

PROTOTYPE DESIGN COLLECTION

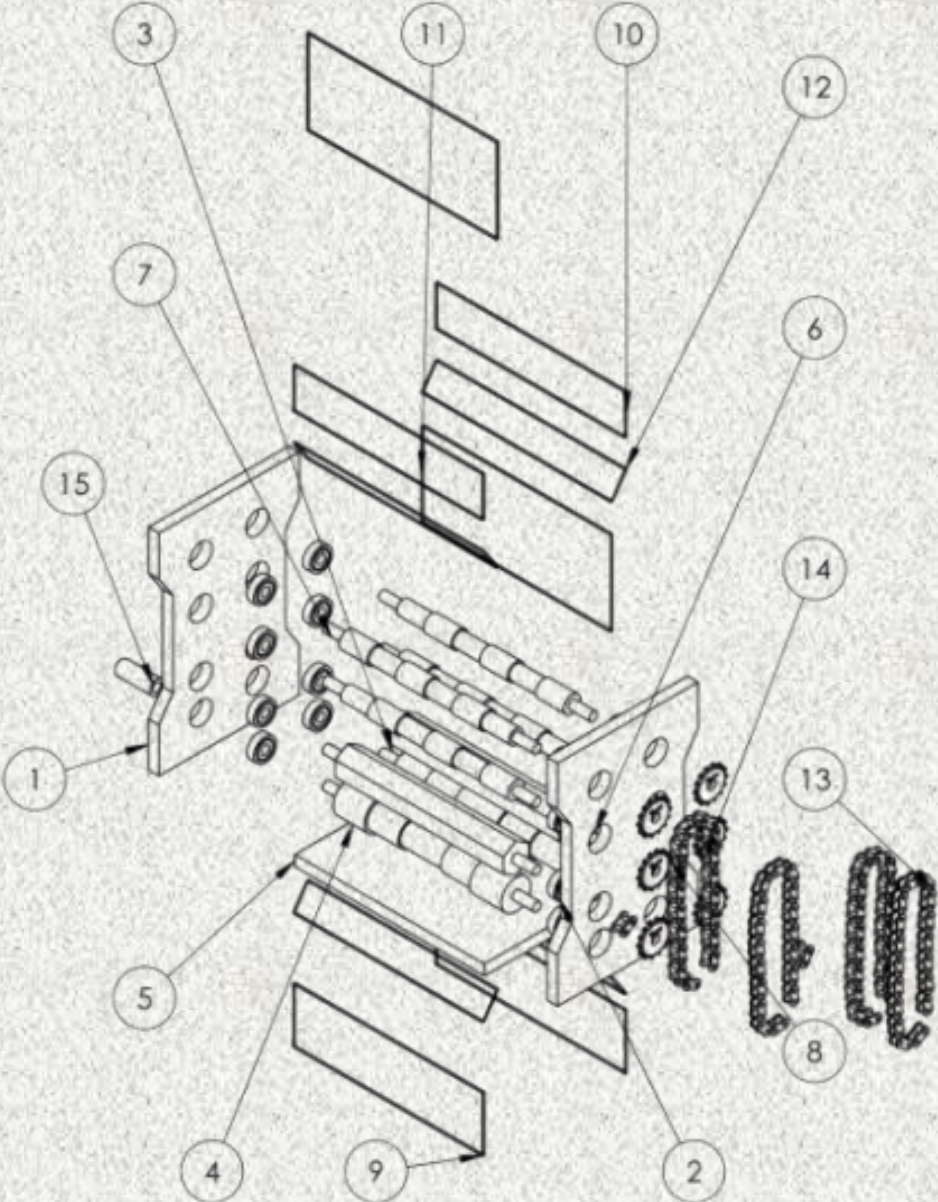
SERIES 4



Universiti Teknologi MARA
Pasir Gudang Campus

Prototype Design Collection

Series 4



Ahmad Najmie Rusli

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Jalan Purnama, Bandar Seri Alam, 81750 Masai Johor.**

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CHIEF EDITOR:

Ahmad Najmie Rusli

EDITOR:

Nurul Nadiyah Rasdi

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FOREWORD

This digital book on Prototype Design Collection Series 4 (PDC Series 4) is published as a reference design for mechanical engineering students. The designs presented experience a few phases of analysis before fabrication of prototype. Each project summarises the project description, prototype, figures, and design parameter. The design products vary in tools or equipment for household, workshop, entrepreneur, etc. Suggested material and detail of prototype dimension are also mentioned in this book.

It is hoped that this book will assist the students to have more ideas on innovation design products in the future.

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CHAPTER 41

Prototype Solar Hydroponic System

Muhammad Ammar Mierza Bin Shuhaimi ¹ and Haszeme Bin Abu Kasim ^{2*}

^{1,2}*Faculty of Mechanical Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, 81750 Masai, Bandar Seri Alam, Johor Darul Ta'zim.*
**Corresponding author (e-mail): haszeme9720@uitm.edu.my*

PROJECT DESCRIPTION

This study focuses on the development of a prototype solar hydroponic system to enhance sustainable agriculture through renewable energy integration. The system aims to address the increasing demand for eco-friendly food production while reducing reliance on conventional farming methods. The objectives of this project include designing and fabricating a solar-powered hydroponic unit, optimizing its energy efficiency, and evaluating its performance under various environmental conditions. The research methodology involves computational modeling using SolidWorks, material selection for structural integrity, and experimental validation of energy capture and water-use efficiency. The prototype integrates photovoltaic panels, an energy storage unit, and a hydroponic nutrient delivery system to ensure optimal plant growth. Performance testing assesses factors such as solar energy conversion, water consumption, and crop yield. Results indicate that the solar hydroponic system significantly reduces water usage while maintaining high crop productivity. The system demonstrates operational stability under fluctuating sunlight conditions, with optimized nutrient delivery improving plant health. Future enhancements include advanced automation, IoT-based monitoring, and improved energy storage to increase scalability. This research supports global food security and sustainable development goals by demonstrating an efficient, eco-friendly farming solution.

Keywords: *Solar Hydroponics, Sustainable Agriculture*

PROTOTYPE



DESIGN PARAMETER

ITEM NO.	PART NUMBER	QTY.
1	box	1
2	box cover	1
3	up pipe	1
4	up steel pipe	1
5	side steel bar	2
6	90 pipe	2
7	right pipe	1
8	pump pipe	1
9	cap	1
10	pump pipe holder	1
11	base	1
12	tyre base	4
13	solar panel	1
14	solar controller	1
15	inverter	1
16	hydroponic housing	1
17	battery	1
18	pump	1

NAME : MUHAMMAD AMMAR MIERZA BIN SHUHAIMI
STUDENT ID : 2022834712
GROUP : J4CEEM1105F
DRAWING TITLE : EXPLODED VIEW
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