM be accessible through the Internet. This is in-line with development in digital technology and globalisation. With this implementation, UTM hopes to be projected as a leading university in research and graduate studies.

5.2   Electronic Theses and Dissertations (ETD)

Electronic Theses and Dissertations (ETD) are documents that record results of research or scholarship of graduate students. These documents are prepared in the form that can be accessed globally through the Internet. An ETD is the same as the original paper document that has been approved by the panel of examiners and Senate.

5.3   Preparation Process

A thesis that has been examined and approved by Examination Board of Graduate Studies (Senate Sub-Committee) and Senate should be converted into digital form and submitted to the School of Graduate Studies (SPS)/faculty. SPS will then forward both ETD and bound thesis to the Library for archive and access. An ETD must consist of two (2) files, namely pre-access file and full text file.

5.3.1   Pre-access File

Pre-access file is a file that contains information about the author, the panel of

examiners and a brief content of the thesis. By reading this file, a reader will be able to assess the relevance of the document to the reader's research interest. If a reader wishes to access the whole thesis, the reader should contact the librarian for the full text file. The pre-access file includes the first chapter in the bound thesis.

5.3.2 Full Text File

A full text file consists of all contents of the thesis that has been approved by the Senate. This includes all preliminary pages, the main contents of the thesis and all appendices as submitted to the panel of examiners and approved. Writing style as the original bound hardcopy must be retained as presented in Chapters 1 to 4. All these pages must be saved into one (1) file only.

5.4   Preparation Guideline

The following guidelines must be observed:

i. The electronic version must be the same as the final bound thesis as approved by the Senate;

ii. Convert the thesis in PDF format. Use the latest version of Adobe Acrobat PDFMaker. **Do not set the Document Security**;

iii. All pages which contain signatures of the student and supervisor must be scanned;

iv. If the status of a thesis is CONFIDENTIAL or RESTRICTRED, electronic version is still required but must be properly indicated in the Thesis Status Declaration form;

v. Two files must be generated. The first file is for the purpose of pre-access that will be made accessible to the public. The second file is the full text file. The files should be named as follows:

<name><matricno><p><tt><ss><c>.pdf

Where:

a. <name> is the student's first name (without surname or father's name)

b. <matricno> is the student's matric card number or staff ID

c. <p> is the university where the thesis was submitted

- d — UTM
- l – other than UTM

d. <tt> is the year approved

e. <ss> is the thesis status

- su – confidential
- th – restricted
- tt – open access

f. <c> is the file type
- p – pre-access file

- t – full texts file

Example 1:

Wan Ahmad Nazri bin Wan Abdullah, is a master's student at Faculty of Engineering. His thesis was approved in 2002. His matric card number is MM100123. The thesis is declared restricted.

Therefore, the file should be labelled as:

      <name>   = wan ahmad nazri

      <matricno>   = mm100123

      <p> = d

      <tt> = 02

      <ss> = th

The files should be named as follows:

      wanahmadnazrimm100123d02thp.pdf   (pre-access file)

      wanahmadnazrimm100123d02tht.pdf   (full texts file)

Example 2:

Wong Ah Seng, is a UTM staff who studied for his PhD overseas. The thesis is approved in the year 2002 and declared open access. He is a staff of Faculty of Social Sciences and Humanities and his staff number is 1234.

Therefore, the file should be labelled as:

      <name> = wongahseng

<degree> = is derived as defined in Table 5.1 below

<Faculty> = is derived as defined in Table 5.1 below

<mode of study> = is derived as defined in Table 5.1 below

<matricno> = 31234

<p> = 1

<tt> = 02

<ss> = tt

Table 5.1   Degree, Faculty and Type of Study's code

DEGREE	FACULTY	TYPE OF STUDY
P – Doctorate	A – Faculty of Engineering	1 – course work
M – Master	B – Faculty of Social Sciences and Humanities	2 – course work and research
U – Undergraduate	C – Faculty of Science	3 - research
	D – Faculty of Built Environment and Surveying	
	E – Azman Hashim International Business School	
	F - Razak Faculty of Technology and Informatics	
	G – Malaysia Japan International Institute of Technology	
	H – Other institutions	

The files should be named as follows:

wongahsengPB31234l02ttp.pdf   (pre-access file)

wongahsengPB31234l02ttt.pdf   (full texts file)

UTM staffs studying in other universities are still required to submit an ETD to the library and the file names for the above example should be follows:

norfaezahPH37171l01sup.pdf   (Pre-access file)

norfaezahPH37171l01sup.pdf   (Full text file)

vi.   If the status of a thesis is CONFIDENTIAL or RESTRICTED, the pre-access file must contain only information that can be distributed. A full text file is still required for archive.

vii.   ETD must be submitted using high quality CD with details of the file printed on a CD cover sticker and placed in a CD casing

viii.   Two (2) CD with three (3) copies of the bound thesis must be submitted to SPS together with the ETD Verification form. Example of ETD Verification form is shown in Appendix V.

Appendix A   Sample of thesis front cover (for viva-voce submission)

5 cm

TITLE IN CAPITAL LETTERS
TITLE IN CAPITAL LETTERS
TITLE IN CAPITAL LETTERS
TITLE IN CAPITAL LETTERS

3.25 cm

3.25 cm

WAN ZUKI AZMAN WAN MUHAMAD

UNIVERSITI TEKNOLOGI MALAYSIA

5 cm

Appendix B   Example of thesis declaration form

UNIVERSITI TEKNOLOGI MALAYSIA

DECLARATION OF THESIS / UNDERGRADUATE PROJECT REPORT AND COPYRIGHT

Author's full name   :

Date of Birth   :

Title   :

Academic Session   : **2018/2019**

I declare that this thesis is classified as:

☐ **CONFIDENTIAL**   (Contains confidential information under the Official Secret Act 1972)*

☐ **RESTRICTED**   (Contains restricted information as specified by the organization where research was done)*

☑ **OPEN ACCESS**   I agree that my thesis to be published as online open access (full text)

1. I acknowledged that Universiti Teknologi Malaysia reserves the right as follows:
2. The thesis is the property of Universiti Teknologi Malaysia
3. The Library of Universiti Teknologi Malaysia has the right to make copies for the purpose of research only.
4. The Library has the right to make copies of the thesis for academic exchange.

Certified by:

SIGNATURE OF STUDENT	SIGNATURE OF SUPERVISOR
721601-01-8890	AP. DR. KHAIRUR RIJAL JAMALUDIN
MATRIC NUMBER	**NAME OF SUPERVISOR**
Date: 20 JUNE 2015	Date: 20 JUNE 2015

NOTES : If the thesis is CONFIDENTIAL or RESTRICTED, please attach with the letter from the organization with period and reasons for confidentiality or restriction

Appendix C   Example of a thesis status declaration letter

Date

Librarian
Perpustakaan UTM
UTM, Skudai
Johor

Sir,

CLASSIFICATION OF THESIS AS RESTRICTED
- TITLE AND NAME OF AUTHOR'S

Please be informed that the above mentioned thesis entitled *" TITLE"* be classified
as RESTRICTED for a period of three (3) years from the date of this letter. The
reasons for this classification are

    (i)

    (ii)

    (iii)

Thank you.

Sincerely yours,
NAME, ADDRESS, TELEPHONE NUMBER OF SUPERVISOR

Note: This letter should be written by the supervisor, addressed to Perpustakaan
UTM and a copy attached to the thesis.

NOTES: *   If the thesis is CONFIDENTAL or RESTRICTED, please attach with the letter from
the organization with period and reasons for confidentiality or restriction.

Appendix D1   Sample of Supervisor's Declaration

"I/We hereby declare that we have read this thesis and in my/our opinion this thesis is suffcient in term of scope and quality for the award of the degree of Doctor of Philosophy (Specialization)"

Signature   :   _____

Name of Supervisor I   :   KHAIRUR RIJAL JAMALUDIN

Date   :   9 MAY 2017

Signature   :   _____

Name of Supervisor II   :   NOOR HAZARINA HASHIM

Date   :   9 MAY 2017

Signature   :   _____

Name of Supervisor II   :   MOHD ZULI JAAFAR

Date   :   9 MAY 2017

BAHAGIAN A - Pengesahan Kerjasama*

Adalah disahkan bahawa projek penyelidikan tesis ini telah dilaksanakan melalui

kerjasama antara _____ dengan _____

Disahkan oleh:

Tandatangan :   Tarikh :

Nama :

Jawatan :

(Cop rasmi)

* Jika penyediaan tesis atau projek melibatkan kerjasama.

═══

BAHAGIAN B - Untuk Kegunaan Pejabat Sekolah Pengajian Siswazah/Fakulti

Tesis ini telah diperiksa dan diakui oleh:

Nama dan Alamat Pcmeriksa Luar   **:**

Nama dan Alamat Pcmeriksa Dalam   **:**

Nama Penyelia Lain (jika ada)   **:**

Disahkan oleh Timbalan Pendaftar di SPS:

Tandatangan   :   Tarikh :

Nama   :

Appendix E   Example of a title page

ENHANCED PARTICLE SWARM OPTIMIZATION
TITLE

TITLE

TITLE

WAN ZUKI AZMAN WAN MUHAMAD

A thesis submitted in fulfilment of the

requirements for the award of the degree of

Doctor of Philosophy (specialisation)

School of Chemical and Energy Engineering

Faculty of Engineering

Universiti Teknologi Malaysia

JUNE 2018

Appendix F   Sample of a declaration page

DECLARATION

I declare that this thesis entitled *"title of the thesis"* is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature   :   ....

Name   :   WAN ZUKI AZMAN WAN MUHAMAD

Date   :   10 NOVEMBER 2016

Appendix G   Example of a dedication

DEDICATION

This thesis is dedicated to my father, who taught me that the best kind of knowledge to have is that which is learned for its own sake. It is also dedicated to my mother, who taught me that even the largest task can be accomplished if it is done one step at a time.

Appendix H   Example of an acknowledgement page

ACKNOWLEDGEMENT

4 lines spacing

1.27 cm (0.5 inch)

In preparing this thesis, I was in contact with many people, researchers, academicians, and practitioners. They have contributed towards my understanding and thoughts. In particular, I wish to express my sincere appreciation to my main thesis supervisor, Professor Dr. Mohd Shariff Nabi Baksh, for encouragement, guidance, critics and friendship. I am also very thankful to my co-supervisor Professor Dr Awaluddin Mohd Shaharoun and Associate Professor Dr. Hishamuddin Jamaluddin for their guidance, advices and motivation. Without their continued support and interest, this thesis would not have been the same as presented here.

I am also indebted to Universiti Teknologi Malaysia (UTM) for funding my Ph.D study. Librarians at UTM, Cardiff University of Wales and the National University of Singapore also deserve special thanks for their assistance in supplying the relevant literatures.

My fellow postgraduate student should also be recognised for their support. My sincere appreciation also extends to all my colleagues and others who have provided assistance at various occasions. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space. I am grateful to all my family member.

Appendix I   Example of an abstract in English

ABSTRACT

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The purpose of this study is to investigate the application of genetic algorithm (GA) in modelling linear and non-linear dynamic systems and develop an alternative model structure selection algorithm based on GA. Orthogonal least square (OLS), a gradient descent method was used as the benchmark for the proposed algorithm. A model structure selection based on modified genetic algorithm (MGA) has been proposed in this study to reduce problems of premature convergence in simple GA (SGA). The effect of different combinations of MGA operators on the performance of the developed model was studied and the effectiveness and shortcomings of MGA were highlighted. Results were compared between SGA, MGA and benchmark OLS method. It was discovered that with similar number of dynamic terms, in most cases, MGA performs better than SGA in terms of exploring potential solution and outperformed the OLS algorithm in terms of selected number of terms and predictive accuracy. In addition, the use of local search with MGA for fine-tuning the algorithm was also proposed and investigated, named as memetic algorithm (MA). Simulation results demonstrated that in most cases, MA is able to produce an adequate and parsimonious model that can satisfy the model validation tests with significant advantages over OLS, SGA and MGA methods. Furthermore, the case studies on identification of multivariable systems based on real experiment t al data from two systems namely a turbo alternator and a continuous stirred tank reactor showed that the proposed algorithm could be used as an alternative to adequately identify adequate and parsimonious models for those systems.

Appendix J   Example of an abstract in Bahasa Melayu

ABSTRAK

4 lines spacing

1.27 cm (0.5 inch)

Kajian ini dilakukan bertujuan mengkaji penggunaan algoritma genetik (GA) dalam pemodelan sistem dinamik linear dan tak linear dan membangunkan kaedah alternatif bagi pcmilihan struktur model menggunakan GA. Algorithma kuasa dua terkecil ortogon (OLS), satu kaedah penurunan kecerunan digunakan sebagai bandingan bagi kaedah yang dicadangkan. Pcmilihan struktur model mengunakan kaedah algoritma genetik yang diubahsuai (MGA) dicadangkan dalam kajian ini bagi mengurangkan masalah konvergens pramatang dalam algoritma genetik mudah (SGA). Kesan penggunaan gabungan operator MGA yang berbeza ke atas prestasi model yang terbentuk dikaji dan keberkesanan serta kekurangan MGA diu t arakan. Kajian simulasi dilakukan untuk membanding SGA, MGA dan OLS. Dengan meggunakan bilangan parametcr dinamik yang setara kajian ini mendapati, dalam kebanyakan kes, prestasi MGA adalah lebih baik daripada SGA dalam mencari penyelesaian yang berpotensi dan lebih berkebolehan daripada OLS dalam menentukan bilangan sebutan yang dipilih dan ketcpatan ramalan. Di samping itu, penggunaan carian tcmpatan dalam MGA untuk menambah baik algorithma tersebut dicadang dan dikaji, dinamai sebagai algoritma mcmetic (MA). Hasil simulasi menunjukkan, dalam kebanyakan kes, MA berkeupayaan menghasilkan model yang bersesuaian dan parsimoni dan mcmenuhi ujian pengsahihan model di samping mcmperolehi beberapa kelebihan dibandingkan dengan kaedah OLS, SGA dan MGA. Tambahan pula, kajian kes untuk sistcm berbilang pcmbolehubah menggunakan data eksperimental sebenar daripada dua sistem iaitu sistem pengulang-alik turbo dan reaktor teraduk berterusan menunjukkan algoritma ini boleh digunakan sebagai alternatif untuk mcmperolehi model termudah yang memadai bagi sistcm tersebut.

Appendix K   Example of a table of contents page

TABLE OF CONTENTS

4 lines spacing

Appendix L   Example of a list of tables page

<div align="center">

LIST OF TABLES

4 lines spacing

</div>

Appendix M   Example of a list of figures page

Appendix N   Example of a list of abbreviations page

LIST OF ABBREVIATIONS

4 lines spacing

ANN   -   Artificial Neural Network

UTM   -   Universiti Teknologi Malaysia

MTS   -   Mahalanobis Taguchi System

TM   -   Taguchi Method

MD   -   Mahalanobis Distance

Appendix O   Example of a list of symbols page

LIST OF SYMBOLS

4 lines spacing

δ   -   Minimal error

F   -   Force

g   -   Gravity=9.81 m/s

D, g   -   Diameter

Appendix P   Example of a list of appendices page

LIST OF APPENDICES

4 lines spacing

CHAPTER 1

3 times SHIFT + ENTER

INTRODUCTION (Heading 1)

4 lines spacing

1.1   Problem Background (Heading 2)

1.27 cm (0.5 inch)   *2 lines spacing*

Video provides a powerful way to help you prove your point. When you click Online Video, you can paste in the embed code for the video you want to add. You can also type a keyword to search online for the video that best fits your document. To make your document look professionally produced, Word provides header, footer, cover page, and text box designs that complement each other. For example, you can add a matching cover page, header, and sidebar. *"For the first paragraph, use 'Para 2 lines' style"*

2 lines spacing

Video provides a powerful way to help you prove your point. When you click Online Video, you can paste in the embed code for the video you want to add. You can also type a keyword to search online for the video that best fits your document. To make your document look professionally produced, Word provides header, footer, cover page, and text box designs that complement each other. For example, you can add a matching cover page, header, and sidebar. Click Insert and then choose the elements you want from the different galleries. Themes and styles also help keep your document coordinated. When you click Design and choose a new Theme, the pictures, charts, and SmartArt graphics change to match your new theme. *"For the last paragraph/single paragraph in the section, use 'Para 4 lines' style"*

4 line spacing

1.2   Problem Background

2 lines spacing

Video provides a powerful way to help you prove your point. When you click Online Video, you can paste in the embed code for the video you want to add. You can also type a keyword to search online for the video that best fits your document.

3.25 cm   *3.25 cm*

2.5 cm

2.5 cm

To make your document look professionally produced, Word provides header, footer, cover page, and text box designs that complement each other. For example, you can add a matching cover page, header, and sidebar. Click Insert and then choose the elements you want from the different galleries.

2 lines spacing

Themes and styles also help keep your document coordinated. When you click Design and choose a new Theme, the pictures, charts, and SmartArt graphics change to match your new theme. When you apply styles, your headings change to match the new theme. Save time in Word with new buttons that show up where you need them. To change the way a picture fits in your document, click it and a button for layout options appears next to it. When you work on a table, click where you want to add a row or a column, and then click the plus sign.

4 line spacing

1.3   Problem Statement

1.4   Research Goal (Heading 3)

1.5   Research Objectives

(a)   To formulate the mathematical model ….

(b)   To design the ….

(c)   To compare and validate the performance …

1.6   Quotation

After deliberating on doctoral education in Australia in the 1990s, one observer I Australia writes:

1.27 cm (0.5 inch)

1.27 cm (0.5 inch)

The lack of any significant formal course work within our Ph.D. and master degrees by research has continued for three decades. The focus of our Ph.D. research type degrees continues to be the research project, and this is almost the only medium by which education is accomplished.

(Stranks, 1984:171)

1.7   Equation

$$y = mx + c \qquad (1.1)$$

Equation (1.1) is a linear equation.

$$MD = D^2 = \frac{1}{k} ZC^{-1} Z^T \qquad (1.2)$$

Mahalanobis distance is calculated using Equation (1.2).

Appendix S1　Sample of a table in the text
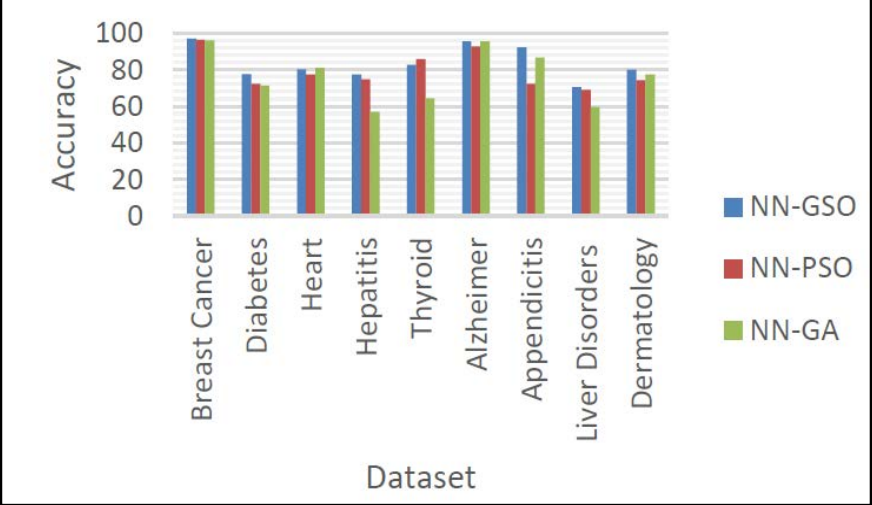
Table 1.1　Optimality of proposed greedy algorithms

Test Case	No. of Tasks	No. of SW Cores	Optimality (%)	
			Alg-greedy1	Alg-greedy2
MP3	16	2	94.2	77.1
MP3	16	3	92.1	84.1
JPEG	22	2	95.0	90.9
Random1	14	2	93.2	90.3
Random2	14	3	87.3	93.0
Random3	7	3	87.3	94.7
Random4	7	2	85.2	82.1

Table 2.2　Comparison of experimental and computer simulation results with different distance ratio (Revelle and Harrington, 2017)

Distance Ratio	Experiment (mean value)	Computer Simulation (mean value)
0.500	0.75	0.861
0.625	0.83	0.939
0.750	0.88	0.981
0.875	0.93	0.997
1.000	1.00	1.000

Adapted from UTM Thesis Manual 2015.

Table 3.3   Description of Datasets

Data Set	Attributes	Classes	Samples
Breast cancer	9	2	683
Diabetes	8	2	768
Heart	13	2	297
Hepatitis	19	2	155
Thyroid	21	3	2069

Figure 1.1   Comparison of the average accuracy on the testing set.
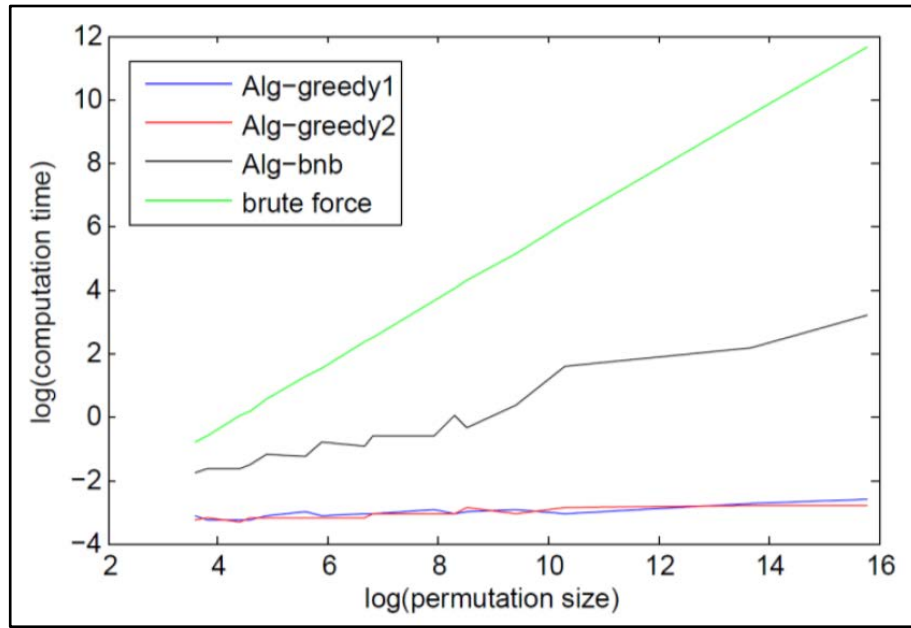
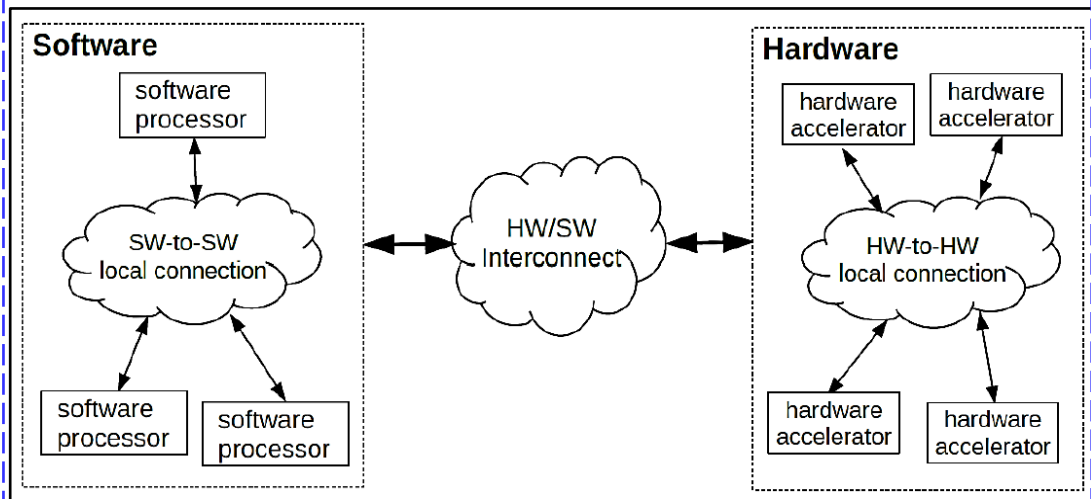Figure 2.2   Critical time-to-area constraint result of MP3 and JPEG streaming

Figure 3.3   Communications among hardware and software tasks in a multi-core architecture (Cheng, 2018)

Appendix U   Sample of list of publications page

LIST OF PUBLICATIONS

Journal with Impact Factor

1.   **Qasem, S. N**., Shamsuddin, S. M., Hashim, S. Z. M., Darus, M., & Al-Shammari, E. (2013). Memetic multiobjective particle swarm optimization-based radial basis function network for classification problems. *Information Sciences*, *239*, 165–190. https://doi.org/10.1016/j.ins.2013.03.021. **(Q1, IF: 4.305)**

2.   **Qasem, S. N**., & Shamsuddin, S. M. (2011). Radial basis function network based on time variant multi-objective particle swarm optimization for medical diseases diagnosis. *Applied Soft Computing*, *11*(1), 1427–1438. https://doi.org/10.1016/j.asoc.2010.04.014. **(Q1, IF:3.907)**

Indexed Journal

1.   **Shen, L. W**., Asmuni, H., & Weng, F. C. (2015). A modified migrating bird optimization for university course timetabling problem. *Jurnal Teknologi*, *72*(1), 89–96. https://doi.org/10.11113/jt.v72.2949. **(Indexed by SCOPUS)**

Non-indexed Journal

1.

Indexed Conference Proceedings

1.   **Muhamad, W. Z. A. W**., Jamaludin, K. R., Ramlie, F., Harudin, N., & Jaafar, N. N. (2017). Criteria selection for MBA programme based on the mahalanobis Taguchi system and the Kanri Distance Calculator. In *2017 IEEE 15th Student Conference on Research and Development (SCOReD)* (pp. 220–223). IEEE. https://doi.org/10.1109/SCORED.2017.8305390. **(Indexed by SCOPUS)**

Non-Indexed Conference Proceedings

1.

71

Appendix V   Sample of an e-thesis declaration/validation form

School of Graduate Studies

Universiti Teknologi Malaysia

VALIDATION OF E-THESIS PREPARATION

Title of the thesis : _____
_____
_____
_____

Degree: _____
Faculty: _____
Year: _____

I _____
(CAPITAL LETTER)
declare and verify that the copy of e-thesis submitted is in accordance to the
Electronic Thesis and Dissertation's Manual, School of Graduate Studies, UTM

_____   _____
(Signature of the student)   (Signature of supervisor as a witness)
Permanent address:

_____   **Name of Supervisor**:_____

_____
_____   **Faculty**: _____
_____

Note: This form must be submitted to SPS together with the CD.