

DESIGN AND DEVELOPMENT OF AN ARTIFICIAL  
HONEYBEES FEEDER

THESIS

JAYSON MARK C. PLAZA  
ROBERT JESS M. POTENTE

College of Engineering and Information Technology

CAVITE STATE UNIVERSITY

Indang, Cavite

Cavite State University (Main Library)



T6681

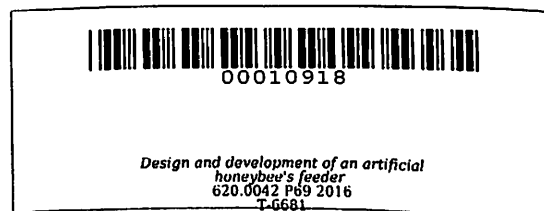
THESIS/SP 620.0042 P69 2016

December 2016

# **DESIGN AND DEVELOPMENT OF AN ARTIFICIAL HONEYBEES FEEDER**

An Undergraduate Thesis  
Submitted to the Faculty of the  
College of Engineering and Information Technology  
Cavite State University  
Indang, Cavite

In partial fulfilment  
of the requirements for the degree  
Bachelor of Science in Computer Engineering



**JAYSON MARK C. PLAZA**  
**ROBERT JESS M. POTENTE**  
December 2016

## **ABSTRACT**

**PLAZA, JAYSON MARK C. and POTENTE, ROBERT JESS M. Design and Development of an Artificial Honeybees Feeder.** Undergraduate Design Project. Bachelor of Science in Computer Engineering. Cavite State University, Indang, Cavite. December, 2016. Adviser: Engr. Bienvenido C. Sarmiento, Jr.

A study was conducted to develop a microcontroller-based automatic honeybee feeder. Specifically, the study aimed to (1) design and develop a microcontroller circuit for pumping , lighting, and monitoring system; (2) design and fabricate the automatic feeder; (3) develop a PIC program that will control the system; (4) test and evaluate the performance of the system through pilot evaluation; and (5) conduct a cost computation of the machine.

The design project was composed of PIC16F877A which served as the microcontroller unit, the light sensor module for the light sensing and automatic light switching, pH sensors for acidity and basicity monitoring, moisture sensor to monitor the moisture of sponge, DC Pump to transfer the solution from container to the sponge, LCD screen for displaying the pH value and pH volts. An LED lamp was used for feeding at night and morning. The microcontroller was responsible for the operation of the system of the honeybees feeder which depended on the data sent by the sensors.

The project was tested and evaluated at NCRDEC at Cavite State University Indang, Cavite to determine the effectiveness and efficiency of lamp, and the ability of feeder to monitor the pH level and to feed the honeybees.

Based on the results of the evaluation, the feeding time of bees could be lengthened by adding a light source for honeybees. A bright and war light could help the bees in navigating a new source of food. Using a bulb with a warm and bright light make bees active at night.

The total cost of the design project was P19,850.00.

## TABLE OF CONTENTS

	Page
<b>BIOGRAPHICAL DATA.....</b>	iii
<b>ACKNOWLEDGMENT.....</b>	v
<b>ABSTRACT.....</b>	x
<b>LIST OF TABLES.....</b>	xiv
<b>LIST OF FIGURES.....</b>	xv
<b>LIST OF APPENDIX TABLES.....</b>	xvi
<b>LIST OF APPENDIX FIGURES.....</b>	xvii
<b>LIST OF APPENDICES.....</b>	xviii
<b>INTRODUCTION.....</b>	1
Statement of the Problem.....	3
Objectives of the Study.....	3
Significance of the Study.....	3
Time and Place of the Study.....	4
Scope and Limitation of the Study.....	4
Definition of Terms.....	5
<b>REVIEW OF RELATED LITERATURE.....</b>	7
<b>METHODOLOGY.....</b>	29
Materials.....	29
Methods.....	30

Design of a microcontroller circuit for pumping, lighting and Monitoring system.....	33
Designing and fabrication of the automatic the feeder.....	37
Develop a PIC program that will control the system.....	37
Test and evaluate the performance of the system through pilot Evaluation.....	38
Conduct a cost computation of the machine.....	38
<b>RESULTS AND DISCUSSION.....</b>	<b>39</b>
Principles of Operation .....	39
Presentation and Analysis of the Design.....	40
Structure of the Honeybees Feeder.....	41
Pumping System .....	42
pH Monitoring System .....	42
Lighting System .....	42
Microcontroller Unit.....	42
Software Development of the System.....	46
Results and Evaluation .....	52
Cost Computation .....	57
<b>SUMMARY, CONCLUSION, AND RECOMMENDATIONS.....</b>	<b>58</b>
Summary.....	58
Conclussion.....	59
Recommendations.....	59
<b>REFERENCES.....</b>	<b>60</b>
<b>APPENDICES.....</b>	<b>62</b>

## LIST OF TABLES

Table		Page
1	pH electrode characteristics .....	20
2	Effect of white bulb.....	54
3	Effect of ultra violet light .....	54
4	Effect of yellow light.....	55
5	U.V bulb hanged one foot from the cylindrical plate.....	55
6	White bulb hanged one foot from the cylindrical plate.....	56
7	Yellow light bulb hanged one foot from the cylindrical plate.....	56
8	Price list of materials for the honeybees feeder.....	57

## LIST OF FIGURES

Figure		Page
1	pH scale.....	18
2	pH electrode size.....	19
3	pH module connecting diagram.....	21
4	The pic16f877a.....	23
5	The system block diagram of the honeybees feeder .....	31
6	System flow chart of honeybees feeder.....	32
7	Moisture sensor and pumping system.....	34
8	The lighting system.....	35
9	The pH module circuit.....	36
10	The honeybee feeder .....	37
11	The honeybee feeder.....	40
12	The display.....	42
13	The system block diagram.....	43
14	Pin assignment diagram of honeybees feeder.....	45
15	Software development flow chart .....	48

## LIST OF APPENDIX TABLES

Appendix Table		Page
1	Battery life of honeybees' feeder.....	64
2	Number of bees fed on day 1 (February 27, 2016).....	64
3	Number of bees fed on day 2 (February 28, 2016) .....	64
4	Number of bees fed on day 3 (February 29, 2016).....	65
5	The mortality rate of automatic and manual feeder.....	65

## LIST OF APPENDIX FIGURES

Appendix Figure		Page
1	The keypad .....	67
2	The relay driver .....	67
3	The light sensor .....	68
4	The moisture sensor .....	68
5	The LCD screen (20 x 14).....	69
6	The pH sensor module .....	69
7	The push button .....	70
8	Dosing pump .....	70
9	The led lamp .....	71
10	The relay .....	71
11	The ph probe .....	72
12	The microcontroller unit.....	72
13	The dimmer .....	73
14	The battery (12v).....	73

## LIST OF APPENDICES

Appendix		Page
1	Appendix tables .....	63
2	Appendix figures .....	66
3	Appendix program codes.....	74
4	Appendix forms and letters .....	90

# **DEVELOPMENT OF AN ARTIFICIAL HONEYBEES FEEDER**

**Jayson Mark C. Plaza**  
**Robert Jess M. Potente**

---

An undergraduate design project submitted to the faculty of Department of Computer and Electronics Engineering, College of Engineering and Information Technology, Cavite State University, Indang, Cavite in partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Engineering (BSCpE) with Contribution No. \_\_\_\_\_ Prepared under the supervision of Mr. Bienvenido C. Sarmiento Jr.

---

## **INTRODUCTION**

Flower is the reproductive part of the plant. It is composed of peduncle, receptacle, sepal, petal, stamen, anther, pistil, stigma, and ovary. Flowers are also known as blossoms or a blooms. In order to produce a new seed, every plants with flowers should be pollinated. Pollination is the process of transferring the pollen to the anther of the flower. There are two (2) types of pollination, abiotic and biotic pollination. Abiotic pollination occur when the flower is pollinated without any involvement of animals, commonly the wind is the main cause of abiotic pollination. In abiotic pollination, 10 percent of flowering plants are being pollinated. In biotic pollination, the pollinating process occur with pollinators, the pollinators carry the pollen from the plants and transfer it to the anther of the flower. There are 200,000 varieties of pollinators in the wild including honeybees.

Honeybees are any member of genus *Apis*. Honeybees account for 80 percent of insect pollination. The honey stomach holds almost 70 mg of nectar and when full, it weighs