**Bharati Vidyapeeth**

**(Deemed to be University)**

**College of Engineering, Pune**

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| **B. Tech. Sem. V: Electronics & Telecommunication Engineering**  **SUBJECT: - EMBEDDED SYSTEMS** | | | | | |
| **TEACHING SCHEME:** | | | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** | |
| Theory: 04 | | | End Semester Examination: 60 Marks | Credits: 04 | |
| Practical: 02 | | | Internal Assessment: 40 Marks |  | |
| Tutorial: 00 | | | TW and Oral: 50 Marks | Credits: 01 | |
|  | | |  | Total Credit: 05 | |
|  | | | | | |
| **Course Pre-requisites:** Digital Electronics | | | | | |
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| **Course Objectives:** | | | | | |
|  | | To teach the need and application of ARM processors in embedded system. | | | |
|  | | To teach the architecture of ARM series processor. | | | |
|  | | To teach architecture and features of typical ARM7 & ARM CORTEX-M3. | | | |
|  | | To teach interfacing of real world input and output devices with ARM7 & ARM CORTEX-M3. | | | |
| **Course Outcomes: After learning this course students will be able to** | | | | | |
| **1** | Use IDE for firmware development. | | | | |
| **2** | Describe features of ARM7. | | | | |
| **3** | Interface LPC2148 with peripherals such as LED, LCD, EEPROM, SDCARD. | | | | |
| **4** | Describe features of CORTEX-M3. | | | | |
| **5** | Interface LPC1768 with peripherals such as RGB LED, TFT display, seven segment display. | | | | |
| **6** | Specify services offered by a typical RTOS. | | | | |
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| **UNIT – I** | | **Introduction to Embedded Systems** | | | **(06 Hours)** |
|  | | Definition of Embedded System, Embedded Systems Vs General Computing Systems, Classification, Major Application Areas, Characteristics of Embedded Systems, Hardware and Software components of an Embedded System, Introduction to IDEs. | | |  |
|  | |  | | |  |
| **UNIT – II** | | **ARM7 Processor** | | | **(08 Hours)** |
|  | | Introduction to ARM processors and its versions: ARM7, ARM9 & ARM11 features, ARM7 data flow model, programmer’s model, modes of Operations, Overview of Instruction set.  ARM7 Based Microcontroller LPC2148: Features, Architecture (Block Diagram and ItsDescription), System Control Block ( PLL and VPB divider) , Memory Map, GPIO, PinConnect Block, timers. | | |  |
|  | |  | | |  |
| **UNIT - III** | | **Interfacing with ARM7** | | | **(09 Hours)** |
|  | | Interfacing the peripherals with LPC2148: LED, LCD, GLCD, KEYPAD, GSM and GPS using UART, on-chip ADC using interrupt (VIC), EEPROM using I2C, SDCARD using SPI, on-chip DAC for waveform generation. Programming in Embedded C. | | |  |
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| **UNIT -IV** | | **ARM CORTEX Processors** | | | **(08 Hours)** |
|  | | Introduction to ARM CORTEX series, improvement over classical series. CORTEX A, CORTEX M, CORTEX R processors series, versions, features and applications.  ARM-CM3 Based Microcontroller LPC1768: Features, Architecture (Block Diagram & Its Description), System Control, Clock & Power Control, GPIO and Pin Connect Block. | | |  |
|  | |  | | |  |
| **UNIT -V** | | **Interfacing with ARM CORTEX M3** | | | **(09 Hours)** |
|  | | Interfacing peripherals with LPC1768: RGB LED, Seven Segment, TFT Display, MOTOR control using PWM.  Concept of USB, CAN, and Ethernet based communication using microcontrollers. CAN, USB, ETHERNET applications in embedded c. | | |  |
|  | |  | | |  |
| **UNIT -VI** | | **Real Time Operating System** | | | **(08 Hours)** |
|  | | Need of operating system in developing complex applications in embedded system, desired features of operating system & hardware support from processor. Architecture of kernel, types of scheduler algorithms. μcos II RTOS services **:** Task management, ISR, Timer, Semaphores, mailbox, message queues, pipes, events, signals, memory management. Applications based on μcos II RTOS. | | |  |
|  | | | | | |
| **List of Experiments (Minimum 8 to be performed)** | | | | | |
| 1. Interfacing LPC2148 with LED. | | | | | |
| 2. Interfacing LPC2148 with Buzzer. | | | | | |
| 3. Interfacing LPC2148 with LCD/GLCD. | | | | | |
| 4. Interfacing LPC2148 for internal ADC on interrupt basis | | | | | |
| 5. UART Interfacing LPC2148 in embedded system (GSM/GPS) | | | | | |
| 6. Interfacing SD card with LPC2148. | | | | | |
| 7. Interfacing EEPROM with LPC2148 using I2C protocol. | | | | | |
| 8. Interfacing LPC1768 to Seven Segment / RGB LED | | | | | |
| 9. Generation of PWM signal for motor control using LPC1768 | | | | | |
| 10. Interfacing TFT display to LPC1768 | | | | | |
| 11. Implementing CAN protocol using LPC1768 | | | | | |
| 12. Implementing ETHERNET protocol using LPC1768. | | | | | |
| 13. Semaphore as signaling and synchronizing in ARM | | | | | |
| 14. Mailbox implementation for message passing in ARM | | | | | |
|  | | | | | |
| **Textbooks/Reference Books** | | | | | |
| 1. Andrew Sloss, Dominic Symes, Chris Wright, “ARM System Developer‟s Guide –Designing and Optimizing System Software”, ELSEVIER | | | | | |
| 2. Joseph Yiu, “The Definitive Guide to the ARM Cortex-M”, Newness, ELSEVIER | | | | | |
| 3. Rajkamal, “Embedded system-Architecture, Programming and Design”, TMH Publications, Edition 2003 | | | | | |
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| --- | --- | --- | --- | --- | --- |
| **B. Tech. Sem. V: Electronics & Telecommunication Engineering**  **SUBJECT: - DIGITAL COMMUNICATION SYSTEM** | | | | | |
| **TEACHING SCHEME:** | | | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** | |
| Theory: 04 | | | End Semester Examination: 60 Marks | Credits: 04 | |
| Practical: 02 | | | Internal Assessment: 40 Marks |  | |
| Tutorial: 00 | | | TW and Oral: 50 Marks | Credits: 01 | |
|  | | |  | Total Credit: 05 | |
|  | | | | | |
| **Course Pre-requisites:**   * Analog Communication | | | | | |
|  | | | | | |
| **Course Objectives:** | | | | | |
|  | | To learn the building blocks of digital communication system. | | | |
|  | | To prepare mathematical background for communication signal analysis. | | | |
|  | | To introduce fundamental concepts of information theory | | | |
|  | | To analyze error performance of digital communication system | | | |
|  | | To understand concept of spread spectrum communication system. | | | |
|  | | To learn and analyze the signal flow in a digital communication system. | | | |
| **Course Outcomes: After learning this course students will be able to** | | | | | |
| **1** | Classify analog to digital conversion techniques in communication system. | | | | |
| **2** | Compare various baseband transmission methods for digital signals. | | | | |
| **3** | Apply Information source codes to find code efficiency | | | | |
| **4** | Analyze different error detection and correction codes. | | | | |
| **5** | Design basic building blocks of digital communication system. | | | | |
| **6** | Analyze performance of spread spectrum communication system | | | | |
|  | | | | | |
| **UNIT – I** | | **Digital Transmission of Analog Signal** | | | **(06 Hours)** |
|  | | Introduction to Digital Communication System: Block Diagram and transformations, Basic Digital Communication Nomenclature. Digital Versus Analog Performance Criteria, Sampling Process, PCM Generation and Reconstruction, Quantization Noise, Non-uniform Quantization and Companding, PCM with noise: Decoding noise, Error threshold, Delta Modulation, Adaptive Delta Modulation, Delta Sigma Modulation, Differential Pulse Code Modulation, LPC speech synthesis. | | |  |
|  | |  | | |  |
| **UNIT – II** | | **Baseband Transmission & Reception** | | | **(06 Hours)** |
|  | | Block diagram of baseband transmitter-receiver system, Line Coding & its properties. NRZ & RZ types, signaling format for unipolar, Polar, bipolar (AMI) & Manchester coding and their power spectra. Inter Symbol Interference (ISI), Inter Channel Interference (ICI).  Baseband Receivers-Matched Filters, Correlation receivers, Optimum filter | | |  |
|  | |  | | |  |
| **UNIT - III** | | **Information Theory** | | | **(06 Hours)** |
|  | | Information: Definition and Properties, Information Source, Discrete Memoryless Source, Binary Source, Entropy, Properties of Entropy, Some Source Coding Algorithms:  Huffman Coding, Shannon-Fano Coding, Average Code length, Efficiency, Channel Coding Theorem, Channel Capacity Theorem. | | |  |
|  | |  | | |  |
| **UNIT -IV** | | **Error Correction and Error Detection** | | | **(06 Hours)** |
|  | | Error detection codes: Cyclic Redundancy Check (CRC) code and Checksum code.  Error Correction codes:  Linear block code: Generator and parity check matrices, error detection, syndrome.  Cyclic code: Code generation, error detection, error correction, syndrome. | | |  |
|  | |  | | |  |
| **UNIT -V** | | **Digital Carrier Modulation & Demodulation Techniques** | | | **(06 Hours)** |
|  | | Generation, Detection and applications of the following modulations: Binary ASK, Binary PSK, Quadrature PSK,  Off-Set QPSK, M-ary PSK, Binary FSK, M-ary FSK, 16-ary QASK and MSK. | | |  |
|  | |  | | |  |
| **UNIT -VI** | | **Spread Spectrum Modulation** | | | **(06 Hours)** |
|  | | Pseudo-Noise Sequences, A Notion of spread Spectrum, Direct-Sequence Spread Spectrum with Coherent Binary Phase-shift Keying, Signal-Space Dimensionality and processing Gain,Probability of Error, Frequency Hop Spread Spectrum, Maximum length and Gold codes,TDMA,FDMA,CDMA | | |  |
|  | | | | | |
| **List of Experiments** | | | | | |
| 1. To perform Sampling and reconstruction of signal. | | | | | |
| 2. To perform Pulse Code Modulation (PCM). | | | | | |
| 3. To observe Delta modulated signal with staircase approximation. | | | | | |
| 4. To compare Delta Modulation (DM) System and Adaptive Delta Modulation (ADM) system | | | | | |
| 5. To perform Differential Pulse Code Modulation (DPCM). | | | | | |
| 6. To draw and observe practically Different Data Formats | | | | | |
| 7. To perform Amplitude Shift Keying (ASK) modulation and demodulation. | | | | | |
| 8. To perform Binary Phase Shift Keying (BPSK) modulation and demodulation. | | | | | |
| 9. To perform Binary frequency Shift Keying (BFSK) modulation and demodulation | | | | | |
| 10. To perform Quadrature Phase Shift Keying (QPSK) modulation and demodulation. | | | | | |
| 11. MATLAB simulation of digital modulation techniques and Information Theory | | | | | |
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| **Textbooks/Reference Books** | | | | | |
| 1.Simon Haykins, “Communication Systems” John Wiley, 4th Edition, 2001 | | | | | |
| 2.Taub& Schilling, “Principles of Digital Communication “Tata McGraw-Hill” 28th reprint, 2003 | | | | | |
| 3.John G. Proakis, “Digital Communication”, McGraw Hill Inc 2001. | | | | | |
| 4.Simon Haykin, “Digital Communication Systems”, John Wiley & Sons, Fourth  Edition. | | | | | |
| 5. A.B Carlson, P B Crully, J C Rutledge, “Communication Systems”, Fourth Edition,  McGraw Hill Publication. | | | | | |
| 6.Ranjan Bose,”Information Theory Coding and Cryptography” Tata McGraw-Hill. | | | | | |

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| **B. Tech. Sem. V: Electronics & Telecommunication Engineering**  **SUBJECT: - Microcontroller Programming** | | | | | |
| **TEACHING SCHEME:** | | | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** | |
| Theory: 00 | | | End Semester Examination: 00 | Credits:00 | |
| Practical: 02 | | | Internal Assessment: 00 |  | |
| Tutorial: 00 | | | TW and PR: 50 Marks | Credits:01 | |
|  | | |  | Total Credit: 01 | |
|  | | | | | |
| **Course Pr-requisites: Digital Electronics, Basic Electronics** | | | | | |
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| **Course Objectives:** | | | | | |
|  | | To introduce an Assembly Language/embedded C programming of Micro controller. | | | |
|  | | To teach interfacing simple peripheral devices to a Micro controller. | | | |
|  | | To equip student groups to design and implement simple embedded systems. | | | |
| **Course Outcomes: After learning this course students will be able to** | | | | | |
| 1 | Students will Understand the basics of microcontroller | | | | |
| **2** | Students will be able to understand fundamental programming concepts of microcontrollers. | | | | |
| **3** | Students will be able to have an in-depth knowledge on interfacing the external devices to the controllers. | | | | |
| **4** | Students will be able to design a microcontroller based system with the help of the interfacing devices | | | | |
| **5** | Students will be able to have an in-depth knowledge of applying the concepts on real- time applications. | | | | |
| **6** | students will be able to use peripherals of microcontroller for different applications | | | | |
|  | | | | | |
|  | | Programming / interfacing experiments with IDE for 8051/PIC/MSP/Arduino/Raspberry Pi based interfacing boards/sensor modules | | |  |
|  | | Assembly Language Programming experiments | | |  |
|  | | Study architecture and programmers model of 8051 micro controller | | |  |
|  | | Identify and study various blocks of 8051 micro controller development board. | | |  |
|  | | Study of Addressing modes and Instruction set of 8051 micro controller | | |  |
|  | | Study Instruction set of 8051 for Arithmetic and Logical operations  a.Write an Assembly language program for Addition of 2 - 16 bit numbers | | |  |
|  | | Study Instruction set of 8051 for Arithmetic /Logical and Program and branching instructions  a.Write an Assembly language program for Addition and Subtraction of n - 8 bit numbers | | |  |
|  | | Study Instruction set of 8051 for Data transfer instructions  a . Write an Assembly language program for Block of Data transfer from internal memory to external memory. | | |  |
|  | | Write an Assembly language program for implementing BCD (UP/DOWN) counter with delay routine. | | |  |
| Interfacing experiments using 8051 Trainer kit and interfacing modules or simulation.  Implementation in Embedded C | | | | | |
|  | | Introduction to embedded C programming to study following aspects.  a. Programming b. Execution c. Debugging | | |  |
|  | | Study port structure and interfacing concepts of 8051  a .Write an Assembly language program to Interface 7-segment display to show the decimal number from 0 to 9. | | |  |
|  | | Write an Assembly language program to interface LEDs with any port and display various patterns. | | |  |
|  | | Study DAC interfacing concepts of 8051  a. Write an Assembly language program for generation of following waveform with DAC /Simulation  1.Triangular 1 staircase 2.sine | | |  |
|  | | Study Timers/counters in 8051 microcontroller.  a .Write an Assembly language program to generate pulse and square wave by using on chip timer. | | |  |
|  | | Write an Assembly language program for Interfacing the given keyboard with 8051and display the key pressed on LCD or Hyper terminal. | | |  |
|  | | Write an Assembly language program to Interface stepper motor to micro controller and rotate in clockwise and anti-clockwise direction at the given angles. | | |  |
|  | | Write an Assembly language program to interface ADC/sensor/potentiometer with 8051 micro controller and verify input/output. | | |  |
|  | | Write an Assembly language program to Interface relay with micro controller and turn it ON and OFF. | | |  |
|  | | Write a Embedded C Program to toggle all the LED s of a Port continuously with 250 ms delay in micro controller board | | |  |
|  | | Simple project work including multiple interfaces(ANY ONE)   1. Distance measurement. 2. Temperature measurement / Digital Thermometer 3. object counter/visitor counter using 8051 | | |  |
| **Textbooks** | | | | | |
| 1.The 8051 Microcontroller and Embedded Systems: Using Assembly and C by M.A. [MAZIDI](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=MAZIDI&search-alias=stripbooks)  2nd edition. | | | | | |
| 2 The 8051 Micro controller 3rd Edition  By [Kenneth Ayala](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Kenneth+Ayala&search-alias=stripbooks) | | | | | |
| 3 Embedded C Programming by Mark Siegesmund Publisher(s): Newnes ISBN: 9780128014707 | | | | | |
| 4.Practical Electronics (Volume I): 8085 Microprocessor & 8051 Micro controller Laboratory Manual by [Balamurugan A](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Balamurugan+A&search-alias=stripbooks) , [Veeramanikandasamy T](https://www.amazon.in/s/ref=dp_byline_sr_book_2?ie=UTF8&field-author=Veeramanikandasamy+T&search-alias=stripbooks) | | | | | |
| Reference Books | | | | | |
| 1)Embedding system building blocks, Labrosse, via CMP publishers. | | | | | |
| 3) Embedded Systems, Raj Kamal, TMH. 4) Micro Controllers, Ajay V Deshmukh, TMH. | | | | | |
| 4) Micro Controllers, Ajay V Deshmukh, TMH. | | | | | |
| 5) Embedded System Design, Frank Vahid, Tony Givargis, John Wiley. | | | | | |
| 6) Micro controllers, Raj Kamal, Pearson Edition. | | | | | |
| 7) An Embedded Software Primer, David E. Simon, Pearson Edition. | | | | | |
| 8) ‗Embedded/Real-Time Systems‘, KVKKF Prasad, Dreamtech, Press | | | | | |
| Web References:  [8051Microcontollers.com](https://8051microcontrollers.com/?utm_source=linkedin&utm_medium=linkedin&utm_campaign=linkedin)  http://en.wikipedia.org/wiki/Embedded\_system | | | | | |

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| **B. Tech. Sem. V: Electronics & Telecommunication Engineering**  **SUBJECT: - POWER ELECTRONICS** | | | | | |
| **TEACHING SCHEME:** | | | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** | |
| Theory: 04 | | | End Semester Examination: 60 Marks | Credits: 04 | |
| Practical: 02 | | | Internal Assessment: 40 Marks |  | |
| Tutorial: 00 | | | TW and Oral: 50 Marks | Credits: 01 | |
|  | | |  | Total Credit: 05 | |
|  | | | | | |
| **Course Pre-requisites:** Elementary electronics, Electrical technology. | | | | | |
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| **Course Objectives:** | | | | | |
|  | | To teach students the construction, operation and applications of controlled and uncontrolled power devices | | | |
|  | | To teach fundamentals of different types of motors | | | |
|  | | To explain industrial applications of power electronics | | | |
| **Course Outcomes: After learning this course students will be able to** | | | | | |
| **1** | Describe constructions, switching characteristics and selection of power devices and thyristors. | | | | |
| **2** | Design and analyze controlled rectifiers(AC-DC) and voltage controllers(AC-AC) | | | | |
| **3** | Design and analyze different types of inverters (DC-AC) | | | | |
| **4** | Identify and differentiate between different types of Choppers(DC-DC) | | | | |
| **5** | Explain construction and working of different types of motors | | | | |
| **6** | Demonstrate applications of power electronics devices in industry. | | | | |
|  | | | | | |
| **UNIT – I** | | **Introduction to Power Devices** | | | **(06 Hours)** |
|  | | Introduction to Power Electronics: Importance, Applications, Merits and Demerits, Task of Power Electronics  Introduction to Uncontrolled Device: Power diode, Power Transistor, Power MOSFET, IGBT.  Introduction to Controlled Device: SCR: Construction, Operation, VI characteristics, Two transistor analogy, Turn on methods, Gate Characteristics, Ratings.  TRIAC: Construction, Operation, triggering modes.  GTO: Construction, Operation, Turn off mechanism, Applications. | | |  |
|  | |  | | |  |
| **UNIT – II** | | **Rectifiers and AC voltage controller** | | | **(06 Hours)** |
|  | | Controlled Rectifiers: line, load & forced commutation, Single phase (half and full) with R &RL and Three phase (half and full) Controlled rectifiers.  Voltage Controller: Single phase AC voltage controller for R & R-L loads, three phase AC voltage controller for R load. | | |  |
|  | |  | | |  |
| **UNIT - III** | | **Inverters** | | | **(06 Hours)** |
|  | | Classification, Series Inverter, Parallel Inverter, Bridge Inverter, Three phase bridge inverter, PWM Techniques, Harmonic reduction | | |  |
|  | |  | | |  |
| **UNIT -IV** | | **Choppers** | | | **(06 Hours)** |
|  | | Introduction, Classification, step-down Chopper, Step-up Chopper, Types of Choppers(class A, B, C, D, E), Thyristor chopper Circuits (Voltage commutated, current commutated &Load commutated) | | |  |
|  | |  | | |  |
| **UNIT -V** | | **Introduction to Motors** | | | **(06 Hours)** |
|  | | DC motors, AC Motors, Special Purpose Motors, Induction Motor, Universal Motor, Stepper Motor, Servomotors, BLDC Motors etc. (Qualitative analysis only) | | |  |
|  | |  | | |  |
| **UNIT -VI** | | **Industrial applications** | | | **(06 Hours)** |
|  | | Introduction, Electric Heating, Electric welding, Ultrasonic, High voltage DC transmission systems, DC Motor control, Industrial Circuits, stepper motor controller, UPS, CNC Machines | | |  |
|  | | | | | |
| **List of Experiments** | | | | | |
| To study the SCR V-I characteristics and find latching current, holding current | | | | | |
| To study the characteristics of IGBT. | | | | | |
| To draw V-I characteristics of TRIAC for different values of gate current. | | | | | |
| Study of triggering circuits. | | | | | |
| To study Single Phase Half controlled bridge converter with R and RL and active (RLE) load. | | | | | |
| To study Single Phase full controlled bridge converter with R and RL and active (RLE) load. | | | | | |
| To study the chopper using MOSFET | | | | | |
| To Study Series, Parallel and Bedford inverter | | | | | |
| Simulation of Converter / Chopper using MATLAB/ Lab View/ Multisim. | | | | | |
| Simulation of PWM Inverter using MATLAB/ Lab View/ Multisim. | | | | | |
|  | | | | | |
| **Textbooks/ Reference Books** | | | | | |
| M. H. Rashid, “Power Electronics circuits devices and applications”, PHI 3rd edition, 2004 edition, New Delhi. | | | | | |
| M. D. Singh & K B Khanchandani, “Power Electronics”, TMH, New Delhi. | | | | | |
| Deodatta Shingare “Industrial and Power Electronics”, EP Publication, Maharashtra. | | | | | |
| P.C. Sen, “Modern Power Electronics”, S Chand & Co New Delhi. | | | | | |
| Ned Mohan, T. Undeland& W. Robbins, “Power Electronics Converters applications and design” 2nd edition, John Willey & sons | | | | | |
| B. L. Thareja& A. K. Tahreja, “Electrical Technology” Volume 1 & 2, S.Chand Publications | | | | | |
| H. Cotton, “Electrical Technology”, CBS. | | | | | |
| Nagrath Kothari, “Electrical Machines”, TMH. | | | | | |

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| **B. Tech. Sem. V: Electronics & Telecommunication Engineering**  **SUBJECT: - MICROWAVE AND ANTENNA** | | | | |
| **TEACHING SCHEME:** | | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** | |
| Theory: 04 | | End Semester Examination: 60 Marks | Credits: 04 | |
| Practical: 02 | | Internal Assessment: 40 Marks |  | |
| Tutorial: 00 | | TW and Oral: 50 Marks | Credits: 01 | |
|  | |  | Total Credit: 05 | |
|  | | | | |
| **Course Pre-requisites:**   * Electromagnetics and Transmission Lines * Linear Algebra and Calculus * Differential Equations and Complex Analysis * Advanced Mathematics-for Electronics * Physics for Electronics Engineering | | | | |
|  | | | | |
| **Course Objectives:** | | | | |
|  | To enhance students’ knowledge in the field of Microwave and Antenna systems. | | | |
|  | To teach students to identify and select microwave components as per requirements of the system. | | | |
|  | To teach students to design different types of antennas as per given specifications. | | | |
| **Course Outcomes:**  **After learning this course students will be able to** | | | | |
| **1** | **Investigate** different types of modes through Waveguide. | | | |
| **2** | **Recognize and select** Passive Devices as per requirement of Microwave system. | | | |
| **3** | **Identify and explain** operations of Microwave sources and Semiconductor Devices. | | | |
| **4** | **Classify** antennas and **calculate** fundamental parameters of antenna. | | | |
| **5** | **Design** Wire Antennas and **Analyse** linear arrays. | | | |
| **6** | **Identify and Design** different types of antennas for Microwave application. | | | |
|  | | | | |
| **UNIT I** | **MICROWAVE WAVEGUIDES** | | | **(08 Hrs)** |
|  | Concept of Modes in Waveguide(TE,TM &TEM), Analysis of TE and TM Modes in Rectangular Waveguide, Analysis of TEM Modes in Co-axial cable, Excitation of modes in Rectangular Waveguide, Power Transmission and losses in Waveguide, Microwave cavity resonator: Rectangular,circular and semicircular Cavity Resonators. | | |  |
|  |  | | |  |
| **UNIT II** | **MICROWAVE PASSIVE DEVICES** | | | **(08 Hrs)** |
|  | **Structure, S-matrix and Working of Microwave Passive Devices:** Waveguide Tees:E-Plane tee and H-plane tee, Magic Tees (Hybrid Tees), Hybrid Rings (Rat-Race Circuits),Waveguide Corners, Bends, and Twists,Two-Hole Directional Couplers, Circulators and Isolators. | | |  |
|  |  | | |  |
| **UNIT III** | **MICROWAVE SOURCES AND ACTIVE DEVICES** | | | **(08 Hrs)** |
|  | **Construction and operation of Microwave Tubes:**  Two cavity Klystron, Reflex Klystron,  Travelling Wave Tube (TWT), Magnetron.  **Construction and Operation of Active Microwave Devices:** Gunn Diode and RWH Theory, Tunnel Diodes, Schottky Diode, PIN Diode,Microwave Transistors. | | |  |
|  |  | | |  |
| **UNIT IV** | A**NTENNA FUNDAMENTALS** | | | **(08 Hrs)** |
|  | Definition and need of Antenna, General classification of antennas,  **Definition and significance of antenna parameters:**  Radiation Pattern ,Radiation Power Density, Radiation Intensity, Beam width, Directivity, Antenna Efficiency, Gain, Beam Efficiency, Bandwidth, Polarization ,Input Impedance , Antenna Radiation Efficiency ,Antenna Vector Effective Length and Equivalent Areas, Antenna Temperature , Near field & Far-Field. Specific Absorption Rate (SAR)  **Friss’s Transmission Equation and Radar Range Equation**. | | |  |
|  |  | | |  |
| **UNIT -V** | **WIRE ANTENNAS AND ARRAYS** | | | **(08 Hrs.)** |
|  | Design and Radiation pattern of : Half wave Dipole Antenna, Short Dipole, Monopole, Loop Antenna, Helical Antenna, Slot Antenna, Yagi-Uda Antenna  Analysis of fields generated by Two element Array and n-element Array (Uniform amplitude and Spacing), Principle of Pattern Multiplication | | |  |
|  |  | | |  |
| **UNIT VI** | **MODERN ANTENNAS** | | | **(08 Hrs.)** |
|  | **Construction/Design , working and Types of** : Horn Antenna, Parabolic reflector/Dish Antenna.  **Design and parametric analysis of** Rectangular and Circular Microstrip patch antenna, Feeding Techniques, Microwave radiation Hazards,  **Advanced Antennas :** Fractal Antenna, Smart Antenna System. | | |  |
|  | | | | |
| **List of Experiments: (\*Any 8 from the list below)** | | | | |
| 1. Study of the characteristics of Klystron Tube and to determine its electronic tuning range. | | | | |
| 1. To study V-I characteristics of Gunn Diode | | | | |
| 1. To determine the frequency & wavelength in a rectangular wave-guide working on TE10 mode | | | | |
| 1. To determine the Standing Wave-Ratio and Reflection Coefficient | | | | |
| 1. To measure an unknown Impedance with Smith chart | | | | |
| 1. To measure the polar pattern and the gain of a wave-guide horn Antenna. | | | | |
| 1. Study the function of multi-hole directional coupler . | | | | |
| 1. Study of Magic Tee | | | | |
| 1. Study of Circulator/Isolator | | | | |
| 1. Study of Attenuator (Fixed and Variable type) | | | | |
| 1. Phase shift measurement | | | | |
| 1. Measurement of Dielectric Constant | | | | |
| 1. Design of Simple Dipole and Monopole Antenna using HFSS | | | | |
| 1. Design of Rectangular Patch Antenna Using HFSS | | | | |
| 1. Design of Circular Patch Antenna Using HFSS | | | | |
| 16. Plot Radiation Pattern of simple Antenna structures. | | | | |
|  | | | | |
| **Textbooks/Reference Books** | | | | |
| 1. Samuel Y Liao, "Microwave Devices & Circuits", Prentice Hall of India,3rd Edition, 2006. 2. D.M.Pozar, "Microwave Engineering", John Wiley & sons, Inc, 3rd Edition, 2006. 3. Robert. E.Collin, "Foundation of Microwave Engg", Willey India. 2nd Edition 4. Annapurna Das and Sisir K Das, "Microwave Engineering", Tata Mc Graw3. Hill Inc., 1st Edition ,2004. 5. C.A Balanis , “Antenna theory and Design”, John willy & sons. 6. K.D.Prasad, “Antenna and Wave Propagation”, Satya Prakashan, New Delhi. 7. R. E. Collin, "Antennas and Radio Wave Propagation", McGraw-Hill., 8. F. B. Gross, "Smart Antennas for Wireless Communications", McGraw-Hill., 2005 9. W. L. Stutzman, and G. A. Thiele, "Antenna Theory and Design", 2nd Ed., John Wiley & Sons. 1998. | | | | |

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| --- | --- | --- | --- | --- | --- |
| **B. Tech. Sem. V: Electronics & Telecommunication Engineering**  **SUBJECT: - DATA COMMUNICATION & NETWORKING** | | | | | |
| **TEACHING SCHEME:** | | | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** | |
| Theory: 03 | | | End Semester Examination: 60 Marks | Credits: 03 | |
| Practical: 00 | | | Internal Assessment: 40 Marks |  | |
| Tutorial: 01 | | | TW and Oral: 00 Marks | Credits: 01 | |
|  | | |  | Total Credit: 04 | |
|  | | | | | |
| **Course Pre-requisites:**   * Analog Communications | | | | | |
|  | | | | | |
| **Course Objectives:** | | | | | |
|  | | To teach various topologies and types of networks. | | | |
|  | | To introduce networking architecture and protocols. | | | |
|  | | To introduce the concepts of network architecture & network design | | | |
|  | | To teach Networking Protocols & Layers | | | |
|  | | To teach different addressing and routing schemes. | | | |
| **Course Outcomes: After learning this course students will be able to** | | | | | |
| **1** | Analyse network topologies, hardware devices, addressing schemes and the protocol stacks | | | | |
| **2** | Compare various transmission media and broadband technologies | | | | |
| **3** | Analyse the flow control, error control and the medium access control techniques | | | | |
| **4** | Identify network layer addressing and routing schemes | | | | |
| **5** | Analyze connection oriented and connectionless services | | | | |
| **6** | Apply the knowledge of application layer protocols in networking. | | | | |
|  | | | | | |
| **UNIT – I** | | **Introduction to Network Architectures, Protocol Layers, and Service models** | | | **(06 Hours)** |
|  | | Applications of computer networks. Network types: LAN, MAN, and WAN, Network topologies.  Protocols and standards, need of layered protocol architecture, OSI reference model.  TCP/IP architecture: protocol suite, comparison of OSI and TCP/IP  Addressing: physical / logical /port addressing/socket addressing. | | |  |
|  | |  | | |  |
| **UNIT – II** | | **Physical Layer** | | | **(06 Hours)** |
|  | | Guided transmission media: comparison among coaxial, optical fibre and twisted pair cables.  Unguided transmission media,  Broadband standards: Cable modem, DSL, and HFC  Ethernet Cables  Networking Hardware | | |  |
|  | |  | | |  |
| **UNIT - III** | | **Data Link Layer** | | | **(06 Hours)** |
|  | | Data link services: Framing, Flow control, Error control  ARQ methods: transmission efficiency, Piggybacking  High Level Data Link Control (HDLC): HDLC configurations, Frame formats, HDLC bit stuffing and de-stuffing, Typical frame exchanges  Medium Access Control Protocols: ALOHA, Slotted ALOHA, CSMA, CSMA/CD. | | |  |
|  | |  | | |  |
| **UNIT -IV** | | **Network Layer** | | | **(06Hours)** |
|  | | Network layer services and functions.  Internet Protocol: Principles of Internetworking, requirements, IPv4 packet, IPv4 addressing (classful and classless (CIDR))  Routing in Packet Switching Networks: Characteristics, Routing strategies  Routing protocols: RIP, OSPF, BGP and EIGRP. Subnetting, super netting, VLSM, and NAT  Introduction to ICMP, ARP, RARP  IPv6 (IPv6 Datagram format, comparison with IPv4, and transition from IPv4 toIPv6). | | |  |
|  | |  | | |  |
| **UNIT -V** | | **Transport Layer** | | | **(06 Hours)** |
|  | | Connectionless and Connection–oriented services at transport layer, Transmission Control Protocol (TCP): TCP Services, TCP Segment, TCP three-way handshake  User datagram Protocol (UDP), UDP Services, UDP Datagram  TCP and UDP checksum calculation  Flow control, error control and congestion control | | |  |
|  | |  | | |  |
| **UNIT -VI** | | **Application Layer** | | | **(06 Hours)** |
|  | | Introduction to Application layer Protocols: HTTP, FTP, DNS, SMTP, TELNET, SSH, DHCP.(specific) | | |  |
| **Textbooks/Reference Books** | | | | | |
| 1. Data Communications and Networking – Behrouz A. Forouzan, Fifth Edition TMH. | | | | | |
| 2. Computer Networks -- Andrew S Tanenbaum, 5th Edition, Pearson Education, 2013. | | | | | |
| 3. J J. F. Kurose and K. W. Ross,” Computer Networking: A Top-Down Approach”, Addison  Wesley, 5th Edition, 2010 | | | | | |
| 4. Alberto Leon Garcia, “Communication Networks”, McGraw Hill Education, Second Edition,  Fourth Edition, 2008. | | | | | |
| 5. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education, 2015. | | | | | |
| 6. Understanding communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning | | | | | |

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| **B. Tech. Sem. I: Electronics & Telecommunication Engineering**  **SUBJECT: - PHOTONICS** | | | | | |
| **TEACHING SCHEME:** | | | | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 04 | | | | End Semester Examination: 60 | Credits: 4 |
| Practical: 02 | | | | Internal Assessment: 40 |  |
| Tutorial: 00 | | | | TW: 50 | Credits: 01 |
|  | | | |  | Total Credit: 05 |
|  | | | | | |
| **Course Pre-requisites:** Electromagnetic Engineering, Analog Communication System | | | | | |
|  | | | | | |
| **Course Objectives:** | | | | | |
|  | | | To introduce optical fiber modes and signal degradations associated with optical fiber. | | |
|  | | | To introduce optical sources, optical detectors, and their use in the optical communication system. | | |
|  | | | To expose the student to digital transmission and its associated parameters on system performance. | | |
| **Course Outcomes: After learning this course students will be able to** | | | | | |
| **1** | Analyze the basic elements of optical fiber, fiber modes configurations and structures. | | | | |
| **2** | Analyze the various optical sources and receivers along with signal degradation | | | | |
| **3** | Analyze the transmission characteristics of optical fiber along with receivers and different kinds of losses. | | | | |
| **4** | Analyze digital transmission and optical measurement . | | | | |
| **5** | Analyze the operational principles of analog systems, WDM and optical amplifiers. | | | | |
| 6 | | Analyze the optical networks. | | | |
| **Contents:** | | | | | |
| **UNIT I**  **Introduction [8 Hrs]**  Introduction to Ray theory transmission: Total internal reflection; Acceptance angle; Numerical aperture, Types of Fiber, Electromagnetic mode theory of optical propagation: modes in planar guide, phase and group velocity, mode theory in cylindrical waveguides: Modal concepts and equation, Maxwell’s Equation, Wave equation and modes for step-index fibers. | | | | | |
| **UNIT-II**  **Signal Degradation, Optical Sources and Detectors** [8 Hrs]  Attenuation, Signal distortion in optical waveguides, pulse broadening in graded index waveguide, Mode coupling and design optimization of single mode fibers,  Optical sources: Light Emitting Diodes; LED structures ; internal quantum efficiency; injection laser diode structures,  Optical Detectors: PIN Photo detectors, Avalanche photo diodes, construction, characteristics and properties, Comparison of performance, Photo detector noise –Noise sources , Signal to Noise ratio , Detector response time. | | | | | |
| **UNIT-III**  **Transmission Characteristics and Receiver of Optical Fiber**  [8 Hrs]  Source to fiber power launching, coupling improvement, LED coupling to single mode fiber, Optical fiber connectors and couplers, Fiber alignment and Joint Losses, Fiber Splices.  Fundamental receiver operation, Pre amplifiers, Error sources, Receiver Configuration, Probability of Error, Quantum limit, performance calculations, preamplifier types | | | | | |
| **UNIT-IV**  **Digital transmission** and Measurement [8 Hrs]  Digital transmission system: point -to-point links, Line coding, error correction, noise effects  Fiber Attenuation measurements, Dispersion measurements, Fiber Refractive index profile measurements , Fiber cut- off Wave length Measurements, Fiber numerical Aperture Measurements, Fiber diameter measurements, OTDR | | | | | |
| **UNIT-V**  **Analog systems, WDM concept and amplifiers** [8 Hrs]  Analog links, carrier-to-noise ratio, multichannel transmission techniques, principle of WDM, passive components, tunable laser and filters, types of optical amplifiers, semiconductor optical amplifier, EDFA, amplifier noise, system applications, wavelength converters. | | | | | |
| **UNIT-VI**  **Optical Networks**  [8 Hrs]  Basic Networks, SONET / SDH, Broadcast and select WDM Networks, Wavelength Routed Networks, Non-linear effects on Network performance. Performance of WDM with EDFA system, Solitons, Optical CDMA, Ultra High Capacity Networks. | | | | | |
|  | | | | | |
|  | | | | | |
| **List of Experiments:** | | | | | |
| 1. Study the characteristics of optical source LED, Laser Diode. | | | | | |
| 2. Determination of Numerical Aperture of optical fiber. | | | | | |
| 3. Determination propagation loss and bending loss in optical fiber. | | | | | |
| 4. Design the analog/digital link using fiber optic cable. | | | | | |
| 5. Simulation of power budget presentation for basic optical network using opti system software. | | | | | |
| 6. Simulation of 16 channel WDM system design. | | | | | |
| 7. Design and Simulation the channel switching based on MEMS. | | | | | |
| 8. Design and Simulation a ring switch using optispice software. | | | | | |
| 9. Setting of Fiber optic voice link using AM, FM& PWM. | | | | | |
| 10. Characteristics of photodetector. | | | | | |
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| **Text Books:**  1. Optical Fiber Communication – John M. Senior – Pearson Education – Second Edition. 2007  2. Optical Fiber Communication – Gerd Keiser – Mc Graw Hill – Third Edition. 2000 | | | | | |
| **Reference books:**  1. R.P. Khare, “Fiber Optics and Optoelectronics”, Oxford University Press, 2007.  2. J.Gower, “Optical Communication System”, Prentice Hall of India, 2001  3. Rajiv Ramaswami, “Optical Networks “, Second Edition, Elsevier, 2004.  4. Govind P. Agrawal, “Fiber-optic communication systems”, third edition, John Wiley &  sons, 2004 | | | | | |
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| **B. Tech. Sem. VI: Electronics & Telecommunication Engineering**  **SUBJECT: - DIGITAL SIGNAL PROCESSING** | | | | | |
| **TEACHING SCHEME:** | | | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** | |
| Theory: 04 | | | End Semester Examination: 60 Marks | Credits: 04 | |
| Practical: 02 | | | Internal Assessment: 40 Marks |  | |
| Tutorial: 00 | | | TW and Oral: 50 Marks | Credits: 01 | |
|  | | |  | Total Credit: 05 | |
|  | | | | | |
| **Course Pre-requisites:**  Advanced Mathematics-for Electronics  Signals and Linear Systems  Digital Communication System | | | | | |
|  | | | | | |
| **Course Objectives:** | | | | | |
|  | | To introduce the student to a very broad and advanced topic of Digital Signal Processing (DSP) | | | |
|  | | To teach the student the basic concepts and tools in the field of DSP | | | |
|  | | To teach different method of solving FIR filters. | | | |
|  | | To teach different method of solving IIR filters. | | | |
|  | | To study applications of Digital Signal Processing in different fields. | | | |
|  | | To introduce DSP Processor and Applications. | | | |
|  | | | | | |
| **Course Outcomes: After learning this course students will be able to** | | | | | |
| **1** | To enumerate the advantages of DSP over processing in analog domain. | | | | |
| **2** | To be able to find Discrete Fourier Transform of a digital signal. | | | | |
| **3** | Design a Finite Impulse Response (FIR) Filter given the specifications. | | | | |
| **4** | Design a Infinite Impulse Response (IIR) Filter given the specifications. | | | | |
| **5** | Illustrate the role of DSP in different areas | | | | |
| **6** | To enumerate the features of a DSP Processor. | | | | |
|  | | | | | |
| **UNIT – I** | | **Introduction to DSP** | | | **(06 Hours)** |
|  | | Basic elements of DSP and its requirement, Advantages of digital over analog signal processing, Introduction to DSP system, DTFT, Relation between DFT and other-Transform. | | |  |
|  | |  | | |  |
| **UNIT – II** | | **Discrete Fourier Transform** | | | **(06 Hours)** |
|  | | Overview of Frequency Analysis of signals, DFT, IDFT, Properties of DFT- Circular convolution, overlap save & overlap-add algorithm, correlation. DIT FFT & DIF FFT algorithm and implementation | | |  |
|  | |  | | |  |
| **UNIT - III** | | **FIR Filter Design** | | | **(06 Hours)** |
|  | | Overview of filters, Introduction of FIR filter, Characteristics of FIR filter, properties of FIR filter, digital network for FIR filter, frequency sampling, Fourier series & windowing method, filter design using Kaiser window, Realization of FIR by direct form structures, cascade, parallel form. | | |  |
|  | |  | | |  |
| **UNIT -IV** | | **IIR Filter Design** | | | **(06 Hours)** |
|  | | Introduction of IIR filter, Impulse invariant technique, Bilinear transformation, Derivative approximation methods, analog filter approximation ,quantization and rounding problems, Realization of IIR by direct form structures, cascade & parallel form. | | |  |
|  | |  | | |  |
| **UNIT -V** | | **Adaptive Filter** | | | **(06 Hours)** |
|  | | Introduction to adaptive signal processing, Adaptive direct form FIR filters, Least Mean Square (LMS) algorithm, PSO algorithm, Hybrid algorithm. | | |  |
|  | |  | | |  |
| **UNIT -VI** | | **DSP Processors And Applications of DSP** | | | **(06 Hours)** |
|  | | Need for special purpose DSP Processors, Features of DSP Processors: Harvard and Modified Harvard Architectures, Bus structure, Addressing Modes, Processing Units, Address Generators, Single Cycle Execution. Case study of TMS320C67x DSP processor. Major applications of DSP: DTMF, Spectral Analysis, Musical Sound Processing. | | |  |
|  | | | | | |
| **List of Experiments** | | | | | |
| 1. Study of Matlab. | | | | | |
| 1. Study of Discrete signals | | | | | |
| 1. Study of Linear Convolution and Circular Convolution | | | | | |
| 1. To plot magnitude and phase Spectra of DFT of a given sequence. | | | | | |
| 1. To plot magnitude and phase Spectra of IDFT of a given sequence. | | | | | |
| 1. To verify properties of DFT | | | | | |
| 1. To implement filter using overlap add and overlap save method | | | | | |
| 1. To design FIR Filter for given specifications. | | | | | |
| 1. Design of FIR filter using Kaiser Window method | | | | | |
| 1. To design IIR Filter for given specifications. | | | | | |
| 1. To do Spectral Analysis of a real signal | | | | | |
| 1. To implement an FIR Filter on a DSP Processor | | | | | |
| **Textbooks/Reference Books** | | | | | |
| 1. John G Prokis , “Digital Signal Processing ,Principles, Algorithms and Application”, PHI | | | | | |
| 2. S. K. Mitra, "Digital Signal Processing", TMH | | | | | |
| 3. E. C. Ifleachor and B. W. Jervis, “Digital Signal Processing- A Practical Approach”, Second Edition, Pearson education. | | | | | |
| 4. A.V.Oppenheins and R.W. Schalfer , “Discrete Time Signal Processing”, PHI | | | | | |

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| **B. Tech. Sem. VI: Electronics & Telecommunication Engineering**  **SUBJECT: - CMOS Design** | | | | | |
| **TEACHING SCHEME:** | | | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** | |
| Theory: 04 | | | End Semester Examination: 60 Marks | Credits: 04 | |
| Practical: 02 | | | Internal Assessment: 40 Marks |  | |
| Tutorial: 00 | | | TW and Oral: 50 Marks | Credits: 01 | |
|  | | |  | Total Credit: 05 | |
|  | | | | | |
| **Course Pre-requisites:** Elementary Electronics, Digital Electronics, Semiconductor Devices and Circuits-1 | | | | | |
|  | | | | | |
| **Course Objectives:** | | | | | |
|  | | To teach MOS transistor fundamentals. | | | |
|  | | To explain static characteristics of an Inverter. | | | |
|  | | To present Switching Characteristics and Interconnect Effects of an Inverter. | | | |
|  | | To introduce concepts of Combinational MOS logic circuit. | | | |
|  | | To introduce concepts of Sequential MOS logic circuit. | | | |
|  | | To introduce students to Low Power CMOS logic circuits | | | |
| **Course Outcomes: After learning this course students will be able to** | | | | | |
| **1** | Apply MOS transistor fundamentals for CMOS Design. | | | | |
| **2** | Use static characteristics for Inverter design. | | | | |
| **3** | Design Inverter with delay constraints. | | | | |
| **4** | Explain CMOS Combinational Logic Circuits | | | | |
| **5** | Explain CMOS Sequential Logic Circuits | | | | |
| **6** | Apply knowledge of low power techniques for CMOS design. | | | | |
|  | | | | | |
| **UNIT – I** | | **MOS Transistor** | | | **(08 Hours)** |
|  | | MOS Structure, MOS System under External bias, Operation of MOSFET, MOSFET C-V Characteristics, MOSFET Scaling and Small geometry effects, MOSFET Capacitance | | |  |
|  | |  | | |  |
| **UNIT – II** | | **MOS INVERTERS: STATIC CHARACTERISTICS** | | | **(08 Hours)** |
|  | | Introduction, Voltage Transfer Characteristic (VTC), Noise Immunity and Noise margins, Power and Area Considerations, Resistive-Load Inverter, Inverters with n-Type MOSFET Load, CMOS Inverter, DC Calculation of  VIL, VIH, VOL, VOH and Vth,  Design of CMOS Inverters | | |  |
|  | |  | | |  |
| **UNIT - III** | | **MOS INVERTERS: Switching Characteristics and Interconnect Effects** | | | **(08 Hours)** |
|  | | Introduction,  Delay-Time Definitions Calculation of Delay times, Inverter design with delay constraints, Estimation of Interconnect parasitics, Calculation of Interconnect Delay | | |  |
|  | |  | | |  |
| **UNIT -IV** | | **Combinational MOS Logic Circuits** | | | **(08 Hours)** |
|  | | Introduction, MOS Logic Circuits with depletion nMOS load, CMOS Logic Circuits, Complex Logic Circuits | | |  |
|  | |  | | |  |
| **UNIT-V** | | **Sequential MOS Logic Circuit** | | | **(08 Hours)** |
|  | | Behaviour of Bistable Elements, The SR Latch Circuit, Clocked Latch and Flip-Flop Circuits, CMOS D-Latch and Edge-Triggered Flip-Flop. | | |  |
|  | |  | | |  |
| **UNIT -VI** | | **Low Power CMOS Logic Circuits** | | | **(08 Hours)** |
|  | | Overview of Power Consumption, Low-Power Design Through Voltage Scaling, Estimation and Optimization of Switching Activity, Reduction of Switched Capacitance | | |  |
|  | |  | | |  |
| **List of Experiments** | | | | | |
| 1. To Study about Microwind tool and λ (Lambda) Rules for Layout Generation | | | | | |
| 1. To generate layout for CMOS Inverter and simulate it. | | | | | |
| 1. To generate layout for CMOS NAND and simulate it. | | | | | |
| 1. To generate layout for CMOS NOR and simulate it. | | | | | |
| 1. To generate layout for CMOS TG and simulate it. | | | | | |
| 1. To implement layout for Boolean function F= (A.B +C.D)’ | | | | | |
| 1. Design and implementation of half adder | | | | | |
| 1. Design and implementation of D latch | | | | | |
| 1. Design and implementation of SRAM Cell | | | | | |
| 1. Design and implementation of Counter | | | | | |
| 1. Design and implementation of Ring Oscillator | | | | | |
| **Textbooks/Reference Books** | | | | | |
| 1. Sung-Mo Kang & Yusuf Leblebici, “CMOS Digital Integrated Circuits – Analysis and Design”, 3rd Edition, Tata McGraw-Hill, New Delhi, 2003. | | | | | |
| 1. Neil Weste and David Harris, “CMOS VLSI Design: A Circuits and Systems Perspective”, 4th Edition, Addison-Wesley, 2010 | | | | | |
| 1. John P.Uyemura, “CMOS Logic Circuit Design”, Springer International Edition.2005.Logic Circuit Design”, Springer International Edition.2005 | | | | | |
| 1. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002 2. J. P. Uyemura, “Introduction to VLSI circuits and Systems,” John Wiley, New Delhi, 2002. | | | | | |

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| **B. Tech. Sem. I: Electronics & Telecommunication Engineering**  **SUBJECT: - INTERNET OF THINGS** | | | | | | |
| **TEACHING SCHEME:** | | | | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** | |
| Theory: 03 | | | | End Semester Examination: 60 Marks | Credits: 03 | |
| Practical: 00 | | | | Internal Assessment: 40 Marks |  | |
| Tutorial: 01 | | | | TW and Oral: 00 Marks | Credits: 01 | |
|  | | | |  | Total Credit: 04 | |
|  | | | | | | |
| **Course Pre-requisites:** Control System and Applications, Embedded systems | | | | | | |
|  | | | | | | |
| **Course Objectives:** | | | | | | |
|  | | | To introduce the IoT paradigm | | | |
|  | | | To teach the types for sensors and actuators for IoT applications | | | |
|  | | | To introduce the communication and networking principles for IoT | | | |
|  | | | To introduce the concepts of Interoperability, Discoverability for IoT | | | |
|  | | | To teach the design of simple IoT systems using SOC/SBC | | | |
|  | | | To introduce the concept of Cloud and Fog computing | | | |
| **Course Outcomes: After learning this course students will be able to** | | | | | | |
| **1** | Identify a given IoT architecture | | | | | |
| **2** | Select appropriate sensor and/or actuator for given IoT application | | | | | |
| **3** | Identify and use communication and networking protocols | | | | | |
| **4** | Apply the knowledge of interoperability and discoverability for IoT applications | | | | | |
| **5** | Design simple IoT applications using microcontrollers/SOC/SBC | | | | | |
| **6** | Apply the knowledge of Cloud and Fog computing for IoT applications | | | | | |
|  | | | | | | |
| **UNIT – I** | | | **Introduction to Internet of Things** | | | **(06 Hours)** |
|  | | | Evolution of IoT Concept, IoT Vision, IoT Definition, IoT Basic Characteristics  IoT Distinction,  IoT Architectures, Three-layer IoT Architecture, Five-Layer IoT Architecture, Seven-layer Architecture | | |  |
|  | | |  | | |  |
| **UNIT – II** | | | **Sensors & Actuators** | | | **(06 Hours)** |
|  | | | Sensor Fundamentals, Sensor Classification, Simple (Direct) Sensor Versus Complex Sensor, Active Sensors Versus Passive Sensors, Contact Sensors Versus Noncontact Sensors, Absolute Sensors and Relative Sensors, Digital Sensors Versus Analog Sensors (Based on Output, Scalar Sensor Versus Vector Sensors (Based on Data Types Anatomy of Sensors, Physical Principles of Sensing, Actuators, Examples of analog and digital sensors (Temperature, Pressure, Level, Accelerometer, Humidity) | | |  |
|  | | |  | | |  |
| **UNIT - III** | | | **IoT Communication** | | | **(06 Hours)** |
|  | | | **IoT Communication**  **“**Traditional” Internet Review, Physical/Link Layer, IEEE 802.3 (Ethernet) , IEEE 802.11 , Network Layer , IPv6 and IPv4 ,Transport Layer , TCP and UDP , Application Layer , HTTP ,AMQP , SIP, Designing the Architecture of an IP-based Internet of Things , Physical/Link Layer , IEEE 802.15.4 and ZigBee , Low-power Wi-Fi , Bluetooth and BLE , Powerline Communications , Network Layer , The 6LoWPAN Adaptation Layer , Transport Layer , Application Layer , CoAP , CoSIP Protocol Specification ,The Industrial IoT | | |  |
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| **UNIT -IV** | | | **Interoperability, Discoverability in IOT** | | | **(06 Hours)** |
|  | | | REST Architectures: The Web of Things, The Web of Things , Messaging Queues and Publish/Subscribe Communications, Session Initiation for the IoT, Optimized Communications: the Dual-network Management Protocol, Service and Resource Discovery, Local and Large-scale Service Discovery, Scalable and Self-configuring Architecture for Service Discovery in the IoT, Lightweight Service Discovery in Low-power IoT Networks | | |  |
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| **UNIT -V** | | | **Microcontrollers and SBC for IoT** | | | **(06 Hours)** |
|  | | | Introduction to ESP8266, ESP8266 Architecture, Features, Examples of programming (sensor interfacing, MQTT, HTTP) using Arduino IDE  Introduction to ESP32, ESP832 Architecture, Features, Examples of programming (sensor interfacing, MQTT, HTTP) using Arduino IDE  Introduction to Single Board Computers (Raspberry Pi, Orange Pi, Intel Galileo) | | |  |
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| **UNIT -VI** | | | **IoT Cloud and Fog Computing** | | | **(06 Hours)** |
|  | | | Cloud Computing for IoT, IoT Cloud Architecture, Virtual Resource Pool , Application Server, Database Servers, Load-balancing Servers, Application Domains of IoT Cloud Platforms, Fog Computing for IoT, Difference from Related Computing Paradigms, Edge Computing, Mobile Edge Computing (MEC), Architecture of Fog Computing, Physical and Virtualization Layer, Monitoring Layer, Pre-processing Layer, Temporary Storage Layer, Security Layer, Transport Layer, Fog Deployment Models, Fog Service Models | | |  |
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| **Textbooks/Reference Books** | | | | | | |
| 1. | Enabling the Internet of Things: Fundamentals, Design, and Applications, Muhammad Azhar Iqbal et al., IEEE Press Wiley 2021 | | | | | |
| 2. | Sensors, Actuators, and Their Interfaces: A multidisciplinary introduction, Nathan Ida ,2nd Edition, The Institution of Engineering and Technology, London, United Kingdom, 2013 | | | | | |
| 3. | Internet of Things, Architectures, Protocols and Standards, Simone Cirani, Wiley 2019 | | | | | |
| 4. | Internet of Things with ESP8266, Marco Schwartz, Packt Publishing, 2016 | | | | | |
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**Bharati Vidyapeeth**

**(Deemed to be University)**

**College of Engineering, Pune**

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| **B. Tech. Sem. I: Electronics & Telecommunication Engineering**  **SUBJECT: - VHDL** | | | |
| **TEACHING SCHEME:** | | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** |
| Theory: 00 | | End Semester Examination: 00 Marks | Credits: 00 |
| Practical: 02 | | Internal Assessment: 00 Marks |  |
| Tutorial: 00 | | TW&PR: 50 Marks | Credits: 01 |
|  | |  | Total Credit: 01 |
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| **Course Pre-requisites:** Digital Electronics | | | |
| **Course Objectives:** | | | |
|  | To teach the student to understand the various features of VHDL to realize the complex digital logic systems. | | |
|  | To explain predefined attributes and configurations of VHDL | | |
|  | To design and simulate combinational logic circuit techniques in VHDL. | | |
|  | To design and simulate sequential and logic circuit techniques in VHDL. | | |
|  | To teach various modeling styles of digital logic systems using VHDL. | | |
| **Course Outcomes: At the end of this course students will be able to** | | | |
| **1.** | Understand the VHDL flow for Design and Implementation of Complex Digital Logic Circuit. | | |
| **2.** | Demonstrate use of Concurrent Assignment and Sequential Assignment Statement. | | |
| **3.** | Design Combinational logic circuits in different styles of modelling. | | |
| **4.** | Design Sequential logic circuits in different styles of modelling. | | |
| **5.** | Use computer-aided design tools for design of complex digital logic circuits. | | |
| **List of Experiments** | | | |
|  | Introduction to Xilinx tools and design of various Gates. | | |
|  | Write a VHDL program for Half adder, Full adder, Half subtractor, Full subtractor using Behavioral, Dataflow and Structure modeling style. | | |
|  | Write a VHDL program for Serial adder and Ripple Carry Adder using Component Instantiation statement (Structure modeling style). | | |
|  | Write a VHDL program for n-bit Comparator using Dataflow and Behavioral modeling style. | | |
|  | Write a VHDL program for Parity Generator and Checker using Dataflow and Behavioral modeling style | | |
|  | Write a VHDL program for 4:1 mux and 1:4 Demux using Select statement and Process-If Statement. | | |
|  | Write a VHDL program to construct 16:1 mux using five 4:1 mux in Structure modeling style using Generate Statement. | | |
|  | Write a VHDL program for 3:8 Decoder and 8: 3 Encoder using Process-Case Statement. | | |
|  | Write a VHDL program for D-flip flop with RESET input in Behavioral modeling Style using Process and Wait Statement. | | |
|  | Write a VHDL program for Circular Shift Register in Behavioral modeling Style using Process Statement. | | |
| **11.** | Write a VHDL program for SISO Shift Register in Behavioral modeling Style using Process Statement. | | |
| **12.** | Write a VHDL program for 8-Bit Barrel Shifter in Behavioral modeling Style using Process Statement. | | |
| **13.** | Write a VHDL program for ALU in Behavioral modeling Style using Case Statement. | | |
| **14.** | Write a VHDL program for Traffic Light Controller in Behavioral modeling Style using Process Statement. | | |
| **15.** | Design and Implementation of Half and Full adder using Xilinx FPGA | | |
| **Textbooks/Reference Books** | | | |
| 1. VHDL Design, Synthesis and Simulation, Debaprasad Das, Oxford University Press. | | | |
| 2. Fundamentals of VHDL Design by Stephen Brown and Zovenkeo Vrasesic, TMH | | | |
| 3. VHDL Programming by Example 4/e, Douglas L. Perry, TMH | | | |
| 4. “A VHDL Primer,” Bhasker, J. Pearson India. | | | |
| 5. V. Pedroni , “Circuit Design and Simulation with VHDL”, MIT Press, 2/e, 2010 | | | |
| 6.Navabi, “VHDL: Analysis and Modeling of Digital Systems”, McGraw-Hill | | | |
| 7.Charles Roth, “Digital System Design Using VHDL”, PWS Publishing. | | | |

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| **B. Tech. Sem. VI: Electronics & Telecommunication Engineering**  **SUBJECT: - Web App Development** | | | | |
| **TEACHING SCHEME:** | | **EXAMINATION SCHEME:** | **CREDITS ALLOTTED:** | |
| Theory: 00 | | End Semester Examination: 00 Marks | Credits: 00 | |
| Practical: 02 | | Internal Assessment: 00 Marks |  | |
| Tutorial: 00 | | TW and Oral: 50 Marks | Credits: 01 | |
|  | |  | Total Credit: 01 | |
|  | | | | |
| **Course Pre-requisites: Data base Management System** | | | | |
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| **Course Objectives:** | | | | |
| 1 | To develop an ability to design and implement static and dynamic website | | | |
| 2 | Choose best technologies for solving web client/server problems | | | |
| 3 | Create conforming web pages | | | |
| 4 | Use JavaScript for dynamic effects | | | |
| 5 | Handling Cookies and Sessions using PHP, SERVLETS and JSP | | | |
| **Course Outcomes: After learning this course students will be able to** | | | | |
| **1.** | Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's | | | |
| **2.** | Create dynamic web pages using JavaScript | | | |
| **3.** | Understand, analyse, and apply the role of languages like HTML, CSS, XML, JavaScript, PHP, SERVLETS, JSP and protocols in the workings of the web and web applications | | | |
| **4.** | Develop JSP applications implementing Session management and Data base Connectivity. | | | |
| **5.** | Use request and response objects provided to a servlet to read parameters and to produce an HTML response | | | |
| **6.** | Build web applications using PHP | | | |
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|  | **List of practical** | | |  |
| **I** | Design the following static web pages required for an online book store web site.  1) HOME PAGE: The static home page must contain three frames.  2) LOGIN PAGE  3) CATOLOGUE PAGE: The catalogue page should contain the details  of all the books available in the web site in a table.  4) REGISTRATION PAGE | | |  |
| **II** | Develop and demonstrate the usage of inline, internal, and external style sheet using CSS. | | |  |
| **III** | Write JavaScript to validate the following fields of the Registration  page.  1. First Name (Name should contains alphabets and the length  should not be less than 6 characters).  2. Password (Password should not be less than 6 characters length).  3. E-mail id (should not contain any invalid and must follow the  standard pattern name@domain.com)  4. Mobile Number (Phone number should contain 10 digits only).  Last Name and Address (should not be Empty). | | |  |
| **IV** | Develop and demonstrate JavaScript with POP-UP boxes and  functions for the following problems:  a) Input: Click on Display Date button using onclick( ) function  Output: Display date in the textbox  b) Input: A number n obtained using prompt  Output: Factorial of n number using alert | | |  |
| **V** | c) Input: A number n obtained using prompt  Output: A multiplication table of numbers from 1 to 10 of n using  alert  d) Input: A number n obtained using prompt and add another number  using confirm  Output: Sum of the entire n numbers using alert | | |  |
| **VI** | Write an HTML page that contains a selection box with a list of 5  countries. When the user selects a country, its capital should be  printed next in the list. Add CSS to customize the properties of the font of the capital (color,bold and font size). | | |  |
| **VII** | Write an XML file which will display the Book information which  includes the following:  1) Title of the book  2) Author Name  3) ISBN number  4) Publisher name  5) Edition  6) Price | | |  |
| **VIII** | Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser. | | |  |
| **IX** | Implement the following web applications using (a) PHP (b) Servlets (c) JSP  I A web application that takes a name as input and on submit it shows a hello <name> page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You <name > message with the duration of usage (hint: Use session to store name and time).  II Write a PHP Program to display current Date, Time and Day.  III A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with “Hello <name>, you are not  authorized to visit the site” message, where <name> should be replaced with the entered name. Otherwise it should send “Welcome <name> to this site” message.  IV A web application that lists all cookies stored in the browser on clicking  “List Cookies” button. Add cookies if necessary..  V write a program for deploying Java Beans in a jsp page | | |  |
| **X** | Write a program to design a simple calculator using (a) JavaScript (b) PHP (c) Servlet and (d) JSP. | | |  |
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| **Textbooks** | | | | |
| 1. Learning Web Application Development , Sammy Purewal , O’Reilly Publication | | | | |
| 2. Learning Web Design , A Beginner’s Guide to HTML, CSS, JavaScript, and Web Graphics, Jennifer Niederst Robbins, O’Reilly Publication | | | | |