

Final Year Project (FYP) Guide Book

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Preamble

This is the Final year project (FYP) guide book for the BSc Mechanical Engineering program of Mechanical, Mechatronics and Manufacturing Engineering Department, KSK Campus, UET Lahore. This book has thorough guidelines of the FYP activities from start to the completion. Each FYP stage and its relevant assessment, rubrics and format have been properly defined in this book for the students and Faculty supervisors.

The purpose of this guide book is to streamline the guidelines, and to implement the uniform policy related to FYP for the undergraduate students. It also serves the purpose to set uniform assessment criterion for Faculty supervisors and the external examiners.

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Revision history

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Note: Please always refer to the most updated version

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1.1. Introduction

Final Year Project (FYP) is a partial fulfilment for the award of degree in BSc Mechanical Engineering. FYP is a culminating experience, typically the last checkpoint, before students graduate into the engineering profession. It is spread over the last two semesters of the degree program. FYP assesses a range of technical, professional and personal skills of the students under the Program Learning Outcomes (PLOs) defined by the Pakistan Engineering Council (PEC). FYP is ideally assumed to be the solution of a certain problem that the society has been facing, and generally, all FYPs of the department are based on Sustainable Development Goals (SDGs). Students are called for to carry out research and the development work on their chosen topic of study. This will inspire students to create practical solution(s) of the engineering problems using the modern tools, methods and techniques.

Working under the supervision of Faculty will assist students to create the road map of their career. It will also help them to enlighten with the spirit of team work, ethics, leadership, project management, communication skills and the lifelong learning traits. Thus, this guide book is developed for students and faculty supervisors to perform their roles and responsibilities in an efficient way.

1.2. Objectives

FYP desires to establish a skeleton which will amplify the abilities of students in the activity of applying engineering knowledge, inflating ideas, resolving problems autonomously and interpreting result outcomes with minimum supervision.

1.3. Overview and Scope of FYP

The FYP can be a product design or a prototype, modelling and simulation, applied research or it can be the solution of the real industrial or societal problems. FYP is a two-semester activity in which 2-4 students choose a project or topic by themselves or they can select it from the project list provided by the Faculty members. Students must undergo the multiple assessments from title defense to final thesis report in order to complete the requirements of the FYP.

1.4. Program Learning Outcomes (PLOs)

- (i) **Engineering Knowledge:** An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
- (ii) **Problem Analysis:** An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
- (iii) **Design/Development of Solutions:** An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- (iv) **Investigation:** An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.
- (v) **Modern Tool Usage:** An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.
- (vi) **The Engineer and Society:** An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.
- (vii) **Environment and Sustainability:** An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
- (viii) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
- (ix) **Individual and Team Work:** An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.
- (x) **Communication:** An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- (xi) **Project Management:** An ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.
- (xii) **Lifelong Learning:** An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

1.5. Course Learning Outcomes (CLOs) of FYP

Sr#	CLO's	PLO	Domain Level
1	Describe the scope and objectives of his/her project/research work using the fundamental knowledge and skills acquired during first three years of engineering.	PLO-1	C2
2	Analyze the problem statement of his/her project/research work in accordance with the existing literature.	PLO-2	C4
3	Design/develop theoretical calculations/numerical simulations/experimentation/physical model to complete his/her research/project work.	PLO-3	C6
4	Analyze/compare the developed solution by means of simulation/existing literature relevant to his/her project/research work.	PLO-4	C4
5	Select modern IT and engineering tools to carry out his/her project/research work.	PLO-5	C6
6	Demonstrate outcomes/results of his/her research/project work have positive societal impact.	PLO-6	C3
7	Propose/develop a sustainable engineering solution of the complex engineering problem through his/her project/research work.	PLO-7	C6
8	Display/express professionalism, ethical conduct and moral responsibility in all aspects of his/her research/project work.	PLO-8	A3
9	Exhibit necessary tasks required in completion of his/her research/project work as an individual or as a team member.	PLO-9	A3
10	Explain his/her project/research work in logical/well-planned way in thesis report, poster and in oral presentation by appropriate communication and professional skills.	PLO-10	C2
11	Organize his/her project/research work by practicing management principles including punctuality, commitment, decision making and dedication.	PLO-11	A4
12	Assess/evaluate his/her project/research work in a broader context and pursue autonomous lifelong learning through creativity, innovation and technological advancement.	PLO-12	C5

1.6. Responsibilities and Roles

FYP Committee, Supervisor(s), Co-supervisor(s) and External Examiner(s) are the main stakeholders, other than students, who will evaluate and execute the whole FYP activity. In order to complete the FYP activity within the specified time frame specific roles and responsibilities have been defined for every stakeholder.

1.6.1. FYP Committee

FYP Committee is formed by the Chairman of the department which consists of convener, secretary and members.

1.6.1.1. Convener

The main responsibilities of the Convener are as follows:

- I. To disperse the timely guidelines regarding each FYP activity to students and supervisors.
- II. To compile the list of FYP project titles suggested by faculty members and students.
- III. To assign suitable supervisor(s) to every group according to the area of expertise of supervisor(s).
- IV. To release the final list of approved project titles.

1.6.1.2. Secretary

The main responsibilities of the secretary are as follows:

- I. To co-ordinate committee meetings to appoint External Examiner(s).
- II. To arrange title defense presentations and final defense viva activities.
- III. To collect evaluation sheets from faculty supervisors and from external examiners.
- IV. To compile students' assessment and prepare the overall result.
- V. To keep record of all related documents.

1.6.1.3. Committee members

The main responsibilities of the Committee members are as follows:

- I. To approve the proposed titles.
- II. To nominate External Examiners.
- III. To appoint panels of faculty supervisors for title defense and poster assessment.
- IV. To endorse FYP assessments.

1.6.2. Supervisor(s)

Each group will be supervised by one main supervisor, who has the relevant area of expertise. Their responsibilities are summarized as follows:

- I. To monitor the project schedule and progress of the students.
- II. To guide students in each FYP activity according to the approved format.
- III. To evaluate student's performance in literature review report submission, mid term viva and final thesis report.
- IV. To schedule weekly meeting with the students.
- V. To endorse the requests on purchasing consumables and equipment and forward to the chairman of the department.

1.6.3. Co-Supervisor(s)

Co-supervisor is nominated by the FYP Committee to assist students. The Co-supervisor's responsibilities are summarized as follow:

- I. To guide students in solving specific tasks within his area of expertise.
- II. To represent on behalf of the Supervisor especially during any FYP activity and evaluation.

1.6.4. External Examiner(s)

The FYP Committee appoints the External Examiner(s). The role of the Examiners is to evaluate the overall project and conduct the final viva according to assessment criteria provided by the FYP committee.

1.6.5. Students

Students are the main stake holders of this FYP activity. They are required to showcase their capabilities in order to carry out the FYP by applying fundamental engineering knowledge and modern tools. They can also take initiative of proposing title for the project on their own. The responsibilities of students are as follow:

- I. To either select a FYP title on their own or the one suggested by FYP committee.
- II. To prepare and perform the each FYP activity according to the given guidelines and formats.
- III. To schedule meeting every week with Supervisor and record in project log book.
- IV. To submit all the reports, logs or any other FYP activity within given time frame.
- V. To complete his/her project on time.
- VI. There would be minimum 2 and maximum 4 members in the group.

1.7. FYP Assessment Skelton and Phases

FYP assessment Skelton, its phases and timeline are given in Table 1.

Table 1. FYP assessment Skelton and phases.

Sr. No	Deliverables	Weightage	Evaluation by	Semester
1	Title defense presentation	10%	Faculty Members	6 th Week 14
2	Literature review reports submission	10%	Supervisor (s)	7 th Week 02
3	Workshop on "Importance of sequence of operations in FYP"	-		7 th Week 03
4	Mid-term appraisal (Internal Viva)	20%	Examiners from the dept. IAB Members	7 th Week 10
5	Workshop on " How to find effective scientific Literature for Research"	-		7 th Week 11
6	Workshop on "use of reference software- Endnote/Mandely	-		7 th Week 13
7	Workshop on "contents of FYP Thesis"	-		7 th Week 15
8	Workshop on "how to prepare scientific poster"	-		8 th Week 01
9	Workshop on "How to Publish an International Research Paper from FYP"	-		8 th Week 03
10	Posters presentations at department	15%	Faculty Panel	8 th Week 04
11	Annual inter-department poster competition at Campus		Faculty Panel	8 th Week 05
12	IOHCF posters presentation at University		Faculty Panel	8 th Week 10
13	Workshop on "commercialization of FYP"	-		8 th Week 11
14	1st draft of Thesis submission	-	Supervisor	8 th Week 12
15	Log book	5%	Supervisor	Every Week
16	Final thesis submission	20%	Faculty Supervisors	8 th Week 14
17	Final defense and viva by external examiners	20%	External Examiners	8 th Week 15
	Total	100%		

1.7.1. Title defense presentation

The students must choose project or a topic by themselves or from the list provided by the Faculty members. Students are supposed to prepare the title defense presentation under the guidance of the Faculty supervisor(s). The format of FYP title defense presentation and their rubrics are given in Annex I.

1.7.2. Literature review reports submission

The students must submit literature review reports in the second week of the 7th semester. Supervisor need to evaluate the reports and assesses it according to the rubrics given in the Annex II.

1.7.3. Mid-term appraisal (Internal Viva)

The students must appear for the mid-term viva before the supervisor in the 10th week of the 7th semester. Supervisor need to evaluate the viva according to the rubrics given in the Annex III.

1.7.4. Posters presentations

Students need to make a poster of their FYP work and present it before the FYP Committee. FYP Committee will assess the poster quality and give valuable suggestions before presenting into the annual interdepartmental poster competition and IOHCF.

1.7.5. Annual inter-department poster competition

Department arranges the annual inter-department poster competition for the final year students in which every group presents its FYP work in the form of poster. Poster evaluation is conducted by the selected faculty panel according to the rubrics given in Annex III. Format of the poster is also given in Annex III.

1.7.6. IOHCF posters presentation

UET Lahore arranges annual Industrial Open House and Career Fair (IOHCF) in which industries are invited to offer jobs and internships to the university students. Final year students present their FYP work here in the form of posters.

1.7.7. 1st draft of Thesis submission

Students need to submit the first draft of their thesis to the supervisor in the 12th week of the 8th semester. Students must incorporate the changes and modification recommended by the supervisor before final submission.

1.7.8. Log book

Students need to record the project activities in proper log book and need to sign the weekly progress from the supervisor. Before the final thesis submission log book will be envaulted by the supervisor according the rubrics given in the Annex IV.

1.7.9. Final thesis submission

Students need to submit their final thesis before the final defense in the correct form, form and structure. Thesis report will be evaluated by the faculty supervisor according to the rubrics given in Annex V. The format of the thesis is also given in Annex V.

1.7.10. Final defense and viva by external examiners

Final Defense & viva is the final activity for FYP. It is evaluated by external examiner(s) according to the rubrics given in Annex VI.

ANNEX-I

Rubrics and Evaluation for Title Defense Presentation

Criteria	CLO/PLO	Assessment			Marks
		Unsatisfactory (0-1)	Satisfactory (2-3)	Excellent (4-5)	
Objectives and subject knowledge	CLO1/PLO1	Student knows very little about the objectives and subject knowledge of the project/research.	Student fairly knows about objectives and subject knowledge of the project/research but unable to describe it thoroughly.	Student has clearly described the objectives of the project/research and showed deep knowledge of the subject.	
Problem statement	CLO2/PLO2	Problem statement is not mentioned.	Briefly description of the problem statement with weak links to the project/research.	Explicit declaration of the problem tackled in this project/research.	
Methodology/Materials & Methods	CLO3/PLO3	Methodology not properly designed, and approach taken to solve the problem is not discussed.	Methodology designed, tools and methods are discussed but not enough to cover the intended scope of work.	Methodology properly designed and covers intended scope of work. All tools, methods and techniques are discussed.	
Presentation skills and confidence	CLO10/PLO10	Unclear voice with poor spoken language and minimal eye contact.	Clear voice with moderately fine spoken language but less eye contact with the audience.	Proper eye contact, and clear voice with excellent spoken language.	
Project timeline	CLO11/PLO11	No project timeline was presented.	Only the main activities were mentioned with no indication of time spent on them.	A timeline including detailed past, present and future activities was presented.	
Answer to questions	CLO10/PLO10	The student struggled to understand questions and could not articulate answers.	The student seemed to understand questions but the answers provided were not convincing.	The student confidently answered all questions.	

Title Defense Presentation Format

Title of FYP

Presented By	
Student Name 1	2016-ME-
Student Name 2	2016-ME-
Student Name 3	2016-ME-
Student Name 4	2016-ME-

Supervised By	
Supervisor	A B C
Co-Supervisor	A B C
Co- Supervisor	A B C

Problem Statement

- This is STANDARD Format. Students are not allowed to change it just fill it with your text. The text Font Size recommended is as 20 and it should remain same.
- Problem Statement should be in bullet points, maximum TWO slides
- Point
- Point
- Point

Literature Review

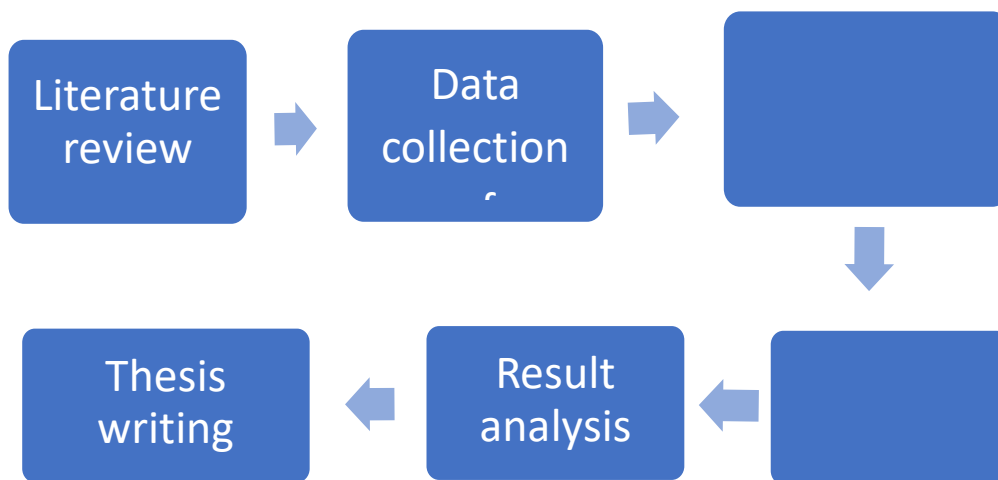
Mention about the Literature from Books and Research Papers only in the form of bullets.

Aim and Objective

- Aim and Objective should be in bullet points, maximum ONE slides
- **Aim of the Project:**
- Define the aim of your project
- **Objectives:**
- Objective 1
- Objective 2
- Objective 3

Methodology

Methodology may be in the following Skelton and bullet points and Maximum TWO Slides



References

- Mention all the references used in the literature [see style from thesis format]

ANNEX-II

Rubrics and evaluation of literature review report

Following guidelines should be followed for the Literature Review Reports submission.

1. **Length of Literature Review [atleast 30 pages]**
2. **References [atleast 30-40] – references must be from scientific authentic sources.
No website, Wikipedia references allowed.**
3. **Similarity index MUST be less than 19%**

Criteria	CLO/PLO	Assessment			Marks
		Unsatisfactory (0-1)	Satisfactory (2-3)	Excellent (4-5)	
Literature review	CLO2/PLO2	. Insufficient and irrelevant literature review is written.	Provide enough literature review but written in unscientific way.	Provide enough, relevant literature review and written in proper scientific way.	
Technical writing	CLO10/PLO10	Lack of technical writing skills. Lot of grammatical mistakes.	Reasonably good technical writing skills with minor grammatical mistakes.	Excellent technical writing skills with no grammatical mistakes.	
Format	CLO10/PLO10	The report does not follow the recommended format.	An attempt was made to follow the format, but there still are mistakes.	The report consistently followed the recommended format.	
Plagiarism	CLO8/PLO8	Similarity index is more than 19%.	Similarity index is 8-19%.	Similarity index is less than 8%.	

ANNEX-III

Rubrics and evaluation of Mid Term Appraisal

Criteria	CLO/PLO	Assessment			Marks
		Unsatisfactory (0-1)	Satisfactory (2-3)	Excellent (4-5)	
Literature review	CLO1/PLO1	. Insufficient and irrelevant literature review is written.	Provide enough literature review but written in unscientific way.	Provide enough, relevant literature review and written in proper scientific way.	
Methodology (Materials and Methods)	CLO3/PLO3	Methodology not properly designed, and approach taken to solve the problem is not discussed.	Methodology designed, tools and methods are discussed but not enough to cover the intended scope of work.	Methodology properly designed and covers intended scope of work. All tools, methods and techniques are discussed.	
Technical writing	CLO10/PLO10	Lack of technical writing skills. Lot of grammatical mistakes.	Reasonably good technical writing skills with minor grammatical mistakes.	Excellent technical writing skills with no grammatical mistakes.	
Structure, format and language	CLO10/PLO10	The report does not follow the recommended format.	An attempt was made to follow the format, but there still are mistakes.	The report consistently followed the recommended format.	
Plagiarism	CLO8/PLO8	Similarity index is more than 19%.	Similarity index is 8-19%.	Similarity index is less than 8%.	

ANNEX-IV

Rubrics and evaluation of Poster

Criteria	CLO/PLO	Assessment			Marks
		Unsatisfactory (0-1)	Satisfactory (2-3)	Excellent (4-5)	
Appearance	CLO10/PLO10	Scattered and disconnected pieces. Poor color choices and layout.	Pleasant to look at, but poor in layout selection.	Very pleasing to look at. Attractive color selection and layout.	
Problem statement	CLO10/PLO10	Absent or vaguely stated.	Present, but not explicit.	Explicit. Prominently visible.	
Methodology	CLO10/PLO10	Absent or very difficult to follow.	Some parts of the methodology are presented but key elements are missing.	Methodology is presented in a good way and easy to understand.	
Results and discussion	CLO10/PLO10	Absent or not properly presented.	Results are presented but not properly interpreted and discussed.	Properly presented and analyzed.	
Conclusions	CLO10/PLO10	Absent or does not follow logically from outcomes presented.	Present but not explicit. Scattered comments in different sections.	Explicit statement providing a thorough reflection on the achieved outcomes.	
References	CLO10/PLO10	No list of references.	A list of reference was presented, but in-text referencing is inconsistent.	References were used where appropriate and listed in a correct format.	
Text/Graphics balance	CLO10/PLO10	Too much text with no figures or not enough text to explain figures.	Mostly balanced, but still too much text or graphics.	Balanced. Text and graphics are evenly dispersed in the poster.	

Title of your poster

Student Name(s), Supervisor, Co Supervisor name

Abstract

Results and Discussion

Objective/Problem Statement

Methodology

Conclusion/future work

References

ANNEX-V

Rubrics and evaluation of student logbook

Criteria	CLO/PLO	Assessment			Marks
		Unsatisfactory (0-1)	Satisfactory (2-3)	Excellent (4-5)	
Logbook condition	CLO8/PLO8	No proper logbook was used, only loose pages without binding.	A combination of loose pages and a suitable notebook.	Everything kept in a single notebook.	
Log entries properly dated	CLO11/PLO11	Entries were not dated.	Only some entries have dates.	Every entry has a date.	
Assumptions and decisions	CLO11/PLO11	No reference at all to any decision-making process.	Some indication that a decision process took place.	Explicit list of all assumptions and decisions taken during the project.	
Members contribution	CLO9/PLO9	It is not clear from the logbook what were the personal contributions to the project.	Evidence that some thinking process took place during the project, but contributions lack detail.	Every contribution is profusely documented. It is obvious that a lot of thinking was put into the project.	

ANNEX-VI

Rubrics and evaluation of final thesis

Criteria	CLO/PLO	Assessment			Marks
		Unsatisfactory (0-1)	Satisfactory (2-3)	Excellent (4-5)	
Structure, format and language	CLO10/PLO10	The thesis does not have the recommended structure and format. A lot of grammatical mistakes.	An attempt was made to follow the structure and format but there still are omissions. Occasional grammatical mistakes.	The thesis has the recommended structure and format. Thesis written in a good way. No grammatical errors are found.	
Abstract	CLO10/PLO10	Abstract is not written or poorly written.	Abstract provides reasonable illustration of the project/research, but some key conclusions could be presented in a good way.	Abstract written in a good scientific and technical writing style. It provides a good summary of the whole project/research.	
Introduction and problem statement	CLO2/PLO2	No indication of the problem statement in the introduction.	Problem statement is present in the introduction but in a vague way, difficult to link with the project/research.	Includes problem statement in the introduction in an organized way.	
Literature review	CLO2/PLO2	. Insufficient and irrelevant literature review is written.	Provide enough literature review but written in unscientific way.	Provide enough, relevant literature review and written in proper scientific way.	
Methodology/Materials & Methods	CLO3/PLO3	Methodology not properly designed, and approach taken to solve the problem is not discussed.	Methodology designed, tools and methods are discussed but not enough to cover the intended scope of work.	Methodology properly designed and covers intended scope of work. All tools, methods and techniques are discussed.	
Results (data collection, analysis and	CLO5/PLO5	Capable of using but poor knowledge of data collection and	Capable of using, fair knowledge of data collection, but poor	Capable of using, great knowledge of data collection	

interpretation by using any equipment & software)		analysis, unaware of limitation.	analysis. Unaware of limitation.	and analysis, aware of the limitation.	
Discussion (validation/verification)	CLO4/PLO4	No evidence that any verification/validation took place of the results.	Verification/validation was mentioned, with limited support from the literature.	The evidence provided demonstrates the solution was thoroughly verified from the literature.	
Conclusions and future work	CLO7/PLO7	No attempt to provide a final reflection on the work done that it's a sustainable solution of a given problem.	Conclusions and future work presented that the provided solution of a given problem is sustainable but lacks proper justification.	It is evident conclusions and future work are the result of deep reflection and the solution of the given problem is sustainable.	
Referencing	CLO10/PLO10	Apparently, no references were used to complete the project.	A list of reference was presented, but in-text referencing is inconsistent.	References were used where appropriate and listed in a correct format.	
Plagiarism	CLO8/PLO8	Similarity index is more than 19%.	Similarity index is 8-19%.	Similarity index is less than 8%.	

Title of the thesis

Supervised by

Student Name

Registration Number

Department of Mechanical Engineering,
University of Engineering and Technology, Lahore



A thesis submitted in partial fulfilment of the requirements of

the Degree of Degree Name at

University of Engineering and Technology, Lahore

Month 2020

Declaration

I, *Student name*, confirm that the research included within this thesis is my own work or that where it has been carried out in collaboration with, or supported by others, that this is duly acknowledged below, and my contribution indicated. Previously published material is also acknowledged below.

I attest that I have exercised reasonable care to ensure that the work is original, and does not to the best of my knowledge infringe any third party's copyright or other Intellectual Property Right, or contain any confidential material.

I accept that the University has the right to use plagiarism detection software to check the electronic version of the thesis.

I confirm that this thesis has not been previously submitted for the award of a degree by this or any other university.

The copyright of this thesis rests with the author and no quotation from it or information derived from it may be published without the prior written consent of the author.

Print Name: **Student Name**

Signature:

Date:

Preface

The work presented in this dissertation was undertaken at the Department of Mechanical Engineering, University of Engineering and Technology, Lahore between October 2006 and February 2010. This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration except where specifically indicated in the text. Neither the present dissertation, nor any part thereof, has been submitted previously for a degree to this or any other university. The main text of this dissertation-chapters one through eight-including appendix, bibliography, tables, and equations contains approximately 53,400 words. Additionally, 100 equations, 92 figures and 10 tables are included.

Some of the works in this dissertation have been published:

Details of collaboration and publications

Conferences

- Conference
- Conference

Journal Papers

- Article
- Article

Abstract

- A Good Abstract Should State:
 - What problem or issue was addressed?
 - What was done?
 - How was it done?
 - What was found or learned?
 - What was recommended?
- It is not easy to include all this information in just a few words. Start by writing a summary that includes whatever you think is important, and then gradually prune it down to size by removing unnecessary words, while still retaining the necessary concepts.
- Don't use abbreviations or citations in the abstract. It should be able to stand alone without any footnotes.

Keywords: At least 6

- Keywords should be specific
- Avoid uncommon abbreviations and general terms

Acknowledgements

Table of Contents

List of Figures

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List of Tables

“This list is inserted by using ‘Insert Table of Figures’ → Caption Label → ‘Table’ in the REFERENCE in MS Word”.

Important Nomenclature

Roman Letters

d	diameter of the particles
D_p	Size of the crystallite
H	Enthalpy

Greek Symbols

α	Degree of oxidation
$\square\square$	Heating Rate
μ	Viscosity

Abbreviations

AP	Aluminum particle
BCC	Body centred cubic
BET	Brunauer-Emmett-Teller (absorption theory)
CRH	Constant rates of heating

Chapter 1

1. Introduction

1.1.Motivation

1.2.Aims and Objectives

1.2.1. Sub heading of aim and objectives

1.2.2. Sub heading of aim and objectives

1.3.Organization of the Dissertation

Chapter 2

2. Literature Review

2.1. How to Cite a Previous Study

References should be inserted using 'EndNote' or any other Professional software (having capability of inserting and compiling reference list automatically). It should NEVER be done manually.

Example

A novel energy storage concept by using nano-structured energetic materials, coined as 'nanofuel', such as aluminium, iron, silicon, and magnesium, was recently proposed [1]. Through oxidation or combustion, the chemical energy is converted to thermal energy, resulting in large exothermicity and high reaction temperatures [2-4], and the process is heavily dependent on the particle materials and morphology.

Chapter 3

3. Materials and Methods

Chapter 4

4. Results and Discussions

4.1.Example How to Caption a Figure

“Figures must be properly captioned at the Bottom using REFERENCE ‘Insert Caption’ Command in the MS word and whatever figure is given in the text must be mentioned in the text, using ‘Cross-reference’.”

Example given below,

The Brunauer–Emmett–Teller (BET) model based on adsorption-desorption of nitrogen gas is used to find the specific surface area of the particles. It is assumed that the particles have uniform spherical shapes. **Figure 4.1** shows the adsorption isotherm of the nAl obtained at -196 °C.

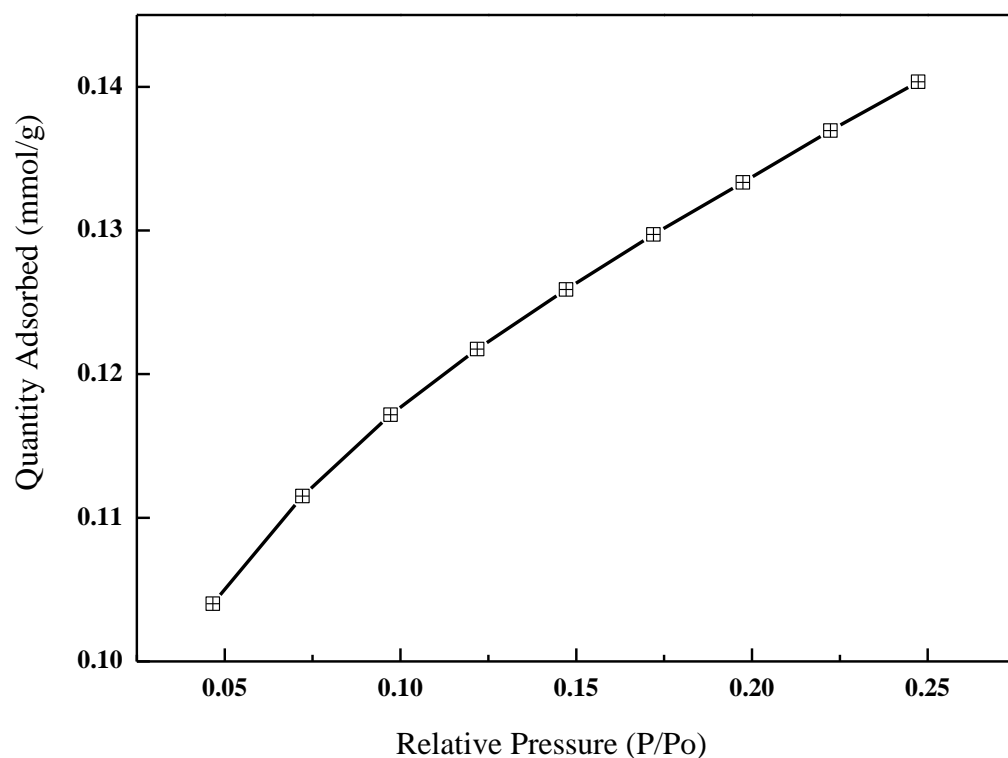


Figure 4.1 Isotherm of the nAl showing the relationship of the relative pressure and the quantity of N₂ adsorbed

4.2.Example How to Caption a Table

Table must be properly captioned at the Top using REFERENCE ‘Insert Caption’ in the MS word and whatever table is given in the text must be mentioned in the text, using ‘Cross-reference’. Example given below,

Other lattice parameters such as the distance between the planes of atoms, i.e. d-spacing, the length and intervening angle of the side, were calculated with the Bragg’s Law ($d = \frac{\lambda}{2 \cdot \sin(\theta/2)}$), illustrated in **Table 3.1**. To analyse various metastable polymorphs of alumina developed at various temperatures, the diffraction pattern of all recovered samples were recorded from 5° to 70° 2θ

Table 3.1 XRD analysis of the nAl (before oxidation) and estimation of crystallite size with Scherer’s formula.

Peaks	FWHM		P_c		D_p	d	(a, b, c)	□□□□□□□□□□ □
	(°)	rad	(°)	(rad)	nm	nm	nm	(°)
P1	0.212	0.00370	38.42	4	41.47	2.343	4.0586	90
P2	0.247	0.00430	44.66	9	36.41	2.029	4.0586	90
P3	0.279	0.00486	65.06	0	35.35	1.434	4.0553	90

Note:

P1, P2, P3 are the 1st, 2nd and 3rd peaks on XRD curve,

FWHM is Full width half maximum and is found with Origin software,

P_c is centre of the peak on XRD trace,

D_p is size of the crystallites,

d is the distance (in angstroms) among the planes of atoms found with the Bragg's Law,

(a, b, c) are the lengths of the planes,

α, β, γ are the angles among the planes.

Chapter 5

5. Further Results

Chapter 6

6. Conclusions and Future Work

References

- [1] D. Wen, *Energy & Environmental Science*, 3 (2010) 591-600.
- [2] G. Jian, S. Chowdhury, K. Sullivan, M.R. Zachariah, *Combustion and Flame*, 160 (2013) 432-437.
- [3] E.M. Hunt, M.L. Pantoya, *Journal of Applied Physics*, 98 (2005) 034909-034909.
- [4] E.L. Dreizin, *Progress in Energy and Combustion Science*, 35 (2009) 141-167.

ANNEX-VI
Rubrics and evaluation of final defense and viva

Criteria	CLO/PLO	Assessment			Marks
		Unsatisfactory (0-1)	Satisfactory (2-3)	Excellent (4-5)	
Methodology/ approach	CLO4/PLO4	Methodology not properly designed.	Methodology designed, but not enough to cover the intended scope of work.	Methodology properly designed and covers intended scope of work.	
Knowledge	CLO1/PLO1	Student seems to know very little about the knowledge of project/research subject.	Student seems to understand the subject but was hesitant during the presentation.	Student has a very good understanding of the subject and confidently presented it.	
Work sharing	CLO09/PLO09	Only one member seems to be actively working on the project.	Not all members are contributing in completing the project.	All members are equally contributing in completing the project.	
Result outcomes	CLO6/PLO6	Student is clueless about the result outcomes that how they have societal impact.	Student stated the result outcomes that they have positive societal impact but lacks justification.	Student has clearly stated the positive societal impact of the result outcomes with logical justification.	
Sustainable solution	CLO7/PLO7	No attempt to provide a final reflection on the work done that it's a sustainable solution of a given problem.	Conclusions and future work presented that the provided solution of a given problem is sustainable but lacks proper justification.	It is evident conclusions and future work are the result of deep reflection and the solution of the given problem is sustainable.	
Novelty	CLO12/PLO12	Project/research has no novelty.	The project/research is somehow novel. Modification of the previous work.	The project/research work is totally novel.	
Formal dressing and style	CLO8/PLO8	Student did not observe the formal dress code.	Student observe the formal dress code with minor anomalies.	Student has properly followed the proper former dress code and show professionalism	
Answer to questions	CLO10/PLO10	The student struggled to understand questions and could not articulate answers.	The student seemed to understand questions but the answers provided were not convincing.	The student confidently answered all questions.	