



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA -
VIZIANAGARAM**

VIZIANAGARAM – 535 003 Andhra Pradesh (India)

B. Tech ECE (R23-COURSE STRUCTURE & SYLLABUS)

B.Tech. – III Year I Semester

S.No	Category	Course Code	Title	L	T	P	C
1	PC	R2331041	Microprocessors and Microcontrollers	3	0	0	3
2	PC	R2331042	Information Theory and Error Control Coding	3	0	0	3
3	PC	R2331043	Digital Signal Processing	3	0	0	3
4	PCE-1	R2331044A	Computer Architecture & Organization	3	0	0	3
		R2331044B	Antenna Analysis and Design				
		R2331044C	Electronic Measurements and Instrumentation				
5	OE-1	R2331045A	Global Navigation Satellite Systems	3	0	0	3
		R2331045B	Internet of Things				
		R2331045C	Communication Systems				
6	PC Lab-1	R2331046	Microprocessors and Microcontrollers	0	0	3	1.5
7	PC Lab-2	R2331047	Digital Signal Processing Lab	0	0	3	1.5
8	SEC	R233104SC	Data Structures with Python	0	1	2	2
9	ES	R233104ES	PCB Design Practice	0	0	3	1.5
10	Internship		Evaluation of Community Service Internship	0	0	0	1
11	MC	R233104MC	Constitution of India	2	0	0	0
Total				17	1	11	22.5



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III Year – I SEMESTER	Professional Core	L	T	P	C
		3	0	0	3
MICROPROCESSORS AND MICROCONTROLLERS					

Course Objectives:

- To impart knowledge of the architecture and functioning of 8086 microprocessor and 8051 microcontrollers.
- To familiarize students with assembly language programming concepts and their practical implementation.
- To understand memory interfacing and peripheral device interfacing with 8086 and 8051.
- To develop the ability to interface microcontrollers with external hardware components and sensors.
- To provide hands-on experience for designing embedded systems using 8051.

Unit I

8086 Microprocessors:

Introduction to microcomputer, evolution of processors and semiconductor memories (RAM, ROM, EPROM, EEPROM), Architecture of 8086 microprocessor, register organization of 8086, Pipelining concept, Memory segmentation, Addressing Modes.

Unit II

Assembly Language Programming:

Instruction Set and Programming: Instruction set of 8086 microprocessors: Data transfer instructions, Arithmetic instructions, Logical Instructions, String instructions, Stack related instructions, Branching instructions, Assembler directives. Data transfer instructions of 8085 microprocessor,

Unit III

8086 Operational Modes and Memory Interfacing

Minimum and Maximum mode operations of 8086 with timing diagrams, Procedures and macros, Stack Structure of 8086, Static RAM Interfacing, Interfacing of 8255 Programmable Peripheral Interface with 8086 microprocessors. Dynamic RAM, Direct memory access.



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Unit IV

8051 Microcontroller

Comparison between microprocessor and microcontroller, 8051 family microcontroller, RAM architecture of 8051, Integrated Development Environment (IDE), Pin description of 8051 microcontroller, Machine cycle. Addressing Modes, Instruction set of 8051: Data transfer instructions, Arithmetic instructions, Logical Instructions, Stack related instructions, Branching instructions. Programing and Applications of Timers, Interrupts, Universal Asynchronous Receiver Transmitter (UART). External memory interfacing with 8051 microcontroller, various constituents of hex file

Unit V

Interfacing 8051 with Peripherals

Interfacing 8051 with: Matrix Keypad, LCD, Seven-segment displays, L293D Motor Driver, Stepper motor, Analog-to-Digital Converter (ADC 0804) and Digital-to-Analog Converter (DAC 0808)

Sensor and Relay Interfacing with 8051

Interfacing of temperature sensor LM35 with 8051, Relay interfacing with 8051, Case studies and practical applications using 8051.

Course Outcomes

After completion of the course, the student will be able to

- Understand the internal architecture and operations of 8086 microprocessor and write assembly language programs.
- Analyze and design memory and peripheral interfacing techniques for microprocessors and microcontrollers.
- Develop embedded applications using 8051 microcontroller and its instruction set.
- Interface 8051 with external peripherals such as LCDs, motors, keypads, ADCs/DACs, and sensors.
- Design simple embedded systems integrating sensors and actuators using the 8051 microcontrollers.



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III Year – I SEMESTER	Professional Core	L	T	P	C
		3	0	0	3
INFORMATION THEORY AND ERROR CONTROL CODING					

Course Objectives:

- To introduce the fundamental principles of source coding and channel coding for efficient and reliable data transmission.
- To understand the construction and performance of linear block codes and cyclic codes for error detection and correction.
- To explain the principles of convolutional codes and their decoding techniques, including ARQ protocols.
- To provide a comprehensive understanding of turbo codes, their structure, encoding and iterative decoding mechanisms.
- To study the theory and implementation of LDPC codes and their applications in modern communication systems.

Unit I: Source Coding

Introduction to source coding, Instantaneous codes, Kraft's inequality, coding efficiency and redundancy, source coding theorem, construction of basic source codes, Shannon Fano coding, Huffman coding, Lempel-Ziv Coding, Channel coding theorem for Discrete memoryless channel, Binary Symmetric Channel, Binary Erasure Channel. Rate-distortion function, Quantization

Unit II: Linear Block Codes

Codes for error detection and correction: Parity check coding, Hamming codes, Linear block codes, Error detecting and correcting capabilities, Generator and Parity check matrices, Standard array and Syndrome decoding, Cyclic codes: Generator polynomial, encoding of cyclic codes, Syndrome decoding of cyclic codes. RS Codes, LDPC codes

Unit III: Convolutional Codes and ARQ Protocols

Encoding and state Tree and Trellis diagrams, Maximum likelihood decoding of convolutional codes, Viterbi algorithm, Automatic repeat request (ARQ), Performance of ARQ, Probability of error and throughput, Applications: Concatenated Codes, Interleavers, Compact Disc, Codes for Magnetic recording. Turbo codes, Hybrid ARQ

Unit IV: Turbo Codes: Types of Turbo Codes, Structure and Encoding of Turbo Codes, Interleaver Design, Iterative Decoding of Turbo Codes. Hybrid Turbo Codes,



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Unit V: LDPC Codes: Introduction to LDPC Codes, Structure and Graph Representation, LDPC Code Construction and Encoding, LDPC Code Decoding Algorithm-Belief Propagation (Sum-Product Algorithm). Spatially coupled LDPC codes

Textbooks:

1. Bernard Sklar, Digital communications: Fundamentals and applications, 2nd edition, Prentice Hall, 2008.
2. R Bose, Information Theory Coding and Cryptography, 2nd edition, McGraw-Hill, 2017.

Reference Books:

1. John G. Proakis, Digital Communication, 5th edition, McGraw Hill, 2014.
2. William Stallings, Cryptography and Network Security: Principles and Practices, 7th edition, Pearson education, 2019.
3. R.P. Singh, SP Sapre, Communication Systems, 3rd edition, McGraw Hill, 2017.

Course Outcomes:

After completion of the course, the student will be able to

- Apply fundamental source coding techniques such as Huffman and Lempel-Ziv coding and analyze channel capacity for different types of channels.
- Construct and analyze linear block codes and cyclic codes and implement error detection and correction techniques using syndrome decoding.
- Explain convolutional encoding techniques, decode using Viterbi algorithm, and evaluate performance using ARQ protocols.
- Design and decode turbo codes using iterative decoding and interleaving techniques for robust communication.
- Construct and decode LDPC codes using belief propagation and analyze their performance in high-throughput applications



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III Year – I SEMESTER	Professional Core	L	T	P	C
		3	0	0	3
DIGITAL SIGNAL PROCESSING					

Course Educational Objectives:

- To introduce the frequency analysis of discrete time LTI systems.
- To identify different hardware structures for IIR systems.
- To explain the numerical computation of DFT / FFT along with their properties and applications.
- To expose the design of IIR filters.
- To expose the design of FIR filters.

UNIT I:

Discrete Time Systems: Transform Analysis of Discrete Time LTI Systems: Frequency response of LTI systems. System Functions for Systems Characterized by Linear Constant Coefficient Difference Equations: Stability, causality, impulse response for rational system functions. Structures for IIR Discrete Time Systems: Direct, parallel and cascade form.

UNIT II:

Discrete And Fast Fourier Transform: The Discrete Fourier Transform (DFT): Representation of periodic sequences. The discrete Fourier series, Fourier representation of finite duration sequences, the discrete Fourier Transform (DFT), computation of DFT, properties of the DFT, circular convolution and linear convolution using DFT, overlap-add method, overlap-save method. Fast Fourier Transform (FFT): Radix-2 decimation-in-time and decimation-in-frequency FFT algorithms, inverse FFT.

UNIT III:

Design Of IIR Filters: Design of IIR Filters: Design of analog prototypes from digital filter specifications using Butterworth and Chebyshev approximations, design of IIR filters from analog filters, Butterworth filters and Chebyshev filters design using impulse invariance, bilinear transformation.

UNIT IV:



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Design Of FIR Filters: Design of FIR Filters: Linear discrete time systems with generalized linear phase, design of linear phase FIR filters using window functions (rectangular, Hamming, Hanning, Blackman and Kaiser) frequency sampling technique.

UNIT V:

Processor Fundamentals: Features of DSP processors - DSP processor packaging (Embodiments)- Fixed point Vs floating point DSP processor data paths - Fixed point Vs floating point DSP processor data paths – pipelining - TMS320 family of DSPs (architecture of C5x)- Memory architecture of a DSP processor (Von Neumann - Harvard) - Addressing modes.

Textbook(s):

1. A.V. Oppenheim, R. W. Schaffer, Digital Signal Processing, Prentice Hall of India, 2004

Reference(s):

1. J. G. Proakis and D. G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, 4/e, Pearson

Education, 2007

2. Sanjay K. Mitra, Digital Signal Processing- A Computer Based Approach, 4/e, Tata Mc Graw Hill Publications, 2011

3. Ifeachor E.C, Jervis B.W, Digital Signal Processing – A Practical Approach, 2/e, Pearson Education, 2002



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III Year – I SEMESTER	Professional Core Elective- I	L	T	P	C
		3	0	0	3
COMPUTER ARCHITECTURE & ORGANIZATION					

Course Objectives

- To impart basic concepts of computer architecture and organization,
- To explain key skills of constructing cost-effective computer systems.
- To familiarize the basic CPU organization.
- To help students in understanding various memory devices.
- To facilitate students in learning IO communication

UNIT – I:

Structure of Computers: Computer types, Functional units, Basic operational concepts, VonNeumann Architecture, Bus Structures, Software, Performance, Multiprocessors and Multicomputer, Data representation, Fixed and Floating point, Error detection and correction codes.

Computer Arithmetic: Addition and Subtraction, Multiplication and Division algorithms, Floating-point Arithmetic Operations, Decimal arithmetic operations.

UNIT – II:

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions and Instruction cycle. Timing and Control, Memory-Reference Instructions, Input-Output and interrupt. Central processing unit: Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs RISC

UNIT - III

Register Transfer and Micro-Operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logic shift unit. **Micro-Programmed Control:** Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit.

UNIT - IV



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Memory Management System:Memory Hierarchy, Semiconductor Memories, RAM (Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations, Virtual memory, Paging, Secondary Storage, RAID.

UNIT – V

Input Output Organization: I/O interface, Programmed IO, Memory Mapped IO, Interrupt Driven IO, DMA. MULTIPROCESSORS: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization, Cache Coherence.

Textbooks:

- 1.M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India.
2. David A. Patterson and John L. Hennessey, “Computer organization and design: The hardware /software interface”, Morgan Kauffman / Elsevier, Fifth edition, 2014

Reference books:

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India.
2. William Stallings (2010), Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersy.
3. Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, Pearson Education Inc,
4. John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGrawHill.

Course Outcomes:

After completion of the course, the student will be able to

- Identify various components of computer and their interconnection
- Identify basic components and design of the CPU: the ALU and control unit.
- Compare and select various Memory devices as per requirement.
- Compare various types of IO mapping techniques
- Critique the performance issues of cache memory and virtual memory.



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III Year – I SEMESTER	Professional Core Elective- I	L	T	P	C
		3	0	0	3
ANTENNA ANALYSIS AND DESIGN					

Course Objectives:

- To introduce the basic characteristics and fundamental parameters of antennas
- To familiarize the concepts of wire antennas
- To acquaint the student with knowledge of high frequency antennas
- To impart knowledge about types of antenna arrays and their analysis and synthesis
- To introduce antennas for mobile communications

UNIT 1:

Antenna Characteristics: Introduction, historical advancements, types, radiation mechanism, review of fundamental parameters – radiation pattern, power density, intensity, directivity, gain, beam width, band width, efficiency, polarization, impedance, effective height, equivalent areas, Friis transmission equation

UNIT 2:

Wire Antennas: Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields

UNIT 3:

Aperture Antennas: Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, Increased Directivity, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays.

UNIT 4:

Antenna Arrays and Synthesis: Antenna Synthesis: Introduction, Continuous Sources, Schelkunoff Polynomial Method and Fourier transform Method

UNIT 5:



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Antennas for Mobile Applications: Antennas for Mobile Communication: Introduction, Characteristics of MSAs, Feeding Techniques, Methods of Analysis Regularly Shaped Broadband MSAs: Introduction, RMSAs

Text Books:

1. Contantine A. Balanis, Antenna Analysis and Design, 3/e, Wiley Publications, 2009.
2. Broadband Microstrip Antennas, Girish Kumar, K. P. Ray, Artech House antennas and propagation library)

References:

- 1.A.R. Harish, M. Sachidananda, Antennas and Wave Propagation, 1/e, Oxford University Press, 2007.



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III Year – I SEMESTER	Professional Core Elective- I	L	T	P	C
		3	0	0	3
ELECTRONIC MEASUREMENTS AND INSTRUMENTATION					

Course Objectives:

- It provides an understanding of various measuring system functioning and metrics for performance analysis.
- Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
- Understanding the concepts of various measuring bridges and their balancing conditions.
- Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Unit I:

Basic Instruments: Block Schematics of Measuring Systems: Performance characteristics, Static characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D'Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

Unit II:

Signal Generators and Analyzers: Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary waveform Generator, Video Signal Generators, and Specifications.

Unit III:

Cathode Ray Oscilloscope: Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications. Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

Unit IV:



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Transducers: Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchronous, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers, gyroscopes, accelerometers.

Unit V:

Bridges and Measurement of Physical parameters.

Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure - High Pressure, Vacuum level, Temperature - Measurements, Data Acquisition Systems.

Text Books:

1. H.S.Kalsi, Electronic instrumentation, Tata McGraw Hill, 2nd Edition, 2004.
2. A.D. Helfrick and W.D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, PHI, 5th Edition, 2002.

Reference Books:

1. David A. Bell, Electronic Instrumentation & Measurements, PHI, 2nd Edition, 2003.
2. Robert A. Witte Electronic Test Instruments, Analog and Digital Measurements, Pearson Education, 2 Edition, 2004.
3. K. Lal Kishore, Electronic Measurements & Instrumentations, Pearson Education, 1
4. Bell Electronic measurements and Instrumentation – B. M. Oliver and J.M. Cage, TMH, 2009.

Course Outcomes:

After completion of the course, the student will be able to

- Measure electrical parameters with different meters and understand the basic definition of measuring parameters.
- Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
- Operate an Oscilloscope to measure various signals.
- Interpret the measurement of passive component values using bridges
- Measure various physical parameters by appropriately selecting the transducers.



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III Year – I SEMESTER	Open Elective-I	L	T	P	C
		3	0	0	3
GLOBAL NAVIGATION SATELLITE SYSTEMS					

Course Objectives:

- To introduce the fundamental principles and architecture of GNSS.
- To familiarize students with various satellite navigation systems and their working.
- To understand GPS signal structure, positioning techniques, and error mitigation.
- To explore GNSS augmentation methods and their applications.
- To equip students with knowledge of real-world GNSS-based applications and innovations.

Unit I:

Introduction to GNSS: Evolution of satellite navigation systems, Overview of Global Navigation Satellite Systems: GPS, GLONASS, Galileo, BeiDou, QZSS, NavIC, Basic concepts: Segments of GNSS (Space, Control, and User segments), GNSS signals and frequencies, Applications of GNSS in navigation, surveying, and timing.

Unit II:

GPS Fundamentals: GPS constellation and orbital characteristics, GPS signal structure (C/A and P codes), GPS coordinate systems: WGS-84, Satellite ranging and pseudorange calculation, Error sources in GPS: ionospheric, tropospheric, multipath, clock and ephemeris errors

Unit III:

GNSS Data Processing and Positioning Techniques: Receiver architecture and measurement principles, Positioning techniques: single-point positioning, differential GPS (DGPS), real-time kinematic (RTK), Precise Point Positioning (PPP), Geometric Dilution of Precision (GDOP), GPS data formats: NMEA, RINEX, Introduction to GNSS simulators and software tools

Unit IV:

GNSS Augmentation and Integration: GNSS augmentation systems: SBAS (WAAS, EGNOS, GAGAN), GBAS, GNSS integration with Inertial Navigation Systems (INS), Carrier phase-based positioning, RAIM (Receiver Autonomous Integrity Monitoring), GNSS spoofing and jamming – concepts and mitigation techniques.



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Unit V:

Applications of GNSS: Applications in land, air, and marine navigation, Surveying and geodesy, Disaster management and precision agriculture, Fleet and asset management, Emerging applications: IoT, autonomous vehicles, smart cities, and drones.

Textbooks:

- B. Hofmann-Wellenhof, H. Lichtenegger, and J. Collins, Global Positioning System: Theory and Practice, Springer, 5th Edition.
- Pratap Misra and Per Enge, Global Positioning System: Signals, Measurements and Performance, Ganga-Jamuna Press, 2nd Edition.
- G.S. Rao, Global Navigation Satellite Systems, McGraw-Hill Publications, New Delhi, 2010
- Ahmed El-Rabbany, Introduction to GPS: the Global Positioning System, Artech House, 2002

Reference Books:

- E.D. Kaplan and C.J. Hegarty, Understanding GPS: Principles and Applications, Artech House, 2nd Edition.
- B. Parkinson and J.J. Spilker Jr., Global Positioning System: Theory and Applications, Volume I & II, AIAA.
- Leick, GPS Satellite Surveying, John Wiley & Sons, 4th Edition.
- P. Teunissen and O. Montenbruck, Springer Handbook of Global Navigation Satellite Systems, Springer, 2017.
- Scott Gleason and DemozGebre- Egziabher, GNSS Applications and Methods, Artech House, 685 Canton Street, Norwood, MA 02062, 2009
- James Ba-Yen Tsui, Fundamentals of GPS receivers-A software approach, John Wiley & Sons, 2001.



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		3	0	0	3
INTERNET OF THINGS					

Objectives:

- 1 To study the fundamentals about IoT
- 2 To study about IoT Access technologies
- 3 To study the design methodology and different IoT hardware platforms.
- 4 To study the basics of IoT Data Analytics and supporting services.
- 5 To study about various IoT case studies and industrial applications.

UNIT I:

Fundamentals Of IOT: Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II:

IOT Protocols: IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, 6LoWPAN, Application Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT.

UNIT III:

Design And Development: Design Methodology, Embedded Computing Logic, Microcontroller, System on Chips, IoT system building blocks IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details

UNIT IV:

Data Analytics and Supporting Services: Data Analytics: Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M, Supporting Services: Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models.

UNIT V:



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Case Studies/Industrial Applications:

IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipment's, Industry 4.0 concepts.

Textbooks:

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017
2. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015
3. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education

Reference Books:

1. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit2).
2. “From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence”, Jan Ho Iler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
3. Architecting the Internet of Things, Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer, 2011.
4. Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, Michael Margolis, Arduino Cookbook and O'Reilly Media, 2011.

e-resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs65
2. The Internet of Things in the Cloud | A Middleware Perspective | Honbo (taylorfrancis.com)

Course Outcomes:

After completion of the course, the student will be able to

- Understand the basics of IoT.
- Implement the state of the Architecture of an IoT.
- Understand design methodology and hardware platforms involved in IoT.
- Understand how to analyze and organize the data.
- Interpret IOT Applications in Industrial & real world



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		3	0	0	3
COMMUNICATION SYSTEMS					

Course Objectives:

- To introduce the need for modulation to communicate signals
- To familiarize the generation and detection of different analog modulation schemes
- To impart knowledge of specifications and real-world applications of analog broadcasting systems
- To expose the noise performance analysis and comparison of analog modulation schemes.

UNIT 1

Fourier Transforms and Signal Transmission Through Systems: Electromagnetic Spectrum, Ranges and Application Areas, Continuous-Time Fourier Transform, Convolution and Correlation, Hilbert Transform, Signal Transmission through Systems. Need for Modulation

UNIT 2

Amplitude Modulation: Amplitude Modulation, Demodulation of AM Signals, AM Broadcast Transmitters, AM Broadcast Receivers, Double Sideband Suppressed Carrier (DSB-SC) Modulation, Single Sideband Modulation, Single Sideband Transmission and Reception, Compatible Single Sideband (CSSB) System, Communication Receivers, Vestigial Sideband Modulation, Comparison of Various Varieties of Amplitude Modulation.

UNIT 3

Angle Modulation: Angle Modulated Signals, Narrowband Angle Modulation, Spectrum of an Angle-Modulated Signal, Power of an Angle-Modulated Signal and Effective Bandwidth, Generation of Wideband Angle-Modulated Signals, effects of Channel Non-Linearities on FM Signals Detection of FM Signals, FM Broadcasting, FM Transmitters and Receivers, Radio and Television Broadcasting: AM Radio Broadcasting, FM Radio Broadcasting, Television Broadcasting.

UNIT 4

Noise in Analog Communication Systems: Noise Performance of AM and FM Systems, Effects of Transmission Losses and Noise in Analog Communication Systems.



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UNIT 5

Analog to Digital Conversion: Advantages of Digital Communication over Analog Communication Systems. Analog to Digital Conversion: sampling process, pulse modulation schemes- pulse amplitude, pulse width, pulse position modulation. pulse code modulation (PCM), differential pulse code modulation, delta modulation, time division multiplexing.

Textbooks:

1. P. Ramakrishna Rao, Communication Systems, 2/e, Tata McGraw Hill Publications, 2018.
2. Proakis, Salehi, Communication Systems Engineering, 2/e, Pearson Education, 2010.
3. Lathi, Modern Analog and Digital Communication Systems, 4/e, Oxford University Press, 2012.

References:

1. Simon Haykin, Michael Moher, Introduction to Analog and Digital Communications, 2/e Wiley, 2007
2. Simon Haykin, Communication Systems 4/e, Wiley, 2001.
3. Kennedy, David, Electronic Communication System 4/e, Tata McGraw Hill, 2012.



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III Year – I SEMESTER	Professional Core Lab - 1	L	T	P	C
		0	0	3	1.5
MICROPROCESSORS AND MICROCONTROLLERS LAB					

Course Objectives

- To understand the architecture and operation of 8086 microprocessor and 8051 microcontroller.
- To develop assembly language programs for 8086 and 8051.
- To interface memory and peripherals with 8086 and 8051.
- To understand the operation of programmable interface devices like 8255.
- To implement real-time applications using microcontrollers interfaced with sensors, motors, and displays.

List of Experiments:

1. Write a data transfer program using different addressing modes in assembly language programming.
2. Perform arithmetic operations on 8 bit and 16-bit numbers in assembly language programming.
3. Data transfer program using string instruction in assembly language programming.
4. Program for data conversion in assembly language programming.
5. Implement stack operations using PUSH and POP instructions.
6. Write assembly language program using procedure.
7. Write assembly language program using macro.
8. Program to reject negative numbers from a series of bytes.
9. Interfacing 8086 with 8255 PPI to display data on LEDs.
10. Perform Arithmetic operations on 8bit numbers in assembly language programming using 8051 microcontrollers.
11. Program to toggle the LED.
12. Programming and interfacing of traffic light logic.
13. Program to generate square wave using interrupts.
14. Programming and interfacing of the key pad matrix.
15. Programming and interfacing of seven-segment display.
16. Programming and interfacing of the LCD
17. Programming and interfacing of the relay.
18. Programming and interfacing of the dc/Stepper motor.



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Text Books

- 1 Douglas V. Hall, Microprocessors and Interfacing: Programming and Hardware, Tata McGraw-Hill.
- 2 Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International.
- 3 Muhammad Ali Mazidi & Janice Gillispie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education.

Reference Books:

- 1 Kenneth Ayala, The 8051 Microcontroller, Cengage Learning.
- 2 Barry B. Brey, The Intel Microprocessors 8086/88, 80186/188, 80286, 80386, and 80486, Pearson Education.
- 3 Krishna Kant, Microprocessors and Microcontrollers: Architecture, Programming and System Design, PHI.

Course Outcomes:

After successful completion of this course, students will be able to:

- Describe the internal architecture of 8086 and 8051.
- Develop and execute assembly language programs for 8086 and 8051.
- Interface peripheral devices such as LCDs, keypads, and motors with 8051.
- Demonstrate interfacing of RAM, ROM, ADC, DAC, and sensor modules with microprocessors and microcontrollers.
- Analyze and implement microcontroller-based real-world applications.



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III Year – I SEMESTER	Professional Core Lab - 1	L	T	P	C
		0	0	3	1.5
Digital Signal Processing Lab					

List of Experiments

- 1 Generation of discrete time signals in time domain.
- 2 Implementation of discrete time systems in time domain.
- 3 Frequency analysis of discrete time signals using DTFT.
- 4 Frequency analysis of discrete time systems using DTFT
- 5 Discrete Fourier transform (DFT) and properties
- 6 FIR filter design.
- 7 IIR filter design.
- 8 Study of TMS320C6478 DSK and code composer studio.
- 9 Sinusoidal waveform generation.
- 10 FIR filter implementation on LCDK Kit.
- 11 IIR filter implementation on LCDK Kit.
- 12 Mini project on DSP (Example: DTMF generation and detection using correlation processing/FFT).

Textbook(s):

1. A.V. Oppenheim, R. W. Schaffer, Digital Signal Processing , Prentice Hall of India, 2004

Reference(s):

1. J. G. Proakis and D. G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, 4/e, Pearson Education, 2007
2. Sanjay K. Mitra, Digital Signal Processing- A Computer Based Approach, 4/e, Tata Mc Graw Hill Publications, 2011
3. Ifeachor E.C, Jervis B.W, Digital Signal Processing – A Practical Approach, 2/e, Pearson Education, 2002.



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III Year – I SEMESTER	Skill Enhancement course	L	T	P	C
		0	1	2	2
Data Structures with Python					

Course Educational Objectives:

1. Introduce object-oriented concepts.
2. Introduction to sort and search methods.
3. Familiarize with linear data structures and operations on them.
4. Demonstrate the organization of data as trees and various operations on trees.
5. Teach various graph representations.
6. Enable to perform graph traversal and find shortest path and minimal spanning tree for a graph.
7. Expose common sorting techniques and their complexities.

UNIT 1 Object Oriented Programming

Object-oriented concepts in Python: Creating a class, objects, methods, constructor, encapsulation, inheritance, polymorphism, operator overloading.

UNIT 2 Searching and Sorting

Searching: Sequential Search, binary search. Sorting: Insertion sort, selection sort, bubble sort. Linked lists: Single linked list, double linked list, circular linked list.

UNIT 3 Stacks and Queues

Stacks: Definition, operations: array implementation, linked implementation. queues: Definition, operations: array implementation, linked list implementation and applications, Priority Queue, Double-Ended Queues

UNIT 4 Trees

Trees: Definition, Tree properties, Binary trees: properties, implementation, tree traversals, Heap tree, Heap sort, binary search tree and operations.

UNIT 5 Graph Algorithms

Graphs: ADT, data structure for graphs, properties of graphs, types of graphs, graph representations, graph traversals, directed acyclic graph, shortest path algorithms, spanning trees and min spanning tree.

List of Assignments:



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1. Write a program to create

- Student class with data members student roll no, name, address, course. Include a constructor to initialize data members. Add a method to print the student details.
- Book class with data members book_id, name, cost and publisher. Include constructor and a method to display the book details. Create 3 objects and display their details.
- Account class with data members acc_no, name, balance. Include a constructor and methods to perform deposit and withdraw operations on account. Create account object perform some operations and display the account details.
- Product class with data members product id, product name, price, expiry date. Include constructor to initialize data members and a method to print products details.
- Complex Number with data members real_part and imaginary_part. Include constructor to initialize complex number. Add a method which adds two complex numbers.
- Employee class with data members eno,ename,sal,designation. Include constructor to initialize employee details and count the number of employee objects created.

2. Create a class called Distance. A person has to travel a certain distance and he used two cars.

Now create two objects “cardist1” and “cardist2” for the class Distance. Add the two objects’ distances and put the total distance in the third object of class Distance “totaldist”. Take one data member, which will accept the distance input in km. Take two functions, for accepting the distance and the other for displaying. Display the total distance in meters.

3. Develop a program to Perform Python Multi-Level and multiple inheritances.

4. Design a program to overload “+” operator for

- Concatenating two strings
- Adding two complex numbers

5. Develop a program to overload “area” method to calculate area of different polygon shapes.

Write a program to

- Implement Method Overriding
- Perform Linear Search on an array.
- Perform Binary Search on a list stored in an array.



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6. Develop a program to implement various sorting techniques
 - Insertion sort
 - Selection Sort
 - Bubble Sort
7. Design a program to create a singly linked list for the following operations
 - Insert a Node at Beginning, at Ending and at a given Position
 - Delete a Node at Beginning, at Ending and at a given Position
 - Search, Count the Number of Nodes and Display
8. Design a program to create a doubly linked list for the following operations
 - Insert a Node at Beginning, at Ending and at a given Position
 - Delete a Node at Beginning, at Ending and at a given Position
 - Search, Count the Number of Nodes and Display
9. Create a Circular singly linked list for adding and deleting a Node.
10. Create a stack and perform various operations on it.
11. Convert the infix expression into postfix form.
12. Perform String reversal using stack
13. Create a queue and perform various operations on it.
14. Construct a binary tree and perform various traversals.
15. Construct a binary search tree and perform search operation.
16. Implement Depth First Search, Breadth First Search traversals on a graph.
17. Implement Dijkstra's Shortest Path Algorithm

Textbooks:

1. Michel T. Goodrich, Roberto Tamassia, Michel H. Goldwasser, Data Structures and Algorithms in Python, Wiley March, 2013. ISBN: 978-1-118-29027-9.
2. Rance D. Necaise, Data Structures and Algorithms using Python, John Wiley & Sons, India. 2011, ISBN 9788126562169.

References: Wesley J. Chun, Core Python Programming, 2/e, Prentice Hall, 2006.



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III Year – I SEMESTER	Engineering Science	L	T	P	C
		0	0	3	1.5
PCB Design Practice					

Course Objectives:

- To introduce students to the fundamentals of PCB design, layout, and fabrication processes using industry-standard EDA (Electronic Design Automation) tools.
- To develop competency in schematic capture, circuit simulation, and PCB layout creation for analog and digital circuits such as power supplies, amplifiers, filters, and control systems.
- To enable students to understand the practical aspects of PCB design, including parameter setting, component placement, routing, and thermal management.
- To promote hands-on experience in designing real-world application circuits, such as sensor-based systems and security circuits, using both simulation and physical prototyping.
- To provide exposure to thermal design concepts and heat dissipation techniques in PCB design to ensure circuit reliability and performance.

List of experiments:

1. Introduction to PCB DESIGN and EDA Tool Software
2. Parameter setting for PCB Design.
3. Design of a $\pm 5V$ Power supply.
4. Schematic Creation and simulation of an electronic circuit
5. Design and Simulate ON/OFF Switches Circuits
6. Design and simulation of a Half and Full Wave Rectifier
7. Design of a PCB layout of Low pass filter
8. Design of a PCB layout of CE Amplifier
9. Design and Simulate Simple 7 Segment Circuits
10. Design of an IR Proximity Sensor – Touchless Door Bell using Zero PCB
11. Design of a Laser Light Security Alarm.
12. Design of a Mobile Phone Detector Circuit.
13. Study of PCB Thermal management techniques.



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14. Study of Transistor Heat dissipation using PCB.

Textbooks:

1. Simon Monk, “Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards (Electronics)” 2017

Reference books:

1. S. Yogesh, “OSCAD: An Open-Source EDA Tool for Circuit Design, Simulation, Analysis and PCB Design”, Shroff Publishers & Distributors Pvt. Ltd, 2013.

e.sources:

1. <https://www.udemy.com/course/circuit-design-simulation-and-pcb-manufacturing-bundle>
2. <https://www.allaboutcircuits.com/technical-articles/pcb-thermal-management-techniques/>

Course Outcomes:

At the end of the course, the student will be able to

- Determine appropriate components to make circuits.
- Design of a Power Supply Module
- Design of types of Rectifiers
- Analyze the Design of a Security System
- Design of an electronic printed circuit board for a specific application using standard software.



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III Year – I SEMESTER	Mandatory Course	L	T	P	C
		2	0	0	0
CONSTITUTION OF INDIA					

Course Objectives

- Understand the historical development and philosophy behind the Indian Constitution.
- Gain insights into the structure, functioning, and powers of Union and State Governments.
- Comprehend the scope of fundamental rights, duties, and directive principles.
- Recognize the functioning of constitutional bodies and their roles in governance.
- Appreciate the significance of local self-governance and recent constitutional amendments.

Unit I: Constitutional Foundation and Historical Background

Constitutional history and the making of the Indian Constitution, Role of the Constituent Assembly, Salient features of the Indian Constitution, Significance of the Preamble, Process of constitutional amendments (Article 368)

Unit II:

Fundamental Rights, Duties, and Directive Principles

Citizenship provisions under the Constitution, Fundamental Rights (Articles 12–35), Directive Principles of State Policy (Articles 36–51), Fundamental Duties (Article 51A)

Unit III:

Union Government

President and Vice President: election, powers, and removal, Prime Minister and Council of Ministers, Structure and functions of Parliament, Judiciary: Structure and powers of the Supreme Court, Centre-State relations: legislative, administrative, and financial, Emergency provisions (Articles 352, 356, 360)

Unit IV:

State Government and Local Governance

Governor: Appointment, powers, and functions, State Legislature and Chief Minister, Role of High Courts, Rural and Urban Local Governments, 73rd and 74th Constitutional Amendment Acts (Panchayati Raj and Municipalities)

Unit V:

Constitutional and Statutory Bodies

Comptroller and Auditor General (CAG), Election Commission of India, Finance Commission, Attorney General and Advocate General, Union and State Public Service Commissions (UPSC & SPSC), Tribunals and National Human Rights Commission (NHRC)

Textbooks:



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1. J.C.Johari, Indian Government and Politics, Vishal Publications, Delhi, 2009. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, 2012, MIT Press (Unit-2&3)
2. M. V. Pylee, Introduction to the Constitution of India, 5th Ed., Vikas Publishing House, Mumbai, 2007.

Reference Books:

1. D.D. Basu, Introduction to the Indian Constitution, 21st Ed., Lexis Nexis, Gurgaon, India, 2011.
2. Subhas C. Kashyap, Our Constitution, 2nd Ed., National Book Trust India, New Delhi, 2013

e-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_lw02/preview Evaluation of Industry Internship

Course Outcomes (COs)

After completion of the course, the student will be able to

- Explain the evolution and salient features of the Indian Constitution.
- Describe the structure of the Indian Government and its functioning at the Union and State levels.
- Analyze the significance of the Preamble, Fundamental Rights, and Duties.
- Evaluate the role of statutory and constitutional bodies in democratic governance.
- Interpret the importance of decentralization through Panchayati Raj and urban local bodies.
