

# ENHANCING DIGITAL CAPACITIES IN HIGHER EDUCATION FOR ASIAN UNIVERSITY PROJECT (Digi-CHE-Asia)

Organized by



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## Training Syllabus for “ELECTRONICS AND ARDUINO”

### INSTRUCTORS TEAM

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2. Kun Sovanrada, Bachelor Degree in Electronics and Automation Engineering from Institute of Technology of Cambodia (ITC)
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### COURSE DESCRIPTION

This short course program will introduce students on the fundamental concepts of Electronics and Arduino and its practical applications in various industry related fields. Students, in addition, will also understand on how to develop and emphasize the programming codes using Arduino associated with other devices. Networking Communication, Motor Control and Sensor Usage are also included in this training course. A small capstone project will be conducted at the last section of the training.

### LEARNING OUTCOMES

Upon completion of this short course, students will be able:

- To understand the basic concepts of Electronics components and Arduino interface and hardware
- To develop Arduino programming codes to be used for Arduino kit
- To understand on and apply networking communications in related fields
- To differentiate types of motors and sensors and its correct usage
- To integrate Arduino into small projects (e.g. home automation, water level monitor, IoT, etc.)

### COURSE CONTENTS

Week	Hours	Lesson Contents	Teaching Method	Learning Activities
1	8h	<b>Section 1: Fundamental of Electronics</b> <ul style="list-style-type: none"> <li>• Introduction to Electrical Circuit (Ohm's law, Current Transmission, etc.) – 2 hours</li> <li>• Introduction to Electronics Components (Capacitor, Resistor, Inductor, Diode...) – 4 hours</li> <li>• Utilization of Electrical and Electronics devices (Lab hours) – 2 hours</li> </ul>	<ul style="list-style-type: none"> <li>• Providing Lectures</li> <li>• Tutorial</li> <li>• Assignment/Report</li> <li>• Lab Hour</li> </ul>	<ul style="list-style-type: none"> <li>• Group Discussion</li> <li>• Practice</li> <li>• Report(s)</li> </ul>
2	8h	<b>Section 2: Arduino Hardware and Simulations</b> <ul style="list-style-type: none"> <li>• Introduction to C program (basic syntax, data type, variables, constants, etc.) – 2 hours</li> <li>• Introduction to Arduino Interface and Hardware and Installation – 2 hours</li> </ul>	<ul style="list-style-type: none"> <li>• Providing Lectures</li> <li>• Tutorial</li> <li>• Assignment/Report</li> <li>• Lab Hour</li> </ul>	<ul style="list-style-type: none"> <li>• Group Discussion</li> <li>• Practice</li> <li>• Report(s)</li> </ul>

		<ul style="list-style-type: none"> <li>• Arduino Language: Variables, Conditions, Loop Function, Operator, etc. – 4 hours</li> </ul>		
3	8h	<p><b>Section 2: Arduino Hardware and Simulations (Cont.)</b></p> <ul style="list-style-type: none"> <li>• Eagle Simulations – 4 hours</li> </ul> <p><b>Section 3: Arduino Analysis and Applications</b></p> <ul style="list-style-type: none"> <li>• Electronics Devices Control using Arduino – 2 hours</li> <li>• Utilization of LCD with Arduino – 2 hours</li> </ul>	<ul style="list-style-type: none"> <li>• Providing Lectures</li> <li>• Tutorial</li> <li>• Assignment/Report</li> <li>• Lab Hour</li> </ul>	<ul style="list-style-type: none"> <li>• Group Discussion</li> <li>• Practice</li> <li>• Report(s)</li> </ul>
4	8h	<p><b>Section 3: Arduino Analysis and Applications (Cont.)</b></p> <ul style="list-style-type: none"> <li>• Utilization of LCD with Arduino (Cont.) – 2 hours</li> <li>• Utilization of Keypad – 4 hours</li> <li>• 7 Segments to Program Traffic Light, Transistor and Relay Control – 2 hours</li> </ul>	<ul style="list-style-type: none"> <li>• Providing Lectures</li> <li>• Tutorial</li> <li>• Assignment/Report</li> <li>• Lab Hour</li> </ul>	<ul style="list-style-type: none"> <li>• Group Discussion</li> <li>• Practice</li> <li>• Report(s)</li> </ul>
5	8h	<p><b>Section 3: Arduino Analysis and Applications (Cont.)</b></p> <ul style="list-style-type: none"> <li>• 7 Segments to Program Traffic Light, Transistor and Relay Control (Cont.) – 2 hours</li> </ul> <p><b>Section 4: Motor Control and Sensors</b></p> <ul style="list-style-type: none"> <li>• Introduction to Networking Communications, i.e. IR Sensors – 2 hours</li> <li>• Types of Motors and Control (Analog and Digital Signal, RGB, Servo Motor Control) – 4 hours</li> </ul>	<ul style="list-style-type: none"> <li>• Providing Lectures</li> <li>• Tutorial</li> <li>• Assignment/Report</li> <li>• Lab Hour</li> </ul>	<ul style="list-style-type: none"> <li>• Group Discussion</li> <li>• Practice</li> <li>• Report(s)</li> </ul>
6	8h	<p><b>Section 4: Motor Control and Sensors (Cont.)</b></p> <ul style="list-style-type: none"> <li>• Types of Sensors and Selections (e.g. Humidity Sensor, Ultrasonic Sensor, Motion Sensor, etc.) – 8 hours</li> </ul>	<ul style="list-style-type: none"> <li>• Providing Lectures</li> <li>• Tutorial</li> <li>• Assignment/Report</li> <li>• Lab Hour</li> </ul>	<ul style="list-style-type: none"> <li>• Group Discussion</li> <li>• Practice</li> <li>• Report(s)</li> </ul>
7	4h	<p><b>Section 5: Capstone Project</b></p> <ul style="list-style-type: none"> <li>• Integration of Arduino into small projects – 4 hours</li> </ul>	<ul style="list-style-type: none"> <li>• Lab Hour</li> </ul>	<ul style="list-style-type: none"> <li>• Group Discussion</li> <li>• Practice</li> <li>• Report(s)</li> </ul>

**Note:** \* The schedule for this course is expected to be 2 times per week, where 1 week takes 4 hours.

## EVALUATION METHODS

The following evaluation methods are conducted to ensure students will receive competences after completing this short course.

- Regular Attendance (10%)
- Report and Assignment (30%)
- Project Plan and Presentation (60%)

*Successful students with passing score of 50 points up will receive Certificate of Completion.*

## SUPPORTING MATERIALS

### Class Hour:

- PPT Present

- Lecture notes
- Computer, LCD, ink markers

**Lab Hour**

- Electronics Components (Capacitor, Resistor, Inductor, Diode, etc.)
- Electrical Devices (Digital Oscilloscope, Multi-meter, Power Supply, etc.)
- Arduino UNO R3 Starter Kit
- Arduino Starter Kit Multi-Language
- MEGA 2569 R3 USB Cable ATMEGA16U2 Driver CP2120
- EAGLE Software

**REQUIRED TEXTBOOKS**

- Charles K. Alexander and Matthew N. O. Sadiku, “Fundamentals of Electric Circuits”, Fifth Edition, 2013.
- Bogdan M. Wilamowski and J. David Irwin, “Fundamentals of Industrial Electronics”, 2<sup>nd</sup> Edition, 2011.
- Brian Evans, “Beginning Arduino Programming”

**TENTATIVE SCHEDULE (Subject to change):**

No	Description	August 2021				September 2021			
		W1	W2	W3	W4	W1	W2	W3	W4
1	Section 1: Fundamental of Electronics – 8 hours								
2	Section 2: Arduino Hardware and Simulations – 12 hours								
3	Section 3: Arduino Analysis and Applications – 14 hours								
4	Section 4: Motor Control and Sensors – 14 hours								
5	Section 5: Capstone Project – 4 hours								