

Editors Nor Fasiha Mohd Yusof
Khairul Anwar Hanafiah

DESIGN PROCESS INVENTION AT YOUR FINGERTIPS

Editors

Nor Fasiha Mohd Yusof
Khairul Anwar Hanafiah

DESIGN PROCESS INVENTION AT YOUR FINGERTIPS

DESIGN PROCESS INVENTION AT YOUR FINGERTIPS

As innovation is key to economic success, engineers with the ability to invent are invaluable assets to any company. However, the journey from idea to invention is complex and often challenging. In *Design Process: Invention at Your Fingertips*, the authors explore the essential framework that guides engineers through this intricate process.

Beginning with a cautionary real-life tale of a failed attempt at invention, the authors emphasise the importance of systematic design methodologies. Readers are introduced to the concept of the design process—an organised approach that blends knowledge, creativity, and technical skill.

Throughout the book, various design projects illustrate the application of these principles. From an automated filter cleaner for domestic air conditioning to a mechanical coconut husk peeler, each chapter presents real-world challenges, and the innovative solutions developed by the authors. Other projects include a multipurpose corn seed sowing jig, a portable incinerator for home use, a flying machine with flapping wings, a hand control mechanism for paraplegic drivers, an automatic fish feeder, and a micro wind turbine.

Design Process: Invention at Your Fingertips serves as an invaluable resource for engineering students and educators, providing a foundational understanding of the engineering design process. Whether you are a budding inventor or an experienced professional, this book equips you with the tools to transform ideas into tangible innovation.



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Penerbit:
UTM Press



RM50.00

**DESIGN
PROCESS
INVENTION AT
YOUR FINGERTIPS**

DESIGN PROCESS INVENTION AT YOUR FINGERTIPS

Editors
Nor Fasiha Mohd Yusof
Khairul Anwar Hanafiah



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Penerbit
UTM Press

www.penerbit.utm.my

2025

First Edition 2025
© NOR FASIHA MOHD YUSOF & KHAIRUL ANWAR HANAFIAH 2025

Hak cipta terpelihara. Tiada dibenarkan mengeluarkan ulang mana-mana bahagian artikel, ilustrasi, dan isi kandungan buku ini dalam apa jua bentuk dan cara apa jua sama ada dengan cara elektronik, fotokopi, mekanikal, atau cara lain sebelum mendapat izin bertulis daripada Timbalan Naib Canselor (Penyelidikan & Inovasi), Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor Darul Ta'zim, Malaysia. Perundingan tertakluk kepada perkiraan royalti atau honorarium.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical including photocopying, recording, or any information storage and retrieval system, without permission in writing from Deputy Vice-Chancellor (Research & Innovation), Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Johor Darul Ta'zim, Malaysia. Negotiation is subject to royalty or honorarium estimation.

Editors: **NOR FASIHA MOHD YUSOF & KHAIRUL ANWAR HANAFIAH**
Editor Penyelaras/*Acquisition Editor*: **RASYIQAH ABDUL RANI**
Pereka Kulit /*Cover Designer*: **NORIZAN YAACOB**

Diatur huruf oleh /*Typeset by*:
NOR FASIHA MOHD YUSOF & KHAIRUL ANWAR HANAFIAH
Faculty of Mechanical Engineering
UNIVERSITI TEKNOLOGI MALAYSIA
81310 UTM Johor Bahru,
Johor Darul Ta'zim, MALAYSIA

Diterbitkan di Malaysia oleh/
Published in Malaysia by:
PENERBIT UTM PRESS
UNIVERSITI TEKNOLOGI MALAYSIA
81310 UTM Johor Bahru,
Johor Darul Ta'zim, MALAYSIA
(Ahli Majlis Penerbitan Ilmiah Malaysia (MAPIM) dan
Persatuan Penerbit Buku Malaysia (MABOPA)
no. keahlian 9101)

Dicetak di Malaysia oleh/
Printed in Malaysia by:
JASAMAX ENTERPRISE
No.16, Jalan Kebudayaan 2,
Taman Universiti,
81310 Skudai,
Johor Darul Ta'zim,
MALAYSIA



Cataloguing-in-Publication Data
Perpustakaan Negara Malaysia
A catalogue record for this book is available from the
National Library of Malaysia
ISBN 978-983-52-2118-7

CONTENTS

<i>Contributors</i>	<i>vii</i>
<i>Preface</i>	<i>ix</i>
CHAPTER 1 DESIGN PROCESS: AN INTRODUCTION	1
<i>Nor Fasiha Mohd Yusof and Khairul Anwar Hanafiah</i>	
CHAPTER 2 AUTOMATED FILTER CLEANER SYSTEM FOR DOMESTIC AIR CONDITIONER	13
<i>Nor Fasiha Mohd Yusof and Ariff Asraf Kadai @ Kadir</i>	
CHAPTER 3 MULTIPURPOSE CORN SEED SOWING JIG	33
<i>Hairul Anuar Abdullah and Zulaikha Haibir</i>	
CHAPTER 4 PORTABLE DRILLING JIG FOR HAND DRILL	47
<i>Hairul Anuar Abdullah and Naqib Abd Razak</i>	
CHAPTER 5 PORTABLE INCINERATOR FOR DOMESTIC USAGE	61
<i>Khairul Anwar Hanafiah and Muhammad Yusup Amrizal</i>	

CHAPTER 6	FLYING MACHINE USING FLAPPING WINGS FOR PROPULSION	75
	<i>Khairul Anwar Hanafiah and Muhammad Asyraf Abd Wahab</i>	
CHAPTER 7	HAND CONTROL MECHANISM FOR PARAPLEGIA DRIVERS	89
	<i>Thamilarasan Balasubramaniam</i>	
CHAPTER 8	AUTOMATIC FISH FEEDER	105
	<i>Mohd Shuisma Mohd Ismail and Lau Chuan Shing</i>	
CHAPTER 9	MICRO WIND TURBINE	117
	<i>Mohd Shuisma Mohd Ismail and Syed Muhammad Naufal Sayed Mat</i>	
CHAPTER 10	MECHANICAL COCONUT HUSK PEELER	127
	<i>Nor Fasiha Mohd Yusof and Muhamad Aidil Misseri</i>	
INDEX		135

CONTRIBUTORS

Ariff Asraf Kadai @ Kadir *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

Hairul Anuar Abdullah *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

Khairul Anwar Hanafiah *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

Lau Chuan Shing *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

Mohd Shuisma Mohd Ismail *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

Muhamad Aidil Misseri *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

Muhammad Asyraf Abd Wahab *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

Muhammad Yusup Amrizal *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

Naqib Abd Razak *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

Nor Fasiha Mohd Yusof *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

Syed Muhammad Naufal Sayed Mat *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

Thamilarasan Balasubramaniam *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

Zulaikha Haibir *Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, Johor Bahru*

PREFACE

“I am interested in design, Dr.” A classic statement given by students when they come to us design lecturers, looking for research advice.

“So, what do you understand about design?” we ask further, and yes, it is also frequent that they did not have the right idea about design. Yet, they claimed that they love anything about design.

People are always fascinated by ‘design’; working on a design project or as a design engineer sounds very charming, and any status or designation that involves ‘design’ looks charismatic and appealing.

Be that as it may, engineering students must understand that design is not about making things look nice. It is important to note that in an engineering context, to design is to solve problems. In other words, when a need or a problem arises, a design engineer will have to create a working engineering solution to it. It is about making things work.

In many cases, solutions for many problems have been developed, and engineers work for improving or modifying the solutions. Withal, recent and global competition require unique and unconventional solutions to make a company successful. Taking a fan as a quite old but typical example—Air chopping blades are not any more a must for circulating the air. They developed a new way for sucking, multiplying, and moving the air, along with features like quieter, safer, and more power-efficient. This new way or new concept is called an invention; engineers with the ability to create an invention are much desirable in the industry.

Nevertheless, ‘design’ is indeed a fascinating option. This book provides overview and examples for the understanding of design in engineering context.

Before you proceed with reading, it is good to note that the design process is divided into two major stages: The conceptual design and the

detailed design. This book, as the word ‘invention’ in the title suggests, focuses on the former. The latter, however, is also presented but in a shallow and introductory manner. Of course, because we might need a whole different book or books to cover that!

Lastly, we would like to acknowledge and express our gratitude to a postgraduate student, Mr. Thamilarasan a/l Balasubramaniam, for his help in the enduring stage of material compilation and early editing from long theses into short articles. Without his flat-out effort, it would be laborious for us to deliver this book.

Happy reading, future design engineers!

Nor Fasiha Mohd Yusof

Khairul Anwar Hanafiah

Universiti Teknologi Malaysia

2025