Course Code	Course Title	L	T	P	C
1152EC117	EMBEDDED NETWORKING	3	0	0	3

a) Course Category

Program Elective

b) Preamble

This course introduces the embedded communication protocol.

c) Prerequisite

Nil

d) Related Courses

Embedded Control System, Embedded Processors, Internet of things.

e) Course Outcomes

Upon the successful completion of the course, student will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Explain the serial and parallel communication protocol related to embedded networking.	K2
CO2	Discuss the concepts of USB & CAN bus.	K2
CO3	Familiarize the basics of Ethernet communication	K2
CO4	Explain the concepts of Embedded Ethernet.	K2
CO5	Recognize the need for wireless protocols to indulge in Real world interfacing.	K2

f) Correlation of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	M	L	-	-	-	-	M	-	-	-	M	L	-
CO2	M	M	M	-	M	-	-	-	-	-	-	M	M	-
CO3	M	L	M	-	L	-	-	-	-	-	-	-	L	-

CO4	M	-	L	-	M	-	-	-	-	-	-	-	M	-
CO5	M	L	-	-	M	-	-	-	-	-	-	H	-	-

g) Course Content

UNIT I EMBEDDED COMMUNICATION PROTOCOLS 9

Introduction , Serial/Parallel communication: Serial communication protocols -RS232 standard – RS485, – Synchronous Serial Protocols: Serial Peripheral Interface (SPI) , Inter Integrated Circuits (I2C) , PC Parallel port programming , ISA/PCI Bus protocols ,Fire wire.

UNIT II USB AND CAN BUS 9

USB bus : Introduction – Speed Identification on the bus – USB States , USB bus communication :Packets –Data flow types , A simple application with USB: Inkjet printer, CAN Bus:– Introduction - Frames –Bit stuffing –Types of errors –Nominal Bit Timing –CAN Interface –A simple application with CAN: Telephone exchange.

UNIT III ETHERNET BASICS 9

Elements of a network – Inside Ethernet – Building a Network: Hardware options – Cables, Connections and network speed – Design choices: Selecting components –Ethernet Controllers – Using the internet in local and internet communications – Inside the Internet protocol.

UNIT IV EMBEDDED ETHERNET 9

Exchanging messages using UDP and TCP, Serving web pages with Dynamic Data, Serving web pages that respond to user Input , Email for Embedded Systems , Using FTP ,Keeping Devices and Network secure.

UNIT V WIRELESS EMBEDDED NETWORKING 9

Wireless sensor networks: Introduction – Applications – Network Topology – Localization –Time Synchronization, Energy efficient MAC protocols: SMAC , Energy efficient and robust routing, Data Centric routing.

Total 45 Hrs

h) Learning Resources

Text Books

1. Weste and Eshraghian, “Principles of CMOS VLSI design”, Pearson Education, 1999
2. M.L. Bushnell and V.D. Agrawal, “Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits”, Kluwer Academic Publishers, 2004
3. P.K. Lala, “Digital Circuit Testing and Testability”, Academic Press, 2002
4. N.K. Jha and S.G. Gupta, “Testing of Digital Systems”, Cambridge University Press, 2003

Reference Books

1. W. W. Wen, “VLSI Test Principles and Architectures Design for Testability”, Morgan Kaufmann
2. A.L.Crouch, “Design Test for Digital IC’s and Embedded Core Systems”, Prentice Hall International, 2002.
3. ZainalabeNavabi, “Digital System Test and Testable Design: Using HDL Models and Architectures”, Springer, 2010
4. A.K Sharma, Semiconductor Memories Technology, Testing and Reliability, IEEE.
5. M. Abramovici, M.A. Breuer and A.D. Friedman, "Digital Systems and Testable Design", Jaico Publishing House

Online Resources

1. www.nptel.ac.in/courses/106103016