Course code	Course Name	L-T-P - Credits	Year of Introduction
IT401	Embedded Systems	4-0-0-4	2016

Prerequisite: Nil

Course Objectives

- To understand the fundamental concepts in Embedded Systems, Real Time Operating Systems, Arduino and Raspberry Pi
- To impart Embedded System Design Techniques

Syllabus

Introduction to Embedded Systems, Embedded Systems – The Hardware Point of View, Sensors, ADCs and Actuators, Examples of Embedded Systems, Buses and Protocols, Software Development Tools, Real Time Operating Systems, ARM Processor, Hardware Accelerators, Embedded System Design Techniques, Introduction to Arduino Environment, Introduction to Raspberry Pi

Expected outcome .

- The students will acquire conceptual understanding in embedded systems, real time operating systems, Arduino, Raspberry Pi and the ability to apply them in practical situations.

References:

1. Lyla B Das, “Embedded Systems : An Integrated Approach”, Pearson Education, 2013
2. Matt Richardson, Shawn Wallace, “Getting Started With Raspberry Pi”, O'Reilly, 2013
3. Michael Margolis,”Arduino Cookbook”, O'Reilly, 2011
4. Peter Barry, Patrick Crowley, “Modern Embedded Computing”, Morgan Kaufmann
5. Wayne Wolf, “Computers as Components : Principles of Embedded Computing System Design”, Elsevier

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Introduction to Embedded Systems, Embedded Systems – The Hardware Point of View: Microcontroller Unit, 8 bit MCU, Memory for Embedded System, Low Power Design Sensors, ADCs and Actuators-Temperature Sensors, Light Sensors, Range Sensors, Humidity Sensors, Other Sensors, Analog to Digital Converters, Actuators.	8	15%
II	Examples of Embedded Systems – Mobile Phone, Automotive Electronics, RFID, Wireless Sensor Networks, Robotics, Biomedical Applications, Brain Machine Interface, Buses and Protocols – Defining Buses and Protocols, On-board buses for Embedded Systems, External Buses, Automotive Buses	8	15%
FIRST INTERNAL EXAMINATION			
III	Raspberry Pi – Introduction, Python and Raspberry Pi, Arduino and Raspberry Pi, Basic Input and Output	9	15%
IV	Embedded Sytem Design Techniques – Design Methodologies, Requirements Analysis, Specifications, System Analysis and Architecture Design, Quality Assurance, Design Examples	9	15%
SECOND INTERNAL EXAMINATION			

V	Arduino – Introduction, Arduino Software Development, Interaction of Arduino board With Computers and Other Devices, Programming with Arduino	10	20%
VI	Software Development Tools, Real Time Operating Systems – Operating Systems, Scheduling Policies, Inter process Communication Mechanisms, Power Optimization Strategies for Processes ARM Processor- Processor and Memory Organization, Data Operations, Flow of Control	10	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN

Maximum Marks: 100 Exam Duration: 3 hours

The question paper shall consist of Part A, Part B and Part C.

Part A shall consist of three questions of 15 marks each uniformly covering Modules I and II. The student has to answer any two questions (15×2=30 marks).

Part B shall consist of three questions of 15 marks each uniformly covering Modules III and IV. The student has to answer any two questions (15×2=30 marks).

Part C shall consist of three questions of 20 marks each uniformly covering Modules V and VI. The student has to answer any two questions (20×2=40 marks).

Note : Each question can have a maximum of 4 subparts, if needed