

## EMBEDDED NETWORKING

<b>II Semester: ES</b>								
Course code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BESB13	Elective	3	-	-	3	30	70	100
<b>Contact Classes: 45</b>		<b>Tutorial Classes: Nil</b>		<b>Practical Classes: Nil</b>		<b>Total Classes: 45</b>		
<b>I. COURSE OVERVIEW:</b>								
<p>Embedded networking is the network design and topology, hardware devices, and communication/data exchange protocols required to link and exchange information across embedded systems. It covers embedded communication protocols, USB and CAN bus for fast communication and Ethernet and protocols. The applications of embedded networking systems include home appliances, internet-of-things , office automation, security, telecommunication, instrumentation.</p>								
<b>II. COURSE OBJECTIVES:</b>								
<b>The students will try to learn:</b>								
<p>I. The embedded communication protocols to implement in embedded networking.            II. The design of CAN network based systems            III. The use UDP, TCP and FTP in design of embedded networks.</p>								
<b>III. COURSE OUTCOMES:</b>								
<b>After successful completion of the course, students should be able to:</b>								
CO 1	Illustrate Serial and parallel communication protocols used for data Communication in embedded networking systems.						Understand	
CO 2	Infer the USB and CAN serial bus system used to communicate between several embedded micro controllers and network systems.						Apply	
CO 3	Explain the basic principles of Ethernet for providing an internet connection, connect devices to a local network						Apply	
CO 4	Develop the frame work for embedded Ethernet protocols used to create local area networks.						Apply	
CO 5	Make use of the various client-server programming models for the users to access the information stored on a web server on the Internet						Apply	
CO 6	Classify the wireless local area networks for the user device to communicate with the network.						Analyze	
<b>IV. SYLLABUS:</b>								
<b>UNIT-I</b>	<b>EMBEDDED COMMUNICATION PROTOCOLS</b>						<b>Classes: 09</b>	
<p>Embedded Networking: Introduction, serial/parallel communication, serial communication protocols, RS232 standard, RS485, synchronous serial protocols, serial peripheral interface , inter integrated circuits I<sup>2</sup>C– pc parallel port programming , ISA/PCI bus protocols, firewire.</p>								
<b>UNIT-II</b>	<b>USB AND CAN BUS</b>						<b>Classes: 09</b>	
<p>USB bus, introduction, speed identification on the bus, USB states, USB bus communication: Packets ,data flow types, enumeration, descriptors, PIC 18 microcontroller USB interface, C programs;            CAN bus: Introduction, frames, bit stuffing, types of errors, nominal bit timing, PIC microcontroller CAN interface, simple application with CAN.</p>								

<b>UNIT-III</b>	<b>ETHERNET BASICS</b>	<b>Classes: 09</b>
<p>Elements of a network, inside Ethernet, building a network: Hardware options, cables, connections and network speed.</p> <p>Design choices: Selecting components, Ethernet controllers, using the internet in local and communications, inside the Internet protocol.</p>		
<b>UNIT-IV</b>	<b>EMBEDDED ETHERNET</b>	<b>Classes: 09</b>
<p>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.</p>		
<b>UNIT-V</b>	<b>WIRELESS EMBEDDED NETWORKING</b>	<b>Classes: 09</b>
<p>Wireless sensor networks: Introduction, applications, network topology, localization, time synchronization, energy efficient MAC protocols, SMAC, energy efficient and robust routing, data centric routing.</p>		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. Frank Vahid, Tony Givargis, “Embedded Systems Design: A Unified Hardware/Software Introduction” John &amp; Wiley Publications, 1<sup>st</sup> Edition, 2002</li> <li>2. Jan Axelson, “Parallel Port Complete: Programming, interfacing and using the PC’s parallel printer port”, Penram Publications, 1<sup>st</sup> Edition, 1996.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Dogan Ibrahim, “Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F series” Elsevier, 1<sup>st</sup> Edition, 2008.</li> <li>2. Jan Axelson, “Embedded Ethernet and Internet Complete”, Penram publications, 2<sup>nd</sup> Edition, 2003.</li> <li>3. Bhaskar Krishnamachari, “Networking Wireless Sensors”, Cambridge press, 1<sup>st</sup> Edition, 2005.</li> </ol>		
<b>Web References:</b>		
<ol style="list-style-type: none"> <li>1. <a href="http://nptel.ac.in/courses/108102045/26">http://nptel.ac.in/courses/108102045/26</a></li> <li>2. <a href="http://freevideolectures.com/Course/2341/Embedded-Systems/27">http://freevideolectures.com/Course/2341/Embedded-Systems/27</a></li> <li>3. <a href="http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Delhi/Embedded%20Systems%20(Video).htm">http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Delhi/Embedded%20Systems%20(Video).htm</a></li> </ol>		
<b>E-Text Books:</b>		
<ol style="list-style-type: none"> <li>1. <a href="http://www.nptel.ac.in/courses/108105057/Pdf/Lesson-26.pdf">www.nptel.ac.in/courses/108105057/Pdf/Lesson-26.pdf</a></li> <li>2. <a href="http://www.nptel.ac.in/courses/108105057/Pdf/Lesson-3.pdf">www.nptel.ac.in/courses/108105057/Pdf/Lesson-3.pdf</a></li> <li>3. <a href="http://emanager.srmuniv.ac.in/elibrary/temp/CAN_and_CANopen.pdf">emanager.srmuniv.ac.in/elibrary/temp/CAN_and_CANopen.pdf</a></li> <li>4. <a href="https://www.crcpress.com/Embedded-and-Networking-Systems-Design-Software-and-Implementation/Khan-Iniewski/p/book/9781466590656">https://www.crcpress.com/Embedded-and-Networking-Systems-Design-Software-and-Implementation/Khan-Iniewski/p/book/9781466590656</a></li> </ol>		