NIRMA UNIVERSITY
School of Technology, Institute of Technology
B.Tech. Electronics & Communication Engineering
Semester - VII
Department Elective V

L	T	P	C
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Course Code	2ECDE67
Course Title	Single Board Computers for Electronic System Design

Course Outcomes (COs):
At the end of the course, students will be able to –

1. comprehend the fundamental features of Single Board Computers and their role in electronic system design.
2. realize sensor interfacing of Raspberry Pi, Arduino, and ESP8266.
3. develop input/output and networking-related programs for Single Board Computers.
4. evaluate the performance of Raspberry Pi, Arduino, and ESP8266 for a given electronic system design for input/output, networking, time, and memory complexity.

Syllabus **Teaching Hours: 45**

UNIT I: Single Board Computers **02**
Introduction to the Computers, features, uses, role of Single Board Computers in electronic system design

UNIT II: Arduino **10**
Introduction to Arduino, Programming Arduino, GPIO Basics, Interfacing Digital and Analog Sensors with Arduino, Visual and Audio Outputs for Arduino, Using, Modifying, and Creating Libraries Arduino Build Process and Memory Handling

UNIT III: Network Programming in Arduino **05**
Remotely Controlling External Devices, Communicating Using I2C and SPI, Wired and Wireless Networking in Arduino, Using the Controller Chip Hardware

UNIT IV: Raspberry Pi **10**
Introduction to Raspberry Pi Models, RPi Setup and Management, Operating Systems for RPi and its porting, Displays for RPi, GPIO Basics, Programming RPi with Python, Interfacing Digital and Analog Sensors with RPi,

UNIT V: Network Programming in RPi **10**
Introduction to TCP/IP protocol suite, Bluetooth standard, Zigbee Standard, Network configuration of maker boards, Socket programming, Virtual Network Computing, Wired and Wireless Networking in RPi, Arduino, and Raspberry Pi

UNIT VI: ESP8266 **08**
Introduction to ESP8266, GPIO Basics, Interfacing Digital and Analog Sensors with ESP8266, Programming ESP8266, Over the Air Update of ESP8266, Using MicroPython on the ESP8266 using ESP8266, Cloud Data Monitoring using ESP8266, Interacting with Web Services, Machine to Machine Interactions using ESP8266

Self-Study:
The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:
Laboratory work will be based on the above syllabus with a minimum of 10 experiments to be incorporated.

Suggested Reading:
1. Michael Margolis, Arduino Cookbook, O'Reilly

2. Simon Monk, Raspberry Pi Cookbook, O'Reilly
3. Marco Schwartz, Internet of Things with ESP8266, Packt Publishing

L = Lecture, T = Tutorial, P = Practical, C = Credit