17ES007 EMBEDDED NETWORKING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15		15	30	-	5	5	-

Course Objectives:

This course is an exploration of Embedded Networking used to study and develop reliable communication protocols. An overview of the Embedded networking concepts is provided here. This course is highly intended for designers who want to use Ethernet, Can Protocols USB and other networking concepts.

Course Outcomes:

The student will be able to:

- Ability to work with CAN bus
- Ability to understand and implement Firewalls and Protocols

SKILLS:

- Building a network using various components
- Trace out the problems if any through testing.
- Knowledge on various network Protocols.

UNIT-I

EMBEDDED COMMUNICATION BASICS : Introduction to Embedded Networking - Serial/Parallel Communication – Serial communication protocols -RS232 standard – RS422 - RS485 – Synchronous and Asynchronous Communication - Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – PC Parallel port Interface -ISA/PCI Bus protocols

UNIT-II

USB, CAN BUS AND FRAMING : USB bus – Introduction – Speed Identification on the bus – USB States – USB bus communication: Packets –Data flow types –Enumeration –Descriptors – CAN Bus – Introduction – CAN Identifier, Deterministic Transmissions on CAN - Framing –Bit stuffing –Error Control Coding – Baseband Transmissions – RZ and NRZ methods

UNIT-III

ETHERNET : Elements of a network – Bus and Star Topologies, CSMA/CD protocol, IEEE802.3 and versions of it, Inside Ethernet – Building a Network Hardware options – Cables, Connections and network speed – Ethernet Addressing, Hubs, switches and Bridges

UNIT-IV

INTERNETWORKING : Internet Protocol IPv4, IP addressing, IPv6, Routing Concepts and Protocols, Distance Vector Routing, Link State Routing, Network Address Translator (NAT), Firewall.

UNIT-V

TRANSPORT AND APPLICATION LAYER PROTOCOLS : TCP, UDP, DNS, HTTP, HTML Language, Cryptography concepts, Security Services and mechanisms, Symmetric cryptography and public key cryptography, DES, AES and RSA algorithms.

TEXTBOOKS:

1. Introduction to Data Communications and Networking- Wayne Tomasi, DeVry Institute Pearson 2005
2. Embedded Systems Design: A Unified Hardware/Software Introduction - Frank Vahid, Tony Givargis, John & Wiley Publications, 2002
3. Embedded Ethernet and Internet Complete - Jan Axelson, Penram publications, 2003
4. Computer Networks : A.Tanenbaum -5th Edition Prentice hall
5. Data and Computer Communications- William Stallings,9th edition. Prentice Hall, 2013.

REFERENCE BOOKS:

1. Frank Vahid, Givargis 'Embedded Systems Design: A Unified Hardware/Software Introduction', Wiley Publications 2007
2. Jan Axelson, 'Parallel Port Complete' , Penram publications 2006
3. Dogan Ibrahim, 'Advanced PIC microcontroller projects in C', Elsevier 2008
4. Jan Axelson 'Embedded Ethernet and Internet Complete', Penram publications 2008
5. Bhaskar Krishnamachari, 'Networking wireless sensors', Cambridge press 2005

ACTIVITIES:

o RS232 based data transfer between two devices using cross connected cable and suitable application using C language or other

o Data transfer using CAN protocol on a CAN bus

o Modbus based data transfer along with application layer development for message interpretation

o TCP/IP based data transfer with socket programming in C language or other

o Implementation of a network address translator NAT

o Implementation of a firewall