##  Networking of Embedded Systems

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| **Course**  | **Networking Embedded systems** |
| **Course Code** | **18EM5104** | **L-T-P** | **3-0-2** |
| **Pre-Requisites** | **Nil** | **Credits** | **4** |

**Course Objective**

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| To make the students understand basic concepts related to networking embedded systems and also develop sample applications using embedded C |

**Course outcomes**

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| **CO No** | **Expected Course Outcomes (CO)** |
| CO1 | Should be aware of the concepts related to networking through RS485, I2C, CAN, USB and Ethernet |
| CO2 | Ability to develop application that run on RS485 and USB networks |
| CO3 | Ability to develop application that run on *I2C* and CAN networks |
| CO4 | Ability to develop application that run on Ethernet |

**Detailed Syllabus**

**Introduction to networking:** Peer to peer connectivity, Any to Any connectivity, Rs232C review. A small review on essential of communication

**Networking through RS485:** RS485 Standards, balanced Differential Lines, Termination resistors, Topologies, cable length and data rate, Maximum number of devices in a RS485 network, Grounding and Common wires, Connections, Half-duplex- RS485, RS485 converters, Full-duplex-RS485

**Networking through USB:** Introduction, Speed identification on the bus, USB states, USB bus communication – Packets, Data flow types, Enumeration, descriptors, interfacing PIC 18 with USB, Developing Sample networking of embedded systems using USB

**Networking through I2C:** Meaning, the I2C Bus, Acknowledgments and negative Acknowledgements, addressing, I2C Firmware, Developing Sample networking of embedded systems using I2C

**Networking through CAN:** Introduction, Frames, bit stuffing, error detection, types of errors, Nominal bit timing, Interfacing PIC controller with CAN, Development of Sample Networking of embedded systems using PIC Micro Controllers

**Networking through Ethernet:** 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. Developing small application

**Text Books**

1. Frank Vahid, Givargis ‘Embedded Systems Design: A Unified Hardware/Software
2. Introduction’, Wiley Publications
3. Jan Axelson, ‘Parallel Port Complete’, Penram publications
4. Dogan Ibrahim, ‘Advanced PIC microcontroller projects in C’, Elsevier 2008
5. Jan Axelson ‘Embedded Ethernet and Internet Complete’, Penram publications