DIPLOMA IN ELECTRICAL ENGINEERING
(ENERGY EFFICIENCY)

CDIO : Integrated Learning Experience for Diploma in Electrical Engineering (Energy Efficiency)

JKE

SEMESTER 4

DEE5081 –PROJECT 1

DEC5052 –EMBEDDED SYSTEM APPLICATION

Diploma in Electrical Engineering (Energy Efficiency)

DEQ

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Integrated Learning Experience for Diploma in Electrical Engineering (Energy Efficiency)

POLITEKNIK MALAYSIA
PORT DICKSON

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FOREWORD

Alhamdulillah, praise to Allah SWT for His mercy, blessing and guidance to us to complete this book. Special thanks also to our families, friends and the lecturers for their support.

As the teaching and learning world moves further towards integrated courses, there will be a greater need for specific guideline for lecturers and students. The guideline would give an understanding of integrated courses between DEE 5081: PROJECT 1 and DEC 5052: EMBEDDED SYSTEM APPLICATION. This will save the cost and time for students in semester 4. This book also consists rubric of assessment for both courses in the syllabus requirements.

We believe this book will benefits to all students and lecturers in Politeknik Port Dickson especially in Electrical Engineering Department as a guideline and manual for integrated courses in future.

INTEGRATED LEARNING EXPERIENCE

INTRODUCTION

An integrated curriculum is defined as one that links various areas of study and breaks down barriers between disciplines and makes learning more meaningful for students. The main objective of an integrated curriculum is to have a student-centered curriculum that engages students, improves student learning, and increases student interest. Higher thinking skills, cooperative learning, and consideration of the values of other students are highlighted. Therefore, the integrated curriculum offers an effective way to teach and maintain the skills of the 21st century, and possibly to boost academic achievement. Thus, curriculum integration provides an effective way of teaching, sustaining, and potentially increasing the academic performance of these capacities of the 21st century.

Polytechnic Port Dickson has offered a new diploma program, namely Electrical Engineering (Energy Efficiency) or DEQ and the first batch students registered in Jun 2017. The DEQ program has been selected under JPPKK's KPI to run CDIO Integrated Curriculum in early year 2017. Four lecturer from DEQ program unit were selected to attend several workshop series in ordered to prepare the integrated curriculum from the gap analysis until to notes of guidance (NoG). Since the DEQ students had registered in Jun 2017, therefore this integrated curriculum has been started in session Dis 2018.

INTEGRATED LEARNING EXPERIENCE

Electrical Engineering Department (JKE) integrates two courses to produce one common mini project involving semester 4 student of DEQ programmes in this department. This Intra-Program Integrated Learning Experience, integrates learning outcomes which infuses the CDIO skill sets of the 21st century skills. DEQ implemented Component 2 of CDIO by selecting courses that has project or mini project assessment in its syllabus. From semester 4 curriculum, two courses namely DEE5081 Project 1 and DEC5052 Embedded System Application have project or mini project assessment using microcontroller development board. In session Dis 2018, DEE5081 Project 1 and DEC5052 Embedded System Application have been chosen for DEQ, JKE integrated learning.

INTEGRATED LEARNING EXPERIENCE

OBJECTIVES

1. to develop students understanding in 21st Century Learning Skills through the experience in project collaboration and relate polytechnic learning environment with their future workplace.
2. to achieve two learning outcome of two different courses by developing one common project.
3. to contribute to JPPKK's KPI 17. *(KPI 17 - Bilangan program pengajian yang menggunakan kurikulum bersepadu (integrated curriculum) melalui kerangka Conceive, Design, Implement and Operate (CDIO))*

INTRA-PROGRAM INTEGRATED CURRICULUM

An intra-program integrated curriculum means to integra the courses within the same semester, and inter-program, the integrated curriculum occurs among the semester. The DEQ program decided to choose the intra-program according to series workshop decision. The intra-program has been shown in the Table 1.

Table 1: Intra-Program Integrated Curriculum

Program	**Integrated Courses**	**Related**	**CDIO's Activities**
Diploma in Electrical Engineering (Energy Efficiency) DEQ	DEC5052 Embedded System Application	I. related contents II. related CLOs III. related assessments	Presentation Project Case Study Brainstorming
	DEE5081 Project 1		

Selection of the courses also have been decided in the workshop. The two courses have been selected were Project 1 (DEE 5081) and Embedded System Application. (DEC 5052). The table 2 shows the two courses selected to implement an integrated curriculum for semester 4 students in DEQ program. The percentage of course work remains, as stated in the curriculum structure. The different was in the teaching and learning (TL) implementation.

Table 2: Integrated Curriculum Courses

COURSES		**TOPICS**	**ASSESSMENTS**
DEC5052	Embedded System Application	Hardware interfacing	Project 10%
DEE5081	Project 1	Procedure to construct project hardware	Project progress (psychomotor) 30%

DESIGN OF INGRATED LEARNING EXPERIENCE

The designed of learning experience has been made included learning objectives, course learning outcomes and the assessments. The specific relation of the learning experience has been shown in Table 3.

Table 3: Design of Integrated Learning Experience

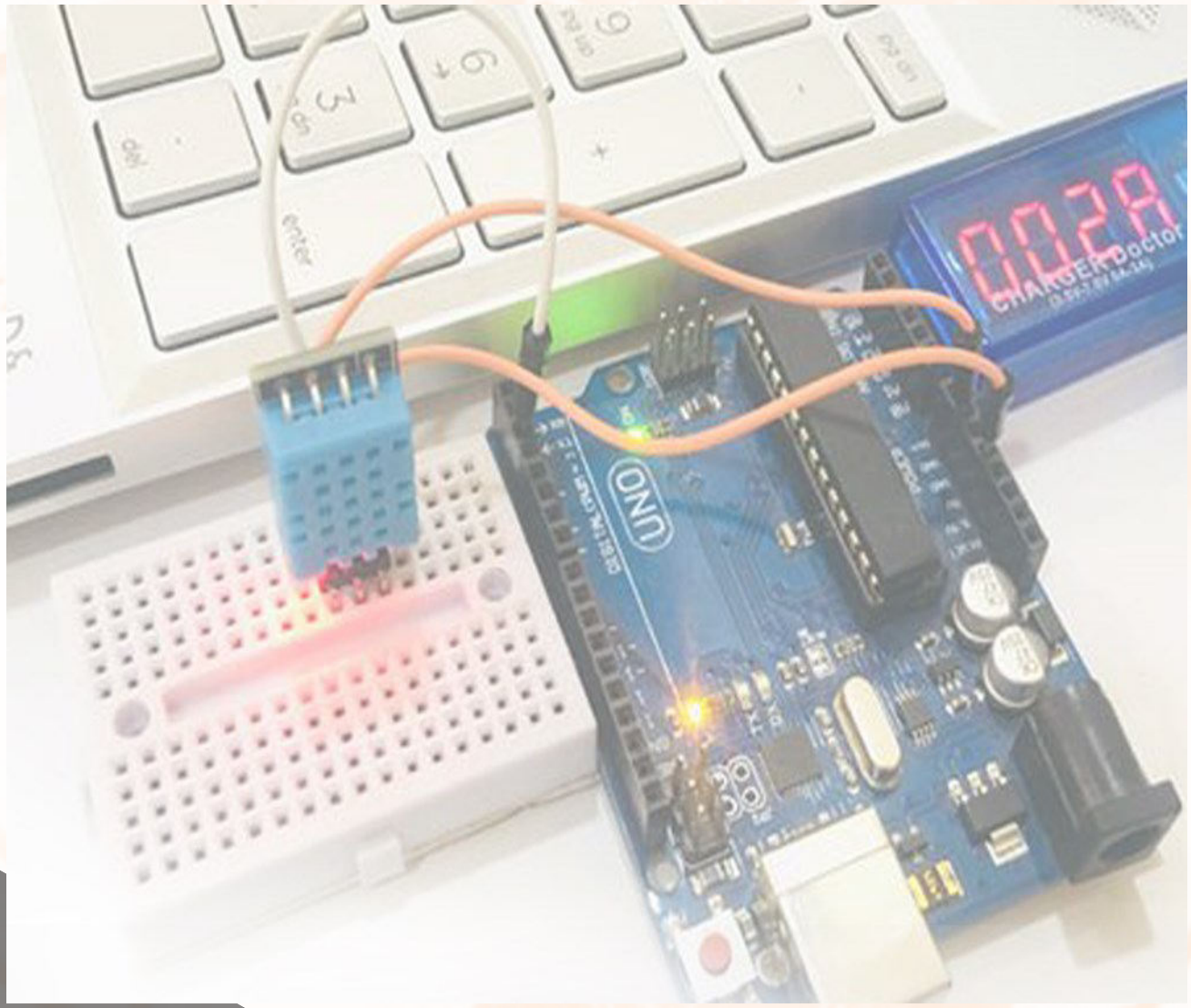
Project Learning Objectives (LOs)	Courses	Related Course Learning Outcomes	Assess-
At the end of the project, students will be able to: 1. Collaborate in a team and design an embedded project using PIC16F/PIC18F microcontroller. 2. Design a relay circuit using altium/proteus software and produce a single layer pcb board of relay circuit 3. Write a report on the process of development embedded project 4. Present the embedded project using appropriate presentation, language, and non-verbal communication skills.	DEC5052 Embedded System Application	CLO2: design embedded system application based on PIC16F/PIC18F effectively (C5, PLO4)	Project 1 10%
		CLO5: demonstrate the ability to lead a team to complete the assigned project / practical work within a stipulated time frame. (A3, PLO11)	Leadership skill 100%
	DEE5081 Project 1	CLO3: carry out project construction procedures (hardware project) or produce flow-chart and draft algorithm for system program (software project) systematically. (P4, PLO5)	Project Progress (Practical Skill) 30%

The program assessment master plan also has been prepared for the whole semester. The schedule was presented in Table 4. Again, the relation for both courses have been considered in the master plan.

Table 4: Program Assessment Master Plan for December 2018 Session

Week	DEC 5052 (EMBEDDED SYSTEM)	DEE 5081 (PROJECT 1)
1	Introduction to Embedded System and PIC programming in C language	Project selection, planning, and proposal prepara-
2		Application of computer aided design in circuit simulation and pcb layout design.
3	Circuit Simulation	
4	**Holiday**	
5	Circuit Simulation	
6		Procedures to construct project hardware.
7	PIC Timer programming in C language	
8		
9	Interrupt programming in C language	
10	**Holiday**	
11	Interrupt programming in C language	Procedures to construct project hardware.
12	Hardware interfacing	
13		
14		Early preparation of the project.
15		
16		
17		
18	Presentation	
19	Report Submission	

NOTES OF GUIDANCE



SEMESTER 4

DEE5081 –PROJECT 1
DEC5052–EMBEDDED SYSTEM APPLICATION

ACTIVITY: EMBEDDED PROJECT

SCENARIO

You need to design an embedded project which include pic16/18, digital/analog input (minimum2), a relay circuit and load. No specific task is given. The block diagram project as the figure 1 below.

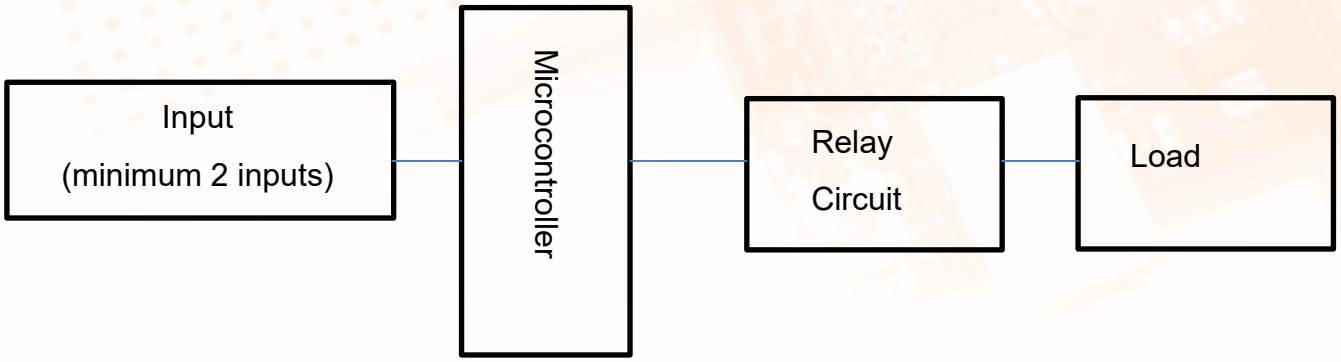


Figure 1: Block Diagram

ACTIVITY: EMBEDDED PROJECT

A. SCENARIO

RELAY CIRCUIT

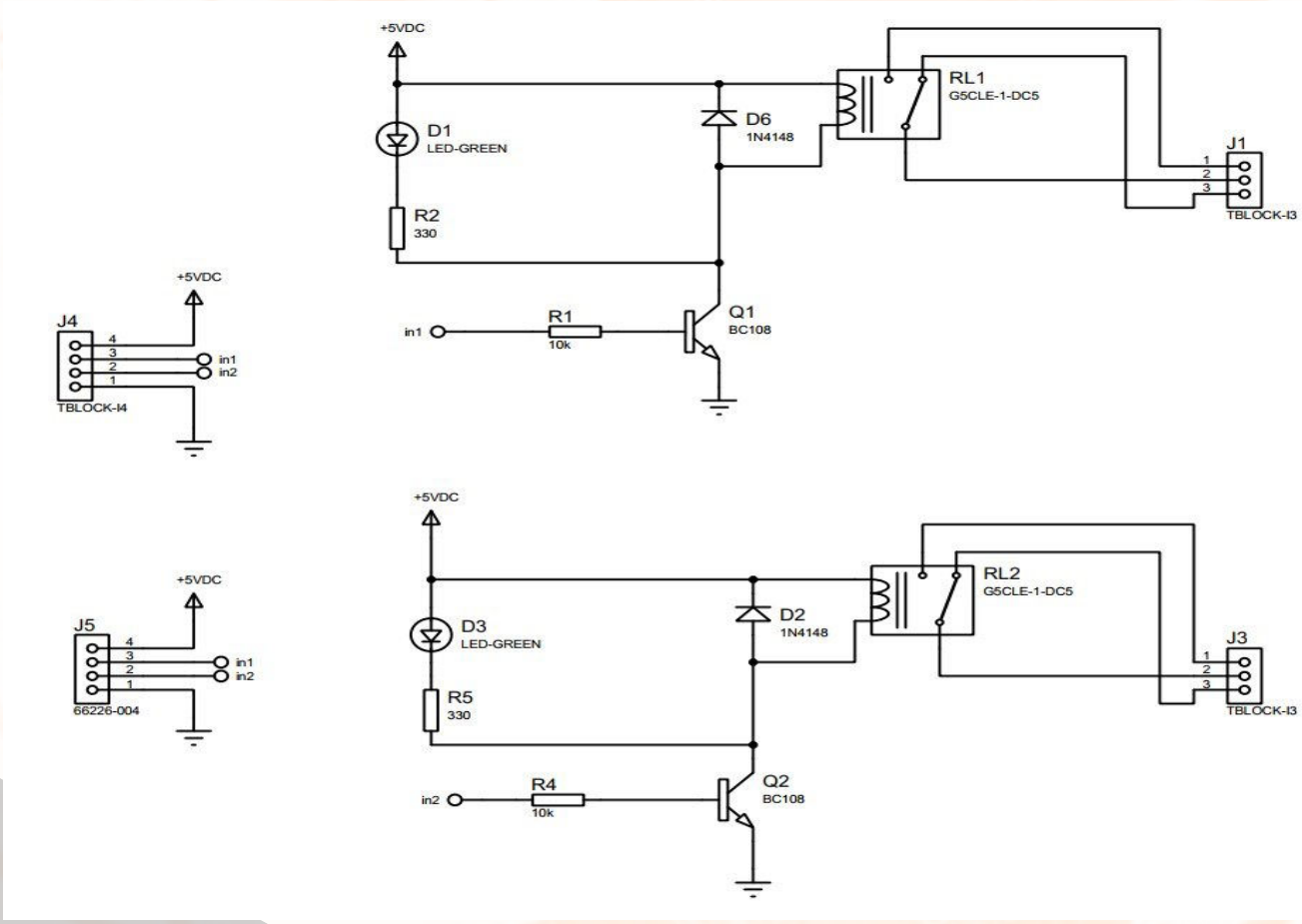


Figure 2: Relay Circuit

Table 5: Component List of Relay Board

NO.	COMPONENT	DESCRIPTION	QUANTITY
1	RESISTOR	10 K ohm	2
2	RESISTOR	220 R ohm	2
3	DIODE	1N4148	2
4	LED	GREEN	1
5	LED	RED	1
6	RELAY	SRD-05VDC-SL-C	2
7	TRANSISTOR	BC 108	2
8	TERMINAL BLOCK	3-PIN, 0.2 INCH PITCH, SIDE ENTRY	2
9	TERMINAL BLOK	4-PIN, 0.2 INCH PITCH, SIDE ENTRY	2
10	MALE PIN HEADER	40 PIN	2
11	PCB DEVELOPER	FOR UV BOARD	1 PACKET
12	PCB ETCHING POW-DER	FOR UV BOARD	I PACKET
13	UV BOARD	10*15 CM	1

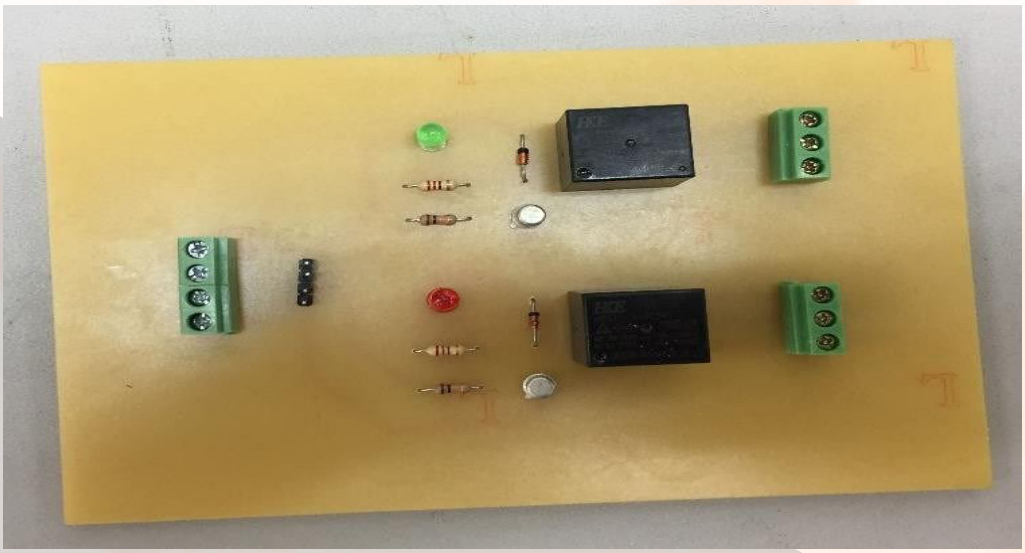


Figure 3: A complete relay circuit

ACTIVITY

B. TASK

To meet the requirements, the group members will need to:

1. Form a work team of 2 or 3 members and organize the necessary activities needed in order to complete the project.
2. Draw the block diagram of your project and identify the types of sensor (digital/analog), relays and related components.
3. Design a relay circuit using altium/proteus software and produce a single layer pcb board of relay circuit (Refer figure 2 and 3).
4. Write a c language programming of embedded project.
5. Deliver an effective oral presentation of a project of around 5 minutes for each team member (excluding Q & A). W10 : 07/02/2018
6. Submission of a report during oral presentation (must be written according to a given format).

C. REPORT FORMAT

1. Introduction
2. Block diagram
3. Schematic circuit
4. PCB circuit
5. Flow chart of programming

PROJECT IMPLEMENTATION

SEMESTER 4

DEE5081 –PROJECT 1
DEC5052–EMBEDDED SYSTEM APPLICATION

IMPLEMENTATION

ACTIVITY NAME:

INTRA-PROGRAMME INTEGRATED LEARNING EXPERIENCE

BACKGROUND/RATIONALE

An integrated curriculum focuses on making connections for students, allowing them to engage in relevant, meaningful activities that can be connected to real life. Students not only connect and create more real world connections in integrated classrooms, but they are also more actively engaged. Creating an integrated curriculum means that teachers are charged with having to create challenging, fun, meaningful tasks that help students connect to information. An integrated curriculum aims to connect the theory learned in the classroom, with practical, real-life knowledge and experiences. The practical and experiential learning aspect of an integrated curriculum is facilitated through activities.

The implementation of integrated curriculum in the DEQ program is in the form of a mini project as a course work assessment. It was selected based on research during the 'gap analysis' workshop where the similarities of coursework' assessment between the selected courses are relevant and the process of evaluating the coursework can be done together to save the time and cost. Integration between these courses has chosen, DEC5052- Embedded System Application and DEE5081- Project 1 which both courses offered in semester 4 for the DEQ program. Participation and coopera-tion among JKE lecturers have been able to enhance the understanding of students in content and application of the courses. Moreover, most of students and lecturer were motivated to solve the problems. The most important thing is that students were able to understand the concept of integrated learning and also able to apply the learning outcomes that they have learned.

IMPLEMENTATION

The benefit of an integrated curriculum is the ability for students to see skills multiple times. Instead of teaching comprehension strategies in just reading, teaching those strategies across multiple disciplines can give students an opportunity to see and implement it more often. The repetition of the skills being taught creates a higher level of understanding and retention of information for students in the classroom. Furthermore, students were be able to generate their minds more creatively and innovatively. Apart from that, it is also in line with the ministry's desire for students to be more focused on the industry 4.0 revolution.

In particular, the purpose of the integrated curriculum is to provide exposure to students of the relationship that exists between the courses. At the end of the semester students can:

1. collaborate in a team and design an Embedded System project using a PIC16F / PIC18F microcontroller.
2. design a relay circuit using proteus software and subsequently produce a pcb circuit.
3. write a report on the process of developing the ‘Embedded System’ project.
4. present the ‘Embedded System’ project

IMPLEMENTATION

Table 6: Activity Information

NO. OF PARTICIPANT	LECTURER: 8 JKE'S LECTURER
	STUDENT: DEQ4-S1 (20 STUDENTS) , DEQ4-S2 (25 STUDENTS)
SEMESTER/SESSION	4 / DEC 2018 SESSION
PROGRAM	PROGRAM DIPLOMA KEJURUTERAAN EL-EKTRIK (KECEKAPAN TENAGA)
DEPARTMENT	ELECTRICAL ENGINEERING POLITEKNIK PORT DICKSON

Table 7: List of Course's Lecturer

COURSE CODE (SEMESTER 4)	COURSE (SEMESTER 4)	PRO-GRAM	LECTURER
DEC 5052	EMBEDDED SYSTEM APPLICATION	DEQ4-S1	NORHAYATI BT AFFANDI
		DEQ4-S2	
DEE 5081	PROJECT 1	DEQ4-S1	RAZIMAH BT ABDUL RAHIM
			AMRAH BT MAT SAFRI
			SHAZILA IDAYU BT MANJA
		DEQ4-S2	MOHD IZHAM B. AHMAD
			HAMRIN B. ABU HASAN
			AHMAD FADIATUDDIN B. MAT TAHIR
			AZLINA BT KHAIRI

IMPLEMENTATION

Table 8: List of Students DEQ4A

NO	STUDENT'S NAME	MATRIX NO.
1	AHMAD RAFFIQ NASRULLAH BIN RAMLI	06DEQ17F1002
2	MUHAMMAD HAFIZZI BIN ABDUL SHATAR	06DEQ17F1003
3	NORLAILA BINTI ISMAIL	06DEQ17F1005
4	MOHAMMAD EKMAL BIN MALIK	06DEQ17F1006
5	MOHAMMAD HAKIM FIRDAUS BIN MOHAMMAD KHORRI	06DEQ17F1007
6	SULAIMAN BIN ZAHARI	06DEQ17F1008
7	MUHAMMAD SAFWAN BIN AMRAN	06DEQ17F1010
8	NUR AMIRA NATASHA BINTI ZAIROL	06DEQ17F1012
9	AZAMUDDIN BIN KHAMIS	06DEQ17F1015
10	ABDUL MUIZZ BIN ABDUL KARIM	06DEQ17F1016
11	MUHAMAD AIMAN RAHMAN BIN ABDUL RAHIM	06DEQ17F1018
12	MUHAMMAD RAIHAN BIN MAZLAN	06DEQ17F1019
13	MUHAMMAD ZIKRY BIN AL IZMIR	06DEQ17F1020
14	MUHAMMAD IMMAD 'IRFAN BIN MOHD SELAHUDIN	06DEQ17F1021
15	MUHAMMAD ZULMAJDI BIN AHMAD SAFIAN	06DEQ17F1022
16	MUHAMMAD SYAQHIR BIN AZMY	06DEQ17F1023
17	FIRAZ AIMAN BIN ZAINI	06DEQ17F1025
18	MUHAMMAD 'AKIF BIN MAZRI	06DEQ17F1052
19	ZANATULAIN BINTI KASLAN	06DEQ17F1058
20	MUHAMMAD EIZZAT IZZUDDIN BIN ZAIRIZAN SHAMSUL	06DEQ17F1064

IMPLEMENTATION

Table 9: List of Students DEQ4B

NO	STUDENT'S NAME	MATRIX NO.
1	AMMAR HAFIY BIN ROSNEZAM	06DEQ17F1026
2	MUHAMMAD ATHIRMIZI BIN AZEMY	06DEQ17F1028
3	MUHAMMAD KHAIRUDIN BIN ATAN	06DEQ17F1029
4	NORR AIN AMIRA BINTI AZMI	06DEQ17F1030
5	MUHAMMAD FIRDAUS BIN MOHD NOR RAFUZI	06DEQ17F1031
6	SHAHRUL IZWAN BIN OMAR	06DEQ17F1032
7	SITI NUR SUHAIDAH BINTI MD ZAIDI	06DEQ17F1033
8	MOHAMAD FAIZ BIN MD SALLEH	06DEQ17F1034
9	MUHAMMAD NAJMI BIN CHE SANUZI	06DEQ17F1035
10	MUHAMMAD FIRDAUS BIN YAHYA	06DEQ17F1037
11	AHMAD MUBIN BIN TAJUL ARUS	06DEQ17F1038
12	MUHAMMAD ZUL IRFAN BIN ZULKIFLI	06DEQ17F1039
13	NUR SYAFIQAH BINTI AHMAD	06DEQ17F1040
14	AFA SYAHIMI BIN AFFANDI	06DEQ17F1041
15	MUHAMMAD IKRAM BIN JALALUDDIN	06DEQ17F1042
16	NUR FAGHIRA NADHIRAH BINTI NORIZAN	06DEQ17F1046
17	MUHAMMAD ALIFF HARITH BIN ADNAN	06DEQ17F1047
18	NADHIRAH AWATIF BINTI YAHAYA	06DEQ17F1050
19	MUHAMMAD HAZMIE HUSAINI BIN ABD RAHMAN PU-TRA	06DEQ17F1051
20	MOHAMMAD AIMAN BIN MOHD SUKOR	06DEQ17F1054
21	MUHAMMAD YASSIN BIN DAUT	06DEQ17F1055
22	AHMAD LUQMAN HAKIM BIN ZULKEFLI	06DEQ17F1057
23	SUTHARSEN A/L MANOKARAN	06DEQ17F1063
24	SHARMINAWATIE BINTI MAD DAUD @ AJAMAIN	06DEQ17F1065
25	MOHAMMAD AMIRULL SYAHMI BIN MOHD AZMAN	06DEQ17F1066

IMPLEMENTATION

SESSION/	DIS 2018
DATE	3/12/2018—12/4/2019
TIME TABLE	EVERY THURDAY 3.15—5.15 PM
PROGRAM	DIPLOMA IN ELECTRICAL ENGINEERING (ENERGY EFFICIENCY) DEQ 4A & DEQ 4B (45 STUDENTS)
CLASSROOM	DK 6

DECEMBER 2018

Integrated Curriculum implementation briefing

IMPLEMENTATION

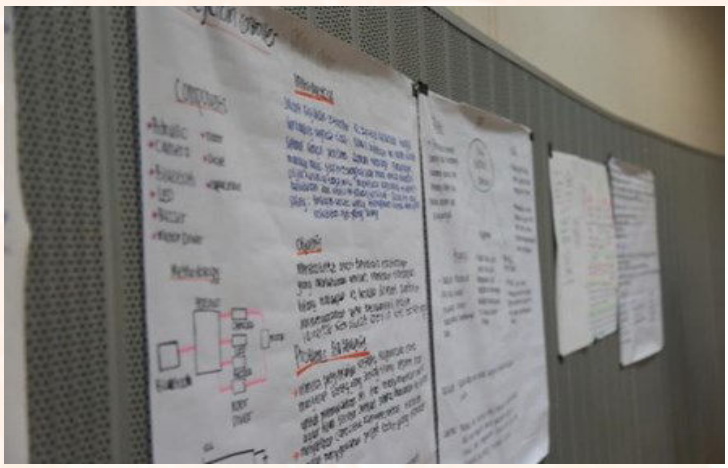
JANUARY 2019

Circuit simulation lecture using proteus and MPLAB software. Both of the courses were used the same software

IMPLEMENTATION

JANUARY 2019

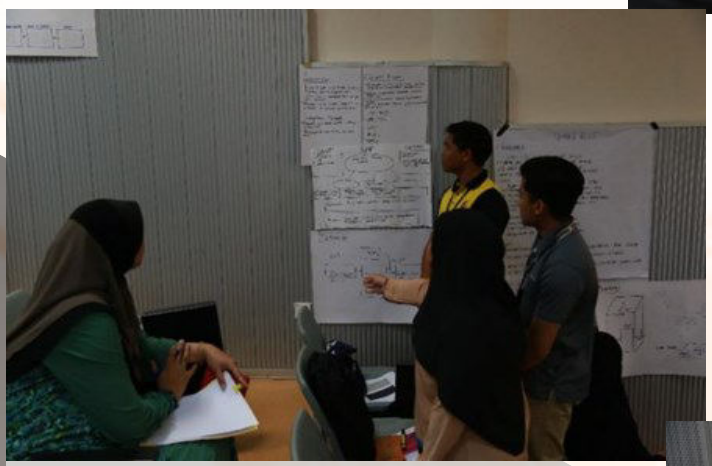
Project proposal presentation



IMPLEMENTATION

JANUARY 2019

Project proposal presentation



IMPLEMENTATION

JANUARY 2019

Mini project: Hardware tool and electronic components

IMPLEMENTATION

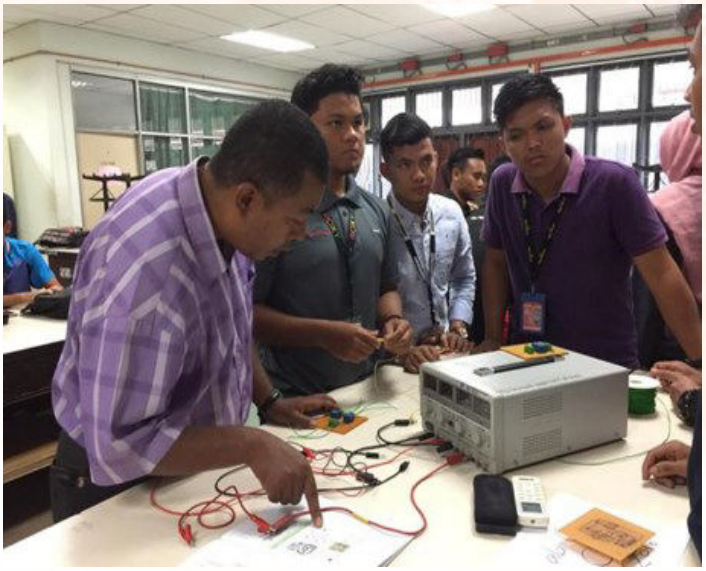
FEBUARY 2019

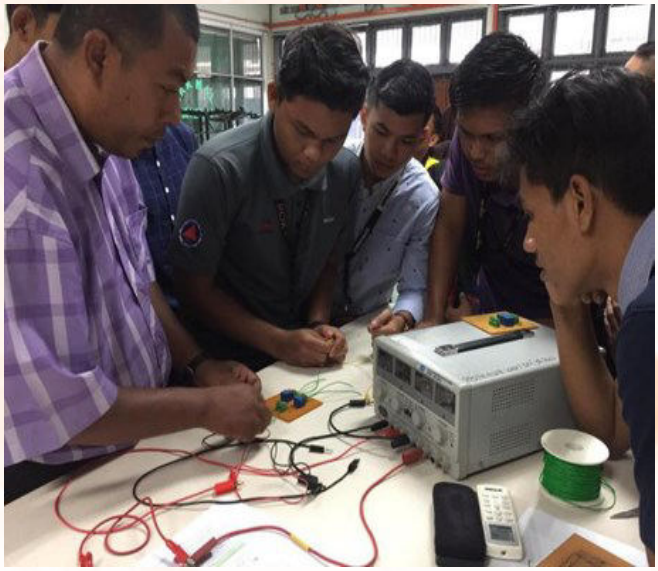
Mini project: Etching, drilling, and soldering/desoldering process

IMPLEMENTATION

MARCH 2019

Mini project: Circuit testing & troubleshoot

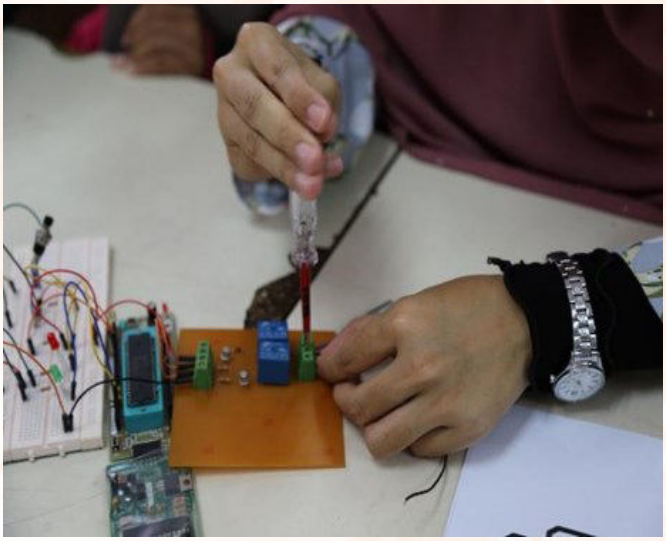


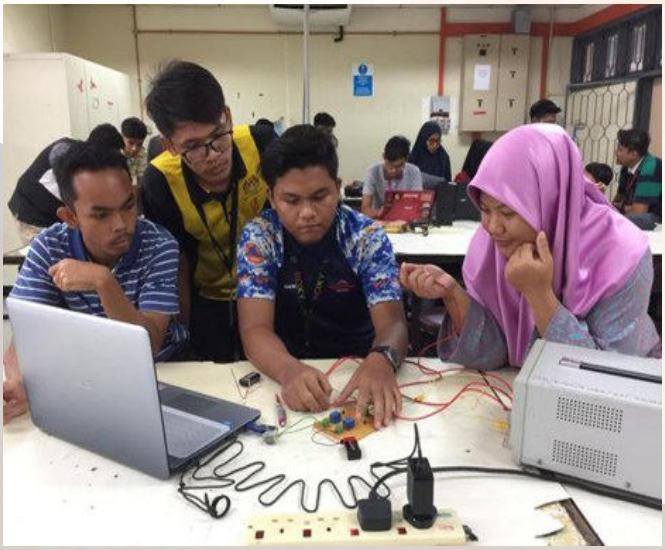


IMPLEMENTATION

APRIL 2019

Mini project: Presentation, demonstration and evaluation

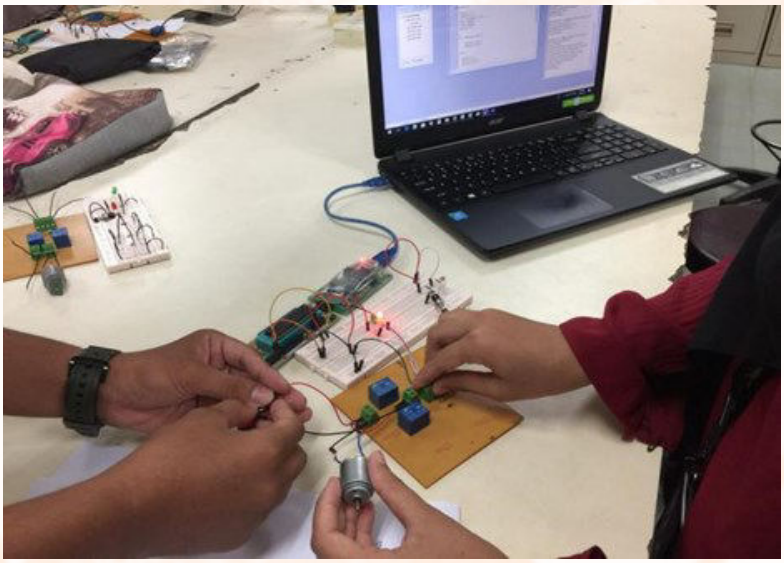


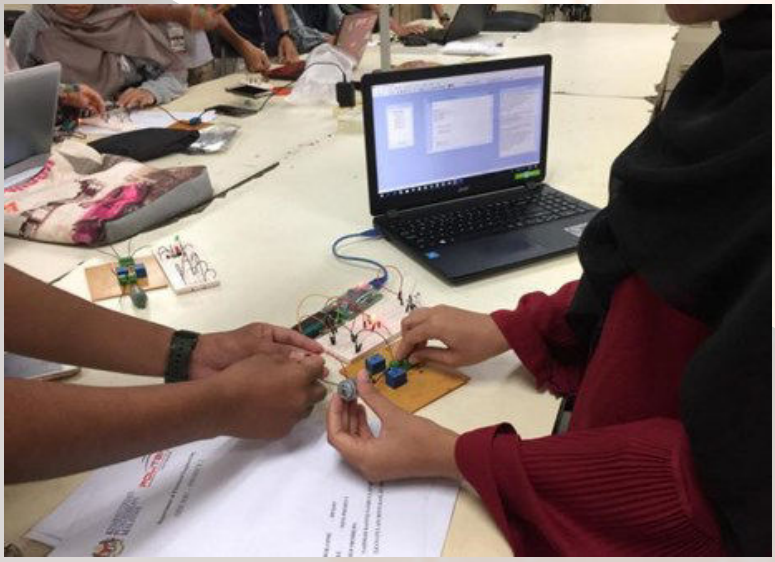


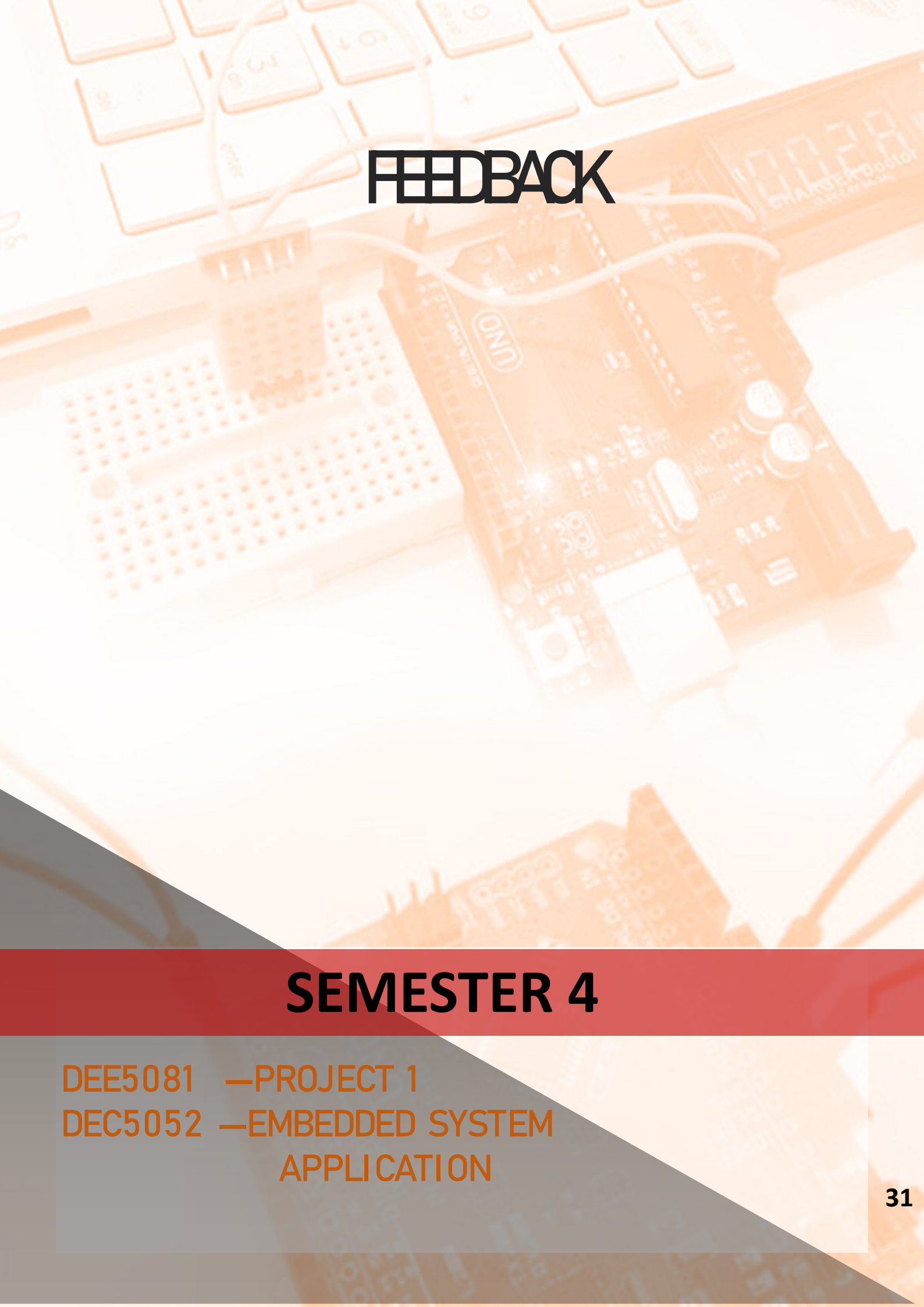
IMPLEMENTATION

APRIL 2019

Mini project: Presentation, demonstration and evaluation







FEEDBACK

SEMESTER 4

DEE5081 –PROJECT 1

DEC5052 –EMBEDDED SYSTEM APPLICATION

STUDENT'S EVALUATION

Table 10: Student's Evaluation

Questionnaire	Student's feedback				
	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
Integrated teaching helped me to get a better understanding of the topic	-	-	-	14	31
Understanding of the topic is better with this method when compared to lectures	-	-	-	16	29
This exercise can be regularly incorporated in the curriculum	-	-	-	14	31
Reduces the amount of time needed for self-study when compared with lectures	-	-	2	16	27
I would like to recommend integrated teaching to other departments	-	-	1	15	29
I have found that integrated teaching sessions help me learn course material more than if I just studied alone	-	-	-	17	28
Integrated teaching has increased my self-confidence and attitude toward learning	-	-	-	16	29

LECTURER'S EVALUATION

Table 11: Lecturer's Evaluation

Questionnaire	Lecturer's feedback				
	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
Integrated TL program is a useful method of TL	-	-	-	1	7
With integrated TL program students would be able to understand the concept more easily	-	-	-	4	4
Concept of integrated TL program is much time consuming for us	-	-	3	-	5
This will need a lot of training and refresher training at the Polytechnic level	-	-	-	2	6
Interdepartmental coordination is a very difficult task	-	-	1	3	4
Understanding of the topic is better with this method	-	-	-	3	5
This integrated TL program will help the students to perform better	-	-	-	1	7
This exercise can be regularly incorporated in the curriculum for must-know areas of the curriculum	-	-	3	3	2
It reduces the amount of time needed for self-study	-	-	-	2	6
Integrated learning will result in a more relevant, meaningful, and student-centered curriculum	-	-	-	3	5

REFLECTION & IMPACT

SEMESTER 4

DEE5081 –PROJECT 1
DEC5052–EMBEDDED SYSTEM APPLICATION

REFLECTION

Student's Reflection

There were 9 survey questions given to students at the end of the semester. Overall, the students had fun and were satisfied with the implementation of integrated curriculum (project 1 & Embedded System). This is because they can perform two coursework simultaneously, which can save their time and cost. Students also feel that they can improve their understanding better and able to relate between theory and practical. They also felt they were able to learn better and for many, they had more fun.

Lecturers Reflection

Overall, most of lecturers strongly supported the implementation of integrated curriculum between these courses. Moreover, integrated curriculum able to increase student learning and their engagement in their own learning. They hope that it can be maintained and improved in terms of the implementation of the integration in curriculum development.

CONCLUSION

SEMESTER 4

DEE5081 –PROJECT 1
DEC5052–EMBEDDED SYSTEM APPLICATION

CONCLUSION

This paper gives a brief study design in developing an integrated curriculum based on project based activities in the DEQ program. The findings support the positive effects of curriculum integration. An integrated curriculum helps students apply skills, encourages depth and breadth in learning, promotes positive attitudes in students, and provides for more quality time for curriculum exploration. This approach is successful in making students more aware of content area connections, challenging students, providing a learning environment supporting academic and social needs. Students participating in an integrated curriculum have demonstrated a more positive attitude about themselves and institution. Similarly, lecturers are provided with a new opportunity to work together, increasing collegiality. They have worked together to provide enhanced learning experiences and a variety of instructional approaches through integrated curriculum. It is hoped that these method will facilitate more and more department or Malaysian Polytechnic to opt for this positive change in approach to teaching and learning.

RUBRICS

SEMESTER 4

DEE5081 –PROJECT 1
DEC5052–EMBEDDED SYSTEM APPLICATION

CLO3—LD2 PRACTICAL SKILLS

Table 12: Practical Skills Rubric

Aspects	Keypoints	Scaling			MARKS	MARKS		
		POOR	AVERAGE	EXCELLENT		A	B	C
		1	2	3				
Progress / Psychomotor (CLO3/PLO5) (30%)	Circuit simulation - simulation techniques - simulation results	Inability to use proper simulation techniques and produce correct simulation results / displays for most	Able to use correct simulation techniques and produce correct simulation results / displays for parts of the project circuit.	Able to use correct simulation techniques and produce correct simulation results / displays successfully.	/3			
	PCB layout using CAD - track size and distance - pad size - footprint selection and placement - layout size	Improper track size, track distance, pad size, footprint selection and placement and PCB layout size.	Proper and acceptable track size, track distance, pad size, footprint selection and placement and PCB layout size.	Perfect track size, track distance, pad size, footprint selection and placement and PCB layout size.	/3			
	Soldering - use of soldering tools - soldering quality	Improper handling of the soldering and desoldering tools. Produce many cold-joints and bulky solder.	Correct handling of the soldering and desoldering tools. Produce a few cold-joint or bulky solder.	Correct handling of the soldering and desoldering tools. Solder is shiny and of proper size.	/3			
	Photolitography - use of photolithography tools (UV exposure unit) - exposure duration	Not able to use and handle the UV exposure unit in a proper manner and over setting the exposure duration.	Acceptable handling of the UV exposure unit and correct exposure duration used.	Able to use and handle correctly the UV exposure unit and correct exposure duration used.	/3			
	Etching - steps in etching process - PCB quality (after etching)	Does not observe the safety procedures of handling the etchant in the etching steps, PCB tracks produced are jagged and	Observe the safety procedures of handling the etchant in the etching steps, produced some well-defined shiny PCB tracks and and some oxidated	Observe the safety procedures of handling the etchant in the etching steps, PCB tracks produced are well-defined and shiny with	/3			
	Component testing - use of correct testing tools - use of correct testing technique	Incorrect use of tools and techniques for testing the components.	Use correct tools and techniques for testing some of the components.	Use correct tools and techniques for testing All different components.	/3			
	Breadboard Circuit testing - use of correct testing tools - use of correct circuit testing technique	Incorrect use of tools and techniques to trace the input and output and testing of the project circuit.	Use correct tools and techniques to trace the input and output and testing of SOME parts of the project circuit.	Use correct tools and techniques to trace the input and output and testing of All parts of the project circuit.	/3			
				TOTAL	/21			
				(Marks /21) x 30	/30			

DEC5052 – EMBEDDED SYSTEM APPLICATION

CLO2—LD1 KNOWLEDGE

CRITERIA	EXCEL-LENT	GOOD	AVERAGE	WEAK	WEIGHT	S1	S2	S3
Development And Implementation Codes (MPLAB) 20%	Able to write and compile the codes without any error and assistance	Able to write and compile the codes with minimum assistance	Able to write and compile the codes with assistance	Faces difficulty writing the codes	5			
Simulation (PROTEUS) 5%	Able to draw circuits and able to simulate programme without any error and assistance	Able to draw circuits and able to simulate programme with minimum assistance	Able to draw circuits and able to simulate programme with assistance	Has difficulty simulating programme correctly	1.25			
Hardware Assemble (PIC Start Up Kit, SK40C) 20%	Able to make microcontroller circuit connection and show the output without any error and assistance	Able to make microcontroller circuit connection and show the output with minimum assistance	Able to make microcontroller circuit connection and show the output with assistance	Unable to make microcontroller circuit connection abd show the output	5			
Oral Presentation 5%	Presentation of information to class was organized, understandable, and accurate	Presentation of information to class was mostly organized, understandable, and accurate	Presentation of information to class was somewhat organized, understandable, and accurate	Presentation of information to class was not organized, understandable, and accurate	1.25			
Report 10%	Information is presented in a logical, interesting way, which is easy to follow. Demonstration of full knowledge of the subject with explanations and elaboration	Information is presented in a logical, manner, which is easy to followed. Writer is at ease with content and able to elaborate and explain to some degree	Work is hard to follow as there is very little continuity. Writer is uncomfortable with content. Only basic concepts are demonstrated and interpreted	Sequence of information is difficult to follow. No apparent structure or continuity. No grasp of required subject matter. No understanding of major issues. No interpretation of results	2.5			
				Total	60			
				(Marks/60) *10	10			

CLO4—LD1 LEADERSHIP

CLO4: demonstrate the ability to lead a team to complete assigned project / practical work within a stipulated time frame. (A3, PLO11) Table 12: Practical Skills Rubric

Table 14: Leadership Rubric

CITERIA	Sangat Lemah	Lemah	Memuaskan	Baik	Sangat Baik	Weight
Keberkesanan kepimpinan	Tiada bukti jelas kebolehan memimpin anggota kumpulan secara berkesan dalam mencapai objektif.	Boleh memimpin Anggota kumpulan sehingga projek mencapai objektif tetapi dengan kesan yang terhad dan memerlukan penambahbaikan	Boleh memimpin Anggota kumpulan sehingga projek mencapai objektif dengan keberkesanan yang baik dan memerlukan sedikit penambahbaikan	Boleh memimpin Anggota kumpulan sehingga projek mencapai objektif dengan berkesan	Mempamerkan bukti jelas kebolehan memimpin anggota kupulan dengan berkesan dalam mencapai objektif	5
Motivasi	Sukar untuk mempengaruhi, memotivasi dan memberi inspirasi kepada individu atau kumpulan	Mempengaruhi, memotivasi dan memberi inspirasi pada tahap yang minimum kepada individu atau kumpulan	Mempengaruhi, memotivasi dan memberi inspirasi pada tahap sederhana kepada individu atau kumpulan	Mempengaruhi, memotivasi dan memberi inspirasi dengan minat kepada individu atau kumpulan	Mempengaruhi, memotivasi dan memberi inspirasi yang sepenuhnya kepada individu atau kumpulan	5
Bimbingan	Tiada sumbangan idea atau membuat keputusan	Jarang menyumbang idea atau membuat keputusan	Kadang-kadang menyumbang idea atau Membuat keputusan	Sering menyumbang idea atau membuat keputusan	Sentiasa menyumbang idea atau membuat keputusan	5
Menghormati dan menerima pendapat	Tidak boleh menghormati dan menerima pendapat ahli kumpulan lain yang membawa kepada konflik	Kurang menghormati dan menerima pendapat ahli kumpulan lain dalam mencapai objektif kumpulan	Boleh menghormati dan menerima pendapat orang lain dalam mencapai objektif kumpulan	Boleh menghormati dan menerima pendapat ahli kumpulan lain secara terbuka dalam mencapai objektif kumpulan	Boleh menghormati dan menrima pendapat ahli kumpulan lain secara lebih terbuka dalam mencapai objektif kumpulan	5
					Markah	100

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