INTRODUCTION TO EMBEDDED SYSTEM AND INTERNET OF THINGS

Module I

		L	T	P	C
DEE1	**INTRODUCTION TO EMBEDDED SYSTEM AND INTERNET OF THINGS**	**3**	**0**	**2**	**4**

COURSE OUTCOMES (On completion of the course, the students will be able to):

1) Explain the real time embedded system and its components.
2) Understand basic components and building blocks of Internet of Things.
3) Apply skills to conduct interfacing of embedded boards with components, actuators and sensors.

COURSE CONTENTS

Theory (L): Real time systems and Real-time scheduling – Processor basics and System-On-Chip – IOT- Definition and characteristics of IoT - Technical Building Blocks, Physical design of IoT, Things of IoT protocols - IoT communication models, IoT Communication Application Programming Interfacings.

Practical (P):

1) Introduction of Components, Sensors and Actuators- Introduction of Arduino Mega2560.

2)Testing- Reading Switches and Blinking LED-Analog/Digital Port Programming - Accelerometer Sensor Interfacing- Temperature Sensor (LM35) Interfacing- Humidity Sensor (DHT11) Interfacing- PIR Sensor Interfacing.

TOTAL: (45 T+ 30P) 75 PERIODS

		L	T	P	C
DEE2	**PYTHON FOR IOT**	**3**	**0**	**2**	**4**

COURSE OUTCOMES (On completion of the course, the students will be able to):

1) Describe the principles and various concepts of python programming.
2) Design and develop environmental friendly IoT enabled devices using Python.
3) Appraise the configuration and control of Raspberry Pi controller circuits.

COURSE CONTENTS

Theory (L): Concepts, Data Structures, Classes – Data Wrangling- – Data Aggregation, Group Operations, Time series & Web Scrapping- Visualization in Python- Introduction of Raspberry Pi- Implementation using Raspberry Pi

Practical (P):

1) Implementation of IoT using Raspberry Pi & Python Programming.

2) LCD Interfacing (HD44780)

TOTAL: (45 T+ 30P) 75 PERIODS

DEE3	EMBEDDED C PROGRAMMING	L	T	P	C
		3	0	2	4

COURSE OUTCOMES (On completion of the course, the students will be able to):

1) Apply the knowledge of programming in different operations of embedded system devices.
2) Summarize the programming and use in embedded processor.
3) Formulate the software and hardware components of Embedded system.

COURSE CONTENTS

Theory (L): Datatypes- Array-Conditional Statements-Functions / Callback function- Structures-Pointers-Storage classes-IEEE 802.15.4 in Embedded system-Communication Networks-serial port, SPI, I2C, UART-Application driven Selection of Microcontrollers.

Practical (P):

1) Interfacing with SPI, I2C, UART

2) IoT Layered Architecture,RF, Zigbee, Wifi

TOTAL: (45 T+ 30P) 75 PERIODS

DEE4	EMBEDDED DESIGN METHODOLOGY	L	T	P	C
		3	0	2	4

COURSE OUTCOMES (On completion of the course, the students will be able to):

1) Apply the knowledge of programming in different operations of embedded system devices.
2) Summarize the programming and instructions sets of ARM embedded processor.
3) Formulate the software and hardware components of ARM processor.

COURSE CONTENTS

Theory (L): Embedded System Programming – Arithmetic & Logic Instructions and Programs-Timer/Counter Programming – Introduction-ARM-The Pipeline- Registers- ARM 9 Instruction Set- Interrupt- Device and component integration

Practical (P):

1) Motor Control Interfacing - Relay, PWM, DC, Stepper and Servo Motors

TOTAL: (45 T+ 30P) 75 PERIODS

DEE 5	IOT AND CLOUD OF THINGS	L	T	P	C
		3	0	2	4

COURSE OUTCOMES (On completion of the course, the students will be able to):

1) Define the building blocks of IOT devices
2) Describe the protocol and communications standards of IOT using Embedded systems.
3) Design IOT device and systems using cloud storage.

COURSE CONTENTS

Theory (L): IoT Physical Devices and Endpoints: Basic building blocks of and IoT device– Protocol Standardization for IoT.- Cloud Storage Models- RFID – ZigBEE – Bluetooth – Internet Communication.

Practical (P):

Temperature Sensor Interfacing (LM35) - Bluetooth Interfacing (HC05)- Motor driver Interfacing (L298) -LCD Interfacing –Cloud Storage- Interface.

Case Studies- Smart Grid &IoT, Commercial building automation using IoT, Recent trends in sensor network and IOT architecture, Automation in Industrial aspect of IOT.

TOTAL: (45 T+ 30P) 75 PERIODS

INDUSTRIAL AUTOMATION

Module II

		L	T	P	C
DEE6	**INTRODUCTION TO PLC**	**3**	**0**	**2**	**4**

COURSE OUTCOMES (On completion of the course, the students will be able to):

1) Analyze the PLC hardware.
2) Write programming in ladder logic.
3) Do control panel wiring.

Theory: Introduction-Automation, PLC Hardware/Architecture, Relay/Digital Logics, Ladder logics Programming, PLC Scan Cycle, Communication Drivers, Networking Configuration,

Practical: Bit, Byte & Word Instructions, Compare/Logical/Arithmetic, Program Control Instructions, Timer, Counter Configuration, Instruction Set, Upload/Download/Monitoring of Program, Forcing Inputs & Outputs, Analog Input/ Output Addressing, Digital Input/ Output Addressing, PLC Troubleshooting, I/O Modules Configuration, Panel Wiring Designing, Applications-ABB,Delta,Siemens,Schneider panels.

TOTAL: (30 T+ 45 P) 75 Hours

		L	T	P	C
DEE7	**SUPERVISORY CONTROL & DATA ACQUISITION (SCADA)**	**3**	**0**	**2**	**4**

COURSE OUTCOMES (On completion of the course, the students will be able to):

1) Explain the SCADA concepts.
2) Simulate the applications.
3) Interfacing PLC and SCADA.

Theory: Introduction-SCADA, advantages and disadvantages, applications

Practical: Creating Database, Images, Objects Configuration, Dynamic Properties (Blinking Visibility, Movement, Filling), Tag Creation & Addressing, Macro Editor, Alarm/Events Configuration, Trends-Real time & Historical, Interfacing with PLC, Recipe Management.(Software-Wonderware intouch,WinCC)

TOTAL: (30 T+ 45 P) 75 Hours

DEE8	VARIABLE FREQUENCY DRIVE	L	T	P	C
		3	0	2	4

COURSE OUTCOMES (On completion of the course, the students will be able to):

1) Explain the VFD concepts.
2) Apply VFD to real time applications.
3) Interfacing PLC,SCADA and VFD.

Theory: Introduction to VFD, VFD Selection, Types of motor and starters, Types of speed control methods,Concept of servo and stepper drive.

Practical: Parameterization, Checking Load, Rated Voltage, Rated Current, Rated RPM, Commissioning, Different Mode of Input Command, No Load Test, Speed Modulation, ON/OFF Command. Real time applications using ABB, Delta and Siemens Panel. Servo drive, stepper driver operations.

TOTAL: (30 T+ 45 P) 75 Hours

DEE9	HUMAN MACHINE INTERFACE	L	T	P	C
		3	0	2	4

COURSE OUTCOMES (On completion of the course, the students will be able to):

1) Explain the HMI concepts.
2) Apply HMI to real time applications.
3) Interfacing PLC, SCADA and HMI.

Theory: Introduction to MMI/HMI, Diff between SCADA and HMI, Advantages and Applications

Practical: Designing in HMI Software – Different types of Operator Interfaces, Textual & Graphical Properties for the Design, I/O Configuration, Wiring Practice of HMI, Data Handling with HMI, Configuration and Interfacing to PLC & PC. Hands on training on ABB,Delta and Siemens Panel.

PNEUMATICS & FIELD INSTRUMENTS

Theory: On/Off Solenoid Valves, Control Valves, Actuator, Level Transmitter, Flow Transmitter, RTD/Thermocouple, Flow Control, Level Control, Temperature Control, Proximity Sensors.

TOTAL: (30 T+ 45 P) 75 Hours

DEE10	DISTRIBUTED CONTROL SYSTEM	L	T	P	C
		3	0	2	4

COURSE OUTCOMES (On completion of the course, the students will be able to):

1) Analyze Hardware I/O modules.
2) Applying DCS with real time applications.
3) Explain communication protocols.

Theory: Architecture of DCS, Comparison of PLC and DCS, Communication Protocol, Advantages and Applications

Practical: Hardware Configuration, I/O Modules, Communication Modules, Troubleshooting, I/O Wiring, Programming, CPU IP Setting, CPU Addressing, Node Addressing, Upload/Download and Monitoring, Ethernet. Working with ABB.

TOTAL: (30 T+ 45 P) 75 Hours