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

Organized by

Training Syllabus for

"*ROBOTICS*"

INSTRUCTORS TEAM

1. Thok Piseth, Master of Engineering in Electronics and Automation Engineering from Institute of Technology of Cambodia (ITC)
2. Kun Sovanrada, Bachelor Degree in Electronics and Automation Engineering from Institute of Technology of Cambodia (ITC)
3. Sin Sotheavuth, Master of Engineering in Mechanical Engineering from Tokyo Institute of Technology (Tokyo Tech)

Affiliation: Faculty of Science and Technology, Department of Mechanical Engineering, Svay Rieng Univerity (SRU), Svay Rieng Province, Cambodia

COURSE DESCRIPTION

This short course will introduce students on the fundamental concepts of Robotics and its practical applications. Utilization of 3D Printer with the aid of Solidwork and LEGO MINDSTORMS will be included in this course.

LEARNING OUTCOMES

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

- To understand the basic concepts of 3D Printer and its applications with the aid of Solidwork
- To understand the basic concepts of LEGO EV3 interface and its applications
- To create blocks using LEGO EV3 software for LEGO EV3 kits
- To develop small projects using 3D Printer and LEGO EV3 software

COURSE CONTENTS

Week	Hours	Lesson Contents	Teaching Method	Learning Activities
1	8h	**Section 1: Application of 3D Printer** • Introduction to 3D Printer Technology and Installation – 2 Hour • Utilization of Solidwork – 2 Hours • Application of Solidwork with 3D Printer – 4 Hours	• Providing Lectures • Tutorial • Assignment/Report • Lab Hour	• Group Discussion • Practice • Report(s)
2	8h	**Section 2: Utilization of LEGO EV3 Mindstorm Software for Core Set and Expansion Set** • Introduction to EV3 Technology (EV3 Brick, EV3 Motors, EV3 Sensors, etc.) – 2 hours • Connection of Sensor and Motor – 2 hours • Connection of EV3 Brick to PC and other devices – 1 hour • EV3 Brick interface – 1 hour • Installation and Utilization of EV3 Software (Lobby, Project Properties and Structure, Robot Educator, Programming block and Palettes, Data	• Providing Lectures • Tutorial • Assignment/Report • Lab Hour	• Group Discussion • Practice • Report(s)

		logging, Hardware Page, Content editor, and Tools) – 2 hours		
3	8h	**Section 3: Utilization of LEGO EV3 Mindstorm Software for Core Set and Expansion Set (Cont.)** • Installation and Utilization of EV3 Software (Lobby, Project Properties and Structure, Robot Educator, Programming block and Palettes, Data logging, Hardware Page, Content editor, and Tools) – 4 hours **Section 3: EV3 Programming Blocks Creation and Adjustment** • Programming Blocks Development using LEGO EV3 – 3 hour • Port Selection and Connection -1 hour	• Providing Lectures • Tutorial • Assignment/Report • Lab Hour	• Group Discussion • Practice • Report(s)
4	8h	**Section 3: EV3 Programming Blocks Creation and Adjustment (Cont.)** • Practice and Adjustment – 2 hours **Section 4: Capstone Projects** • Integration of above knowledge into small projects using 3D Printer – 3 hours • Integration of above knowledge into small projects using LEGO Mindstorms EV3 – 3 hours	• Providing Lectures • Tutorial • Assignment/Report • Lab Hour	• Group Discussion • Practice • Report(s)

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

- Solidwork Software
- 3D Printer
- Solidwork Software
- LEGO Mindstorms Education EV3 Core Set
- LEGO Mindstorms Education EV3 Expansion Set

REQUIRED TEXTBOOKS

- Matt Lombard, “Mastering Solidworks”, 2019

- Ben Redwood, Filemon Schöffer and Brian Garret, "The 3D Printing Handbook: Technologies, Design and Application"
- Miguel Agullo, Mario Ferrari, et al, "LEGO Mindstorms Masterpieces: Building and Programming Advanced Robots", 2003
- LEGO MINDSTORMS Education EV3 Coding Activities Second Edition copyright of the LEGO Group 2017.
- User Guide LEGO MINDSTORMS Education copyright of the LEGO Group 2013, 2015, 2016.

TENTATIVE SCHEDULE (Subject to change):

No	Description	October 2021			
		W1	W2	W3	W4
1	Section 1: Application of 3D Printer – 8 hours				
2	Section 2: LEGO EV3 Mindstorm Software for Core Set and Expansion Set – 12 hours				
3	Section 3: EV3 Programming Blocks Creation and Adjustment – 6 hours				
4	Section 4: Capstone Project – 6 hours				