

ATILIM UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
INSTRUCTIONS FOR PREPARATION OF THESES

1. GENERAL POLICIES

Every thesis accepted for an advanced degree is a mature piece of original research. Just as the research must be precise and complete to meet program standards, the presentation of that research must be equally precise and complete to meet Graduate School standards.

In addition, each manuscript must meet library and archival standards or permanence. Hence it is essential to use paper of the prescribed quality and to follow directions for the preparation of illustrative materials exactly.

Each copy should include a diskette/cd containing the thesis in pdf or any other format accepted by the institute.

The purpose of these guidelines is to ensure that every thesis which will carry the name of Atilim University meets the same high standards of presentation. These standards are for Graduate School of Natural and applied Sciences and are applied consistently to all departments and programs under it.

2. FORMAT AND APPEARANCE

2.1 Paper and Duplication

To insure durability, permanency, and opacity, all copies must be on good quality white bond paper, measuring 21 by 29.7 cm (A4). Only single-sided copies will be accepted.

Submission of the original copy is not required. Photocopies must be made from the original, and all pages must have high contrast with consistently dark print for lettering throughout the thesis. The print must be permanent; it must not smudge. Colored figures and pictures may be included within the text area. All pages must be copied onto acceptable paper, as described above. ***Inferior copies and copies not made on approved paper will not be accepted.*** It is recommended that you work with a reputable copying firm or bindery when having your thesis reproduced.

2.2 Type

The type size should be 12. Only Times New Roman is acceptable. Do not use script, or ornamental fonts. ***The typeface and size must be consistent throughout the thesis.*** Bold face letters and symbols, and italics may be used for special emphasis and foreign words.

In the body of the thesis, Bold face Times New Roman typeface and 14 font size should be used to set chapter titles. For section headings type face should be Times New Roman and font size should be 12

All print must be in permanent black ink and must appear on only one side of each page.

No ink corrections, strikeouts, correction fluid or tape, paste-ups, insertions between lines, and leterset are permitted on the final bound copies. If you must make corrections, do them on the original manuscript before it is copied (but not by ink corrections and strikeouts which are never allowed).

2.3 Spacing

The general text of the manuscript must use one and one-half line spacing, although tables, long quotations, footnotes, endnotes, bibliographies, and captions may be single-spaced.

2.4 Margins

The left margin (binding side) must be 4 cm wide to allow for binding; the other three margins must be 2.5 cm wide. *Absolutely nothing must appear in the margins.* This means that all headings, page numbers, text, tables, illustrations, etc., must be contained completely within the area bounded by the margins.

If right justification is used without hyphenation, right-justified text containing long technical and scientific words may result in unsightly white spaces between words which are not acceptable.

2.5 Centering

All materials must be centered between the text margins rather than between paper edges. After the manuscript is bound, centered material will appear to be centered on the page.

2.6 Pagination

All page numbers of the thesis or dissertation must appear on the bottom center of the page. The following pagination plan should be used:

a) For the preliminary pages, use small Roman numerals (i, ii, iii, iv, etc.). The Title page and the Approval page do not have numbers but count as pages i and ii, respectively. Actual page numbering begins with iii on the Abstract page.

b) Use Arabic numerals beginning with "1" on the first page of the text and continue throughout the rest of the thesis, including bibliography and appendices.

2.7 Multiple Volumes

If your finished manuscript exceeds 5 cm in thickness it must be bound in two or more volumes. Volumes are numbered consecutively, using capital Roman numerals. Each additional volume must contain a title page. Title pages are identical except for the notation Volume I, Volume II, etc., just below the title to differentiate the volumes.

2.8 Binding

All PhD theses are to be bound in **claret red (bordo)** cloth. Synthetic, leatherette, or similar cloths are not acceptable. A bound copy of the thesis should measure 21.5 by 28.5 cm.

See Appendix A for the front cover and the spine.

3. SPECIFIC GUIDELINES FOR THE PARTS OF THE THESIS

Every thesis has three main parts or divisions: the preliminary pages, the text, and the reference matter. You must follow the order of items within these parts as listed below. *Required sections are marked with asterisk. Further instruction about each section follows this list.*

PRELIMINARY PAGES

* Title Page

* Approval Page

* Abstract

* Öz

Dedication

Acknowledgments

* Table of Contents

List of Tables

List of Figures

List of Illustrations

List of Symbols and/or Abbreviations

TEXT

* Main Body

REFERENCE MATTER

* Bibliography or References

Appendices (May be placed before Bibliography or References)

3.1 PRELIMINARY PAGES

3.1.1 Title page

The title must be single-spaced, in all capital letters, and should begin at 5 cm from the top of the page. Consequently, *the title must not contain any formula, symbol, superscript, subscript, Greek letter, or other non-standard abbreviation and character.* The format of the title page should be applied to the cover page. Right faced lettering of the thesis title only is required on the binding surface in the same format of the title page.

The format of the title page, including spacing and capitalization must be exactly as in the sample title page shown in Appendix B.

3.1.2 Approval page

A sample Approval Page is provided in Appendix C. It is strongly recommended that the approval page of the thesis be signed in black ink.

3.1.3 Abstract

The abstract gives a succinct account of the thesis or dissertation, including a statement of the problem, procedure and methods, results, and conclusions. It must not exceed 250 words, must not include diagrams, and should not include mathematical formulas unless essential.

A sample Abstract is provided in Appendix D.

3.1.4 Öz

Öz is the Turkish translation of the Abstract. A sample Öz is provided in Appendix E.

3.1.5 Dedication, acknowledgments, and preface

These are optional. If included, each of these items must appear on a separate page. A heading for the dedication is not required, but it must have a page number. If used, the dedication must be brief and centered on the page..

They must have headings and should use the same spacing as the text (i.e., double spacing or space and a half). The heading **ACKNOWLEDGMENTS** or **PREFACE** appears centered between the text margins without punctuation 5 cm from the top of the page; text begins at least three spaces below the heading.

Examples of Dedication and Acknowledgments are provided in Appendices F and G respectively.

3.1.6 Table of contents

The table of contents must list the title of each chapter and its parts and sections, references or bibliography, appendices. The wording used for all entries in the table of contents must match exactly with what is used in the text. Each entry must have leader dots which connect it to its corresponding page number.

The heading **TABLE OF CONTENTS** should be centered between the text margins 5 cm from the top of the page. The listing of actual contents begins at the left margin at least three spaces below the heading. A sample Table of Contents is provided in Appendix H.

3.1.7 List of tables

A list of tables may be included for the convenience of the reader. If included, it will immediately follow the table of contents on a new page.

The heading **LIST OF TABLES** appears centered between the text margins without punctuation 5 cm from the top of the page; the listing begins at the left margin at least three spaces below the heading.

A sample List of Tables is provided in Appendix I.

3.1.8 List of figures or list of illustrations

If included, these lists must appear on separate pages and are governed by the same rules as the list of tables. A sample List of Figures is provided in Appendix J.

3.1.9 List of symbols and/or abbreviations

If included, you should follow a format consistent with acceptable practice in your discipline.

3.2 THE TEXT

The text, or the body of a thesis, should be divided into multiple chapters. *All headings and subheadings should be presented in the same way in each chapter, in terms of capitalization, placement on the page and kind of type used.*

Chapters are numbered consecutively in Arabic or Roman numerals and capital letters (CHAPTER 1, CHAPTER 2, etc., or CHAPTER I, CHAPTER II, etc.) and should begin with a new page. Within a chapter, the presentation of subsections must be continuous;

The heading "CHAPTER 1" in all capitals is centered between the text margins 5 cm from the top of the page; the title goes two spaces below. The text begins at least three spaces below.

3.2.1 Illustrative material

Illustrations of one-half page or less in length may appear on the same page with the text, separated from the text above and below by triple spacing; illustrations longer than one-half page are better placed on a separate sheet.

Illustrations that are too large to be placed sideways between the left- and right-hand margins should be rotated counterclockwise 90 degrees so that the of the illustration runs parallel to the left-hand margin of the page. The caption or legend for such an illustration must also be rotated. When illustrations are presented in this manner, the usual margin requirements remain in effect, and page numbers should appear in their normal place.

Illustrations of any kind must be numbered consecutively. This includes appendices, if you have them. You may follow a straight sequence (1, 2, 3, etc.) or use a decimal approach (1.1, 1.2, 1.3,..., A.1, A.2, where the first digit is the chapter or appendix number, and the digit after the decimal point is the illustration number).

Illustrations may run longer than one page. In such cases all subsequent pages of the illustration must include at least the illustration number and the notation that it is continued, e.g., "Table 1 (cont.)" or "Table 1 (continued)."

All headings and captions must be prepared either in the same typeface and point size used for the text, or in the same typeface and point size as every other heading and caption. Choose a point size that can be read easily, especially for tables.

Table numbers and captions are placed one space above the top line of the illustration; figure numbers and captions are placed one space below the last line or bottom of the illustration.

3.2.2 Formulas

Mathematical and chemical formulas, equations and expressions may be printed, neatly hand-lettered, or both. If reference is made to them, they must carry numerical identification. All hand-lettered pages require priorapproval of the Graduate School.

3.2.3 Footnotes and endnotes

Notes may be in the form of footnotes, placed at the bottom of each page. Footnotes must be separated from the text by a complete horizontal line one space above the first line of the footnote.

Arabic numerals, asterisks or small letters should be used for footnotes.

3.3 THE REFERENCE MATERIAL

The reference material consists of a bibliography or references, which is required, and appendices, which are optional.

3.3.1 References

A reference is a selected list of all books, articles, and other source material related to the thesis research and is always in alphabetical order, with the author's last name first.

List all of the references at the end of the thesis in a section headed "References" or "List of References". The references in the thesis are cited by year, e.g, Smith (1966), or by number, e.g., Smith [3] or [3]. If numbers are used, the listing should be in numerical order, and the author's last name need not be first.

- a) Do not give references a chapter number, but it must have page numbers written in the same typeface and size used for pagination throughout the thesis.
- b) The heading **REFERENCES** is centered between the text margins without punctuation 5 cm from the top of the page; the list begins four spaces below.
- c) Each reference entry should be single-spaced with double spacing between entries.
- d) *The candidate's major department should be consulted for a reference style that is appropriate to the discipline and acceptable to the department.*

3.3.2 Appendices

An appendix may contain test forms, detailed apparatus description, extensive tables of raw data, computer programs, data records on a cd, etc.

- a) If the information to be appended requires more than one appendix, each should be given a letter (Appendix A, Appendix B, etc.).
- b) The heading APPENDIX A should appear centered between the text margins 5 cm from the top of the page. The typeface and size should be those used for chapter titles.
- c) Each appendix with its title must be listed separately in the table of contents as a subdivision under the heading APPENDICES.
- d) All appendices must have page numbers written in the same typeface and size used for pagination throughout the thesis.
- e) If an appendix contains photocopied material, the photocopies should be of letter quality.
- f) A data CD as an appendix should be prepared write protected and placed in a tightly glued envelope on the inside page of the back cover.

**CONSTRUCTION OF A QUALITY CONTROL SYSTEM:
“TAGUCHI METHOD”**

A DOCTOR OF PHILOSOPHY (PhD) THESIS

in

Modeling and Design of Engineering Systems (MODES)

Atilim University

by

HASAN USTAOGU

JUNE 2004

**CONSTRUCTION OF A QUALITY CONTROL SYSTEM:
“TAGUCHI METHOD”**

**A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF**

ATILIM UNIVERSITY

BY

HASAN USTAOGU

**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF**

DOCTOR OF PHILOSOPHY

IN

**MODELING AND DESIGN OF ENGINEERING SYTEMS (MODES) PhD
PROGRAM**

JUNE 2004

Approval of the Graduate School of Natural and Applied Sciences, Atılım University.

(Title and Name)

Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Doctor of Philosophy.

(Title and Name)

Program Chair

This is to certify that we have read the thesis “Thesis Name” submitted by “Candidates Name” and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Doctor of Philosophy.

(Title and Name)

Co-Supervisor

(Title and Name)

Supervisor

Examining Committee Members

.....
.....
.....
.....
.....

Date: (Thesis defence date)

I declare and guarantee that all data, knowledge and information in this document has been obtained, processed and presented in accordance with academic rules and ethical conduct. Based on these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last name:

Signature:

ABSTRACT

**CONSTRUCTION OF A QUALITY CONTROL SYSTEM:
“TAGUCHI METHOD”**

Ustaoglu, Hasan

PhD in Modeling and Design of Engineering Systems (MODES)

Supervisor: Assoc.Prof.Dr. Emre Seekin

Co-Supervisor: Prof.Dr. Ahmet Kayali

June 2004, 56 pages

This thesis reviews the quality control systems and introduces Taguchi Method in detail. An implementation by using Taguchi Method involving experimental design is then given.

Keywords: Quality control, Taguchi method

ÖZ

KALİTE KONTROL SİSTEMİ GELİŞTİRİMİ: TAGUCHI YÖNTEMİ

Ustaoglu, Hasan

Doktora, Mühendislik Sistemlerinin Modellenmesi ve Tasarımı

Tez Yöneticisi: Doç. Dr. Emre Seçkin

Ortak Tez Yöneticisi: Prof.Dr. Ahmet Kayalı

Haziran 2004, 56 sayfa

Bu çalışma, kalite kontrol sistemlerini incelemekte ve Taguchi metodunu detayı ile vermektedir. Taguchi yöntemi ile deneysel tasarımı kapsayacak şekilde bir uygulama gerçekleştirilmiştir.

Anahtar Kelimeler: Kalite kontrol, Taguchi yöntemi

Appendix F. Sample Dedication

To My Parents

ACKNOWLEDGMENTS

I express sincere appreciation to my supervisor Assoc.Prof.Dr. Emre Seckin for his guidance and insight throughout the research. Thanks also go to my co-supervisor Prof.Dr. Ahmet Kayali. The technical assistance of Ali Can, Veli Deger, and Fatma Ozen is gratefully acknowledged. To my wife, Hale, I offer sincere thanks for her continuous support and patience during this period.

TABLE OF CONTENTS

ABSTRACT	iii
OZ	iv
DEDICATION.....	v
ACKNOWLEDGMENTS	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	ix
LIST OF FIGURES	xi
LIST OF ABBREVIATIONS.....	xii
CHAPTER	
1. INTRODUCTION	1
1.1 Statement of the Problem	1
1.2 Scope and Outline of the Thesis	3
2. BACKGROUND INFORMATION AND LITERATURE SURVEY	5
2.1 The meaning and Importance of Quality	5
2.3 Literature Survey	10
3. TAGUCHI METHODOS	16
3.1 Quality Function Development (QFD)	16
3.1.1 The Basic structure	16

3.1.2 The Basic Objective	18
3.2 Loss Function	20
4. Empirical Data and Their Collection	28
4.1 Curve fitting by regression analysis	28
4.2 Data Analyses	28
5. CONCLUSIONS	47
REFERENCES	51
APPENDICES	
A. DATA RELATIVE TO CHAPTER 1	53
B. DATA RELATIVE TO CHAPTER 3	64

LIST OF TABLES

TABLE

1. Occurrence of stipples on leaves of hybrid poplar clones that were given varying doses of ozone36

2. Occurrence of flecks on leaves of hybrid poplar clones that were given varying doses of ozone 39

3. Occurrence of chlorosis on leaves of hybrid poplar clones that were given varying doses of ozone 41

4. Occurrence of leaf drop from hybrid poplar clones that were given varying doses of ozone 44

5. Occurrence of fungal lesions on leaves of hybrid poplar clones that were given varying doses of ozone 45

OR

1.1 Peroxidase activity as BEP in leaves at three positions along the stems of ozone-fumigated hybrid poplars 48

1.2 Correlation coefficients between peroxidase activity and ozone doses in top, middle, and bottom leaves of hybrid poplars 49

10.1 Peroxidase activity as DEP in leaves at three positions	
along the stems of ozone-fumigated hybrid poplars	51

LIST OF FIGURES

FIGURES

1. Tagged plants of clone NE-252. Photograph was made after 6 weeks of fumigation with ozone at 10 ppm 28
2. Flow diagram of peroxidase extraction procedure 30

OR

- 1.1 Tagged plants of clone NE-252. Photograph was made after 6 weeks of fumigation with ozone at 10 ppm 28
- 2.1 Flow diagram of peroxidase extraction procedure 30

LIST OF ABBREVIATIONS

ER	-	Entity Relationship
I/O	-	Input/Output
PC	-	Personal Computer