Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Digital Communication/Embedded System)

SEMESTER I

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM	MST	Q/A	END SEM	Q/A				
MTMAEC 101	BS	Advanced Mathematics	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objective

To introduce the students with the Fundamentals of the Advanced Mathematics

Course Outcomes

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

1. *Understand and apply the basics of the numerical and analytic techniques of solution PDE, various transforms which are fundamental of almost every subject of Electrical, Electronics and Telecommunication Engg.*
2. *Know the fundamental principles of the Modern probability theorems and Statistics, Stochastic or Random Processes, Fuzzy set and logic, Matab programming.*
3. *Apply the approaches of Reliability engineering, Decision theory and Goal programming which play significant role in the subjects of modern engineering and Technology.*

Course Content:

UNIT – I

Partial Differential Equations and various Transforms:

Solution of PDE by separation of variable method, Numerical solution of PDE using finite difference method, Elementary properties of FT, DFT, Wavelet transform, WFT, Haar transform.

UNIT – II

Probability & Statistics:

Probability, Compound probability, Discrete Random variable, Binomial and Poisson distribution, Continuous Random variable, Normal distribution, Sampling distribution, Theory of hypothesis.

UNIT – III

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Stochastic or Random Process:
Introduction of Random or Stochastic processes, Markov Processes, Markov chain, Queuing theory: $M/M/1:\infty/FCFS, M/M/N:\infty/FCFS$.

UNIT – IV
Fuzzy Set and Theorems:
Fuzzy set, Fuzzy relation, Fuzzy arithmetic, Fuzzy logic, Introduction of MATLAB, MATLAB Programming, functions and applications.

UNIT – V
Reliability:
Introduction of Reliability, derivation of reliability functions, Failure rate, mean time to failure and applications, Decision theory, Goal programming.

Texts:

1. B. S. Grewal, "Higher Engg. Mathematics", Khanna Publishers, Delhi.

References:

1. Ervin Kreszig, "Advance Engineering Mathematics", John Wiley & Sons (Asia) Pvt. Ltd.
2. S. D. Sharma, Kedar Nath, Ram Nath, "Operation Research", Delhi.
3. Probability, Random variables & Random processes: Schaum's outlines.
4. J. Medhi, "Stochastic processes", New Age International Publishers
5. Gupta, Malik, "Calculus of finite differences and Numerica Analysis".
6. J. N. Sheddon, "Fourier Transform".
7. T. J. Ross, "Fuzzy logic in Engineering".
8. H. J. Zimmersoms, "Fuzzy set theory and its applications".
9. Pran Nath, "Statistics, Reliability and Decision making for Engineers", Tara Printing works.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTES101		Digital VLSI Design	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. Be able to use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnects.
2. Be able to create models of moderately sized CMOS circuits that realize specified digital functions.
3. Be able to apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
4. Have an understanding of the characteristics of CMOS circuit construction

Course Outcomes:

1. Be able to complete a significant VLSI design project having a set of objective criteria and design constraints.
2. To design static CMOS combinational and sequential logic at the transistor level, including mask layout.
3. Use different analysis and verification tools, implementation and synthesis methodologies and testability techniques that will enable them to design high performance and efficient digital systems.
4. Design digital systems for a variety of applications, including microcomputers and special purpose computing systems

Syllabus:

UNIT I

Fundamental of MOS Transistor its Characteristic under Static and Dynamic Conditions, MOS Transistor Secondary Effects, Process Variations, Technology Scaling, CMOS Inverter -Static Characteristic, Transient response, Logical effort and Power Dissipation.

UNIT II

Stick diagram, Layout diagrams, Combinational logic design examples, Complementary logic, Pseudo NMOS logic, Pass Transistor Logic, Complementary Pass Transistor logic, Double Pass Transistor logic, Dynamic Logic and Domino logic

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UNIT III

Array Subsystems: SRAM, DRAM, ROM, Serial Address memories, Content addressable memories, Programmable logic arrays. Packaging, Cooling, Power distribution and Clocks.

UNIT IV

Structured design methodology: Hierarchy, Regularity, Modularity and Locality, Design methods: Microprocessor/DSP, SOG/GA, PLD, Platform based design, SOC, Design flows, Design economics. Data path Subsystem: Addition, Subtraction, Comparators, Counters.

UNIT V

CMOS Processing Technology, Single crystal Silicon growth, Wafer Formation, Photolithography, N-well process, Twin tub process, Stick Diagrams, layout design rules, CMOS process enhancements.

Text Books:

1. Neil H.E. Weste, David Money Harris, "CMOS VLSI Design, A circuits and systems perspective", IV Edition, Pearson, 2010.
2. Neil H.E. Weste, David Money Harris Ayan Banerjee, "CMOS VLSI Design, A circuits and systems perspective", III Edition, Pearson Education, 2004.
3. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata McGraw-Hill Education, 2002.
4. Peter Van Zant, "Microchip Fabrication, A Practical Guide to Semiconductor Processing", Sixth Edition, McGraw Hill Professional, 2013.

References:

1. Randall L. Geiger, Philip E. Allen, Noel R. Strader, "VLSI Design Techniques for analog and digital circuits", Tata McGraw Hill, 1989.
2. Sung Mo Kang, Yusuf Lebliabici, "CMOS Digital Integrated Circuits: Analysis and Design", IV Edition, Tata McGraw Hill, 2015.
3. Douglas A. Pucknell, Kamran Eshraghian, "Basic VLSI Design", III Edition, Prentice Hall, 1994.
4. S M Sze, VLSI Technology, II Edition, Tata McGraw-Hill Education, 2003.
5. Sorab Gandhi: "VLSI Fabrication Principles", Wiley India.

List of Experiments:

1. Introduction to layout EDA tools and Technologies.
2. Study of Stick Diagrams and Euler's Path.
3. Layout design of Resistors, Capacitors and MOSFETs.
4. Layout Design for Logic gates.
5. Layout Design for Half adder and Full adder.
6. Layout Design for Multiplexer.
7. Layout Design for Encoders and Decoders.
8. Layout Design for SRAM.
9. Layout Design for Flip Flops.
10. Layout Design for 4-Bit Multiplier.
11. Study of different packages and Bonding pads.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTES102	EC	Microcontrollers and Interfacing	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

The subject aims to provide the student with:

1. To understand the architecture of various 8-bit controllers.
2. To understand the concepts of various interfaces to the controller.
3. To obtain hands-on experience in programming microcontroller.

Course Outcomes:

The student will be able to

1. Understand the architecture of 8 bit controllers.
2. Design embedded system using 8 bit microcontroller

Syllabus:

UNIT I

INTEL 8051 microcontroller: Architecture of 8051, Memory Organization, Register banks, Bit addressing media, SFR area, addressing modes, Instruction set, Programming examples. 8051 Interrupt structure, Timer modules, Serial Features, Port structure, and Power saving modes.

UNIT II

Interrupts and communication Protocol: Interrupts in 8051, interrupt types, steps in interrupt processing, IE special function register , IP special function register, priority of interrupts, Serial I/O Devices, RS232 specifications, SPI and I2C communication protocols.

UNIT III

AVR microcontroller: Features and applications, Types, Architecture, Internal Architectural Block diagram of controller (Atmega 8). Functions of each pins of ATmega8, Addressing modes, Instruction set, Configuration of Timers and Counters.

UNIT IV

Configuration of AVR and Essential Peripheral circuits: Crystal Circuit, Power supply, Oscillator Circuit Initial programming configurations of Atmega8: port, counter, timer. Boot-Loader Circuit, ISP of Atmega 8 and Atmega328.

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UNIT IV

Microcontroller interfacing: Interfacing with LEDs, Seven Segment, Sensors, basic concepts and interfacing of LCD, ADC, DAC, Relays and External Memory Interface.

Text Books:

1. M.A. Mazidi & J.G. Mazidi, "The 8051 Micro Controller & Embedded Systems", Pearson Education. Asia (2000).
2. Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi, "AVR Microcontroller and Embedded Systems: Using Assembly and C", Pearson New International Edition.
3. Kenneth J. Ayala, " The 8051 Microcontroller", Thomson Delmar Learning, third edition, 2005

References:

1. "8-bit Embedded Controllers Handbook", INTEL Corporation 1990.
2. Jonathan W. Valvano, "Embedded Microcomputer systems, Real Time Interfacing", 3rd edition, Cengage learning, 2011.

List of Experiments:

Write a program using

1. Write a program using Data Transfer Instructions
2. Write a program using Arithmetic Instructions
3. Write a program using Logical Instructions
4. Write a program using Jump Instructions
5. Write a program using Loops for Delay
6. Write a program for LED interfacing
7. Write a program for RGB LED for Glowing Alternate patterns
8. Write a program to Display numbers and alphabets on 7 segment display
9. Write a program to generate waves with different duty cycles
10. Write a program to handle Interrupts.
11. Write a program for understanding communication protocols

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assess-ment*	END SEM University Exam	Teachers Assess-ment*				
MTES113		HDL Fundamentals	60	20	20	30	20	2	0	2	3

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:
The objective of this course is to-
1. Introduce basic concepts of hardware description language.
2. Describe FPGA implementation of digital systems.

Course Outcomes:
After completion of this course the students will be able to-
1. Describe digital hardware in terms of its structure or behavior using HDL.
2. Configure FPGA boards for specific design need.

UNIT I
Programmable Logic Devices and Computer Aided Design Tools
Introduction to design of digital hardware, Programmable Logic Devices- PAL, PLA, CPLD and FPGA.CAD Tools: Introduction, Design flow, Synthesis, RTL Synthesis, Overview of Synthesis Steps, Net List Generation, Gate Optimization, Technology Mapping, Simulation, Functional and Timing Simulation, Physical Design Steps- Placement , Routing and Static Timing Analysis.

UNIT II
Verilog HDL Basics
Introduction of HDL, Verilog, Top Down and Bottom Up design, Data Flow modeling , Structure and Behavioral Modeling, Verilog Basic Constructs, White space, Comments, Nets and Variables, Data Types, Identifiers, Signal Values, Numbers, Parameters.
Module and Ports- Module Declaration, List of Ports, Port Types, Port Declaration, Port Connection Rules.

UNIT III
Concurrent Statements
Verilog Operators: Arithmetic,Bitwise, Logical, Reduction, Relational,Shift,Conditional, Concatenate, Replication. Operator Precedence, Gate Instantiation, Signal Assignments, Continuous Assignment, Delays, Data Flow Modeling and Structure Modeling, Module Instantiation,Design of various Combinational Logic Circuits i.e. Adders, Multiplexers, Encoders and Decoders.

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UNIT IV

Procedural Statements

Always and Initial Block, Sensitivity List, Blocking and Non Blocking Assignments, If-else Statements,Case Statements, For Loop, While Loop, Repeat and Forever Loop, Generate statement, Verilog Function and Task, Finite State Machines- Melay and Moore Models, Behavioral Modeling of Various Combinational Circuits. Behavioral Modeling of Various Sequential Circuits- Latches and Flip Flops, Shift Registers and Counters, Mealy and Moore Machines.

UNIT V

Introduction to VHDL

Language Constructs, Modeling Style, Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators, Structural Description, Organization of the Structural Descriptions.

Text Books

1. Stephen Brown I Zvanko Vranesic "Fundamentals of Digital Logic with Verilog Design", The Mc Graw Hill, Third Edition 2014.
2. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL Design", McGraw-Hill Higher Education, 3rd edition, 2009.

References

1. Peter Wilson, "Design Recipes for FPGA using Verilog and VHDL", Newnes Publication, Second Edition 2016.
2. M. Morris Mano, Michael D. Cilletti, "Digital Design With An Introduction to The Verilog HDL", Pearson, Fifth Edition 2012.

List of experiments

Students should implement and verify digital systems through Verilog/VHDL. After synthesis and simulation the design should be implemented on FPGA board.

1. Design of Boolean functions using gate instantiation.
2. Design of various adders circuits.
3. Design of various multiplexers.
4. Design and analysis of Encoder and Decoders.
5. Design of various latches and flip flops with Preset and Clear capability.
6. Design of various Shift registers.
7. Design Johnson and Ring counters.
8. Design synchronous and asynchronous up/down counters.
9. Design of a frequency divider circuit.
10. Design of Digital System based on Mealy and Moore machine

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTES123		Robotics and Machine Vision	60	20	20	30	20	2	0	2	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives:
Students will be able to
1. Gain knowledge of Robotics and its applications.
2. Understand the working methodology of robotics and automation.
3. To understand the fundamentals of digital image processing

Course Outcomes:
On completion of course students will be able to
1. Understand Robotics, automation, robotics motion, sensors and control, machine vision, and roles of robots in industry
2. Understand the working methodology of motion and control and application of robots in industry.
3. Apply the image fundamentals and mathematical transforms for image processing.
4. Apply the image enhancement, compression, and restoration techniques.

Syllabus

UNIT I
Basic Concepts of Robotics, Classification and Structure of Robotic Systems, Architecture of Robotic systems, Law of Robotics, History and Terminology of Robotics, Speed of Robot, Robot joints and links, Robot classifications, Industrial Applications of Robots and Programming.

UNIT II
Accuracy and repeatability of Robotics, Simple problems Specifications of Robot, Robot Drive systems, Principles of Machine Vision, Vision and factory automation, Human Vision Vs. Machine Vision, Economic Considerations, Machine Vision: System Overview .

UNIT III
Image acquisition, Illumination, Image formation and Focusing, Image Detection-Introduction, Types of Cameras; Image Processing and Presentation, Discretization, Neighbours of a pixel, connectivity, Distance measures, preprocessing, Neighbourhood averaging.

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UNIT IV

Median filtering, smoothening of binary Images, Image Enhancement, Histogram Equalization, Histogram Specification, Local Enhancement, Edge detection, Gradient operator, Laplace operators, Thresholding, Morphological image processing

UNIT V

Case study-Automated Navigation guidance by vision system, Vision based depalletizing, line tracking, Automatic part Recognition, Image processing techniques implementation through Image Processing software MATLAB/OPENCV

Text books:

1. Mikell P. Groover, Mitchel Weiss, Roger N. Nagel, Nicholas G. Odrey and Ashish Dutta, "Industrial Robotics: Technology, Programming and Applications", 2 nd Edition, Tata McGraw Hill, 2012.
2. P.A. Janaki Raman, "Robotics and Image Processing an Introduction", Tata McGraw Hill Publishing company Ltd., 2003

References:

1. Roland Siegwart, Illah R. Nourbakhsh, an d Davide Scaramuzza, "Introduction to Autonomous Mobile Robots", 2 nd Edition, PHI, 2011
2. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, "Robotics Engineering an Integrated Approach", Phi Learning., 2009.

List of Experiments:

1. Study component of a real robot.
2. Program to filter an image using averaging low pass filter in spatial domain and median filter.
3. Program for an image enhancement using pixel operation.
4. Program for image enhancement using histogram equalization.
5. Program for morphological image operations-erosion, dilation, opening & closing.
6. Program for illustrating color image processing.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTDC203	EC	Advanced Communication Systems	60	20	20	30	20	2	0	2	3

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To develop a understanding of OFDM and MIMO systems.
2. To enable the students to differentiate between various type of receiver and fading characteristics.
3. To provide the knowledge of cognitive and cooperative systems.

Course Outcomes:

The student will be able to:

1. Analyze MIMO and OFDM systems and design systems with different fading channels.
2. Design various MIMO receivers.
3. Analyze and design cognitive and cooperative communication systems.

Syllabus:

UNIT I

Introduction, principle of OFDM, implementation of transceivers, frequency-selective channels, channel estimation, peak to average power ratio, inter carrier interference, adaptive modulation and capacity, multiple access, multi carrier code division multiple access, single carrier modulation with frequency-domain equalization.

UNIT II

MIMO systems: spatial multiplexing, System model, Pre-coding, Beam forming, transmitter diversity, receiver diversity, Channel state information, capacity in fading and non-fading channels.

UNIT III

Smart antennas, multiple input multiple output systems, multi user MIMO, MIMO System Model, Zero Forcing Receiver, MMSE receiver, Singular Value Decomposition of MIMO Channel, Asymptotic MIMO Capacity, Alamouti and Space-time codes.

UNIT IV

Cognitive Radios, Problem description, cognitive transceiver architecture, principle of interweaving, spectrum sensing, spectrum management, spectrum sharing, overlay, underlay.

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UNIT V

Introduction and motivation for Cooperative Communication, fundamentals of relaying, relaying with multiple parallel relays, routing and resource allocation in multi hop networks, routing and resource allocation in collaborative networks, applications, network coding.

Text Books:

1. Molisch, "Wireless Communications", Wiley India.
2. Aditya K. Jagannatham, "Prinicples of Modern Wireless Communication System", McGraw Hill.
3. Ramji Prasad and Richard Van Nee, "OFDM Wireless Multimedia Communication", Artech House.

References:

1. Proakis, "Digital Communication", McGraw Hill.
2. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd., 2001.
3. Marvin K. Simon, Mohamed-Slim Alouini, "Digital Communication over Fading Channels", 2nd Ed., Wiley-IEEE Press 2004.

List of Experiments:

1. To study Simulink and implement simulink model for different modulation techniques
2. To study BERTool
3. To implement orthogonal frequency division multiplexing
4. To implement water filling model in MIMO
5. Energy detection simulation for cognitive radio

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTDC101		Data Communication and Computer Networks	60	20	20	30	20	2	0	2	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Introduce the student to advanced networking concepts.

Course Outcomes:

After completing this course the students must demonstrate the knowledge and ability to:

1. Identify the different types of network topologies and protocols.
2. Enumerate the layers of the OSI model and TCP/IP.
3. Identify the different types of network devices and their functions within a network.
4. Understand the various routing mechanisms as well as design new routing algorithm.

Syllabus:

UNIT I

Network and its application, categories of network: LAN, MAN, WAN, Wireless Network, Internetwork, Reference models: OSI, TCP/IP model and their comparison. Line configuration: point to point, multicast, broadcast, Network Topologies: Mesh, Star, Tree, Bus, Ring, Hybrid. Physical Layer: Shannon's maximum data rate of a channel. Transmission media: Guided Media, Magnetic, Twisted Pair, Coaxial cable, Fibre optics. Wireless Media: Radiowave, Microwave, Infrared, RS-232 C and X.21 standards.

UNIT II

Framing techniques, Error detection-correction, Multiplexing-TDM, FDM, WDM; switching circuit, message, packet switching, Repeaters, Hubs, Bridges, switches, routers and gateways, Data link protocols, unrestricted simplex protocol, stop & wait, sliding window, Go-back n, selective repeat, data link layer in internet.

UNIT III

Channel allocation, Multiple access protocols – ALOHA, CSMA, CSMACD, collision-free protocol, Ethernet- frame format, cabling, encoding, performance, fast Ethernet, Gigabit Ethernet Broadband and wireless LAN, Bluetooth.

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UNIT IV

Connectionless & connection oriented service, comparison of virtual circuit and datagram subnet, Routing algorithms: shortest path, flooding, distance vector, hierarchical routing, congestion control and prevention, Quality of service, network layer in internet- IP protocol and IP address, IPv6, OSPF, BGP routing protocol.

UNIT V

Elements of Transport Protocol, Internet Transport Protocol-UDP / TCP protocol, performance issues -Network performance measurement, system design for better performance Domain name system, email, world wide web- architecture, HTTP.

Text Books:

1. Andrew S. Tannenbaum, "Computer Networks", 4th Ed., Pearson Education, 2003.
2. William Stallings, "Data and Computer Communications", 8th Ed., Prentice Hall India, 2007.

References:

1. Behrouz A. Forouzan, "Data Communications and networking", 4th Ed., Tata McGraw-Hill, 2000.

List of Experiments:

1. Implementation of Ring Topology using db9.
2. To plot efficiency of pure aloha and slotted aloha in Matlab.
3. To study different physical equipments used for networking.
4. To implement sliding window protocols.
5. To plot channel efficiency for Ethernet in Matlab.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTES114		Data Acquisition System	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives:

1. To know about the types of transducers and the function of Data Acquisition system.
2. To understand various signal conditioning methods.
3. To gain information about various types of filters and their working.
4. To learn about different conversions such as ADC and DAC.
5. To understand the concept of interfacing.

Course Outcomes:

The students will be able to

1. Summarize the working of various data acquisition and transmission systems.
2. Categorize different amplifiers and couplers.
3. Outline various filters by their operation and construction.
4. Classify various conversion methods and interfacing.

Syllabus

UNIT I

DAS Introduction: Data Acquisition Systems (DAS), Introduction, Objective, Block Diagram Description of DAS, General configurations, Single and multichannel DAS, Transducers for the measurement of motion, force, pressure, flow, level, dc and ac voltages and currents, Hall Effect Current Sensors, High Voltage Sensors , Optosensors, Rogowski Coil, Ampflex Sensors.

UNIT II

Signal conditioning: Requirements, Instrumentation amplifiers, Basic characteristics, Chopped and Modulated DC Amplifiers Isolation amplifiers, Opto couplers, Buffer amplifiers, Noise Reduction Techniques in Signal Conditioning, Transmitters, Optical Fiber Based Signal Transmission, Piezoelectric Couplers, and Intelligent transmitters.

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UNIT III

Filtering: First and second order filters, classification and types of filters, Low-pass, High-pass, Band-pass and Band-rejection and All Pass, Butterworth, Bessel, Chebyshev and Elliptic filters, Operational amplifier, RC Circuits for Second Order Sections, Design of Higher Order Filters using second order sections using Butterworth Approximation, Narrow Band pass and Notch Filters and their application in DAS,

UNIT IV

Signal Conversion and Transmission: Analog-to-Digital Converters (ADC), Conversion Processes, Speed, Quantization Errors, Successive Approximation ADC, Dual Slope ADC, Flash ADC, Digital-to-Analog Conversion (DAC) Techniques, Speed Conversion, Post Filtering, Weighted Resistor, R-2R, Weighted Current type of DACs, Multiplying Type DAC, Bipolar DACs,

UNIT V

Digital Signal Transmission and Interfacing: DAS Boards, Introduction, Study of a representative DAS Board-Interfacing Issues, I/O vs Memory Addressing, Software Drivers, Virtual Instruments, Bus standard for communication between instruments, GPIB (IEEE-488bus), RS232C USB, 4-to-20mA current loop serial communication systems, Communication via parallel port, Interrupt based Data Acquisition.

Text Books:

1. Murty D V S, "Transducers & Instrumentation", PHI, New Delhi (2016).
2. Ernest O Doeblin, "Measurement Systems: Application and Design", McGraw Hill (Int. edition) 1990.
3. George C. Barney, "Intelligent Instrumentation", Prentice Hall of India Pvt Ltd., New Delhi, 1988.
4. Ibrahim, K.E., "Instruments and Automatic Test Equipment", Longman Scientific & Technical Group Ltd., UK, 1988

References:

1. H S Kalsi, "Electronic Instrumentation", TMH, New Delhi (2012).
2. Patranabis, "Principles of Industrial Instrumentation", 3rd Ed., TMH (2009).
3. A. K Ray, "Advanced Microprocessors and Peripherals", Tata McGraw Hill, 1991.
4. Oliver Cage, "Electronic Measurements and Instrumentation", McGraw-Hill, (Int. edition) 1975.

List of Experiment:

1. To learn about basics of LabView and its HMI (Human Machine Interface).
2. To Study the Various Palettes Used in LabView to create virtual instruments.

3. To perform and Study of Creation of Virtual Instruments, (Creation of Random Wave Analyzer)
4. Implement Virtual Instrument (Random Wave Analyzer) & Control its Wave plot Speed by adding Time Delay.
5. Develop Virtual Instrument (Random Plot Analyzer) and also add a function that will calculate the mean values of Plot.
6. Design a HMI of PLC using LabView.
7. Develop HMI using LabView for Fahrenheit (°F) to Celsius (°C).
8. Design a table to create data logging.
9. Write a program for table of 2 using loop.
10. Design a HMI to display sine wave.

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Master of Technology (Embedded System)

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTES124	EC	Embedded System Designing using Raspberry pi	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To describe the basic functionality of Raspberry Pi B+ board.
2. To present the basics of the Python programming language to prepare students for programming on the Raspberry Pi.
3. To communicate with devices through the pins of the Raspberry Pi.

Course Outcomes (COs):

After completing this course, students will be able to:

1. Setup and operate the Raspberry Pi
2. Understand the basics of the Linux OS used on the Pi and the basics of the X Windows System (the GUI environment)
3. Program the Pi for different applications

Syllabus:

UNIT I

Introduction and familiarization with Raspberry Pi board

Introduction to Raspberry Pi board and installation, introduction to Linux, preparation of Boot SD card, configuration of Raspberry Pi and networking with host computer, interfacing with Raspberry Pi board, accessing GPIO pins.

UNIT II

Introduction: Need of Python Programming, Running Python Scripts, Variables, Assignment, Operators and Expressions: Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Expressions and order of evaluations.

UNIT III

Data Structures: Lists, Tuples, Sets, Dictionaries, Sequences. **Control Flow** - if, if-elseif-else, for, while, break, continue. **Functions** - Defining Functions, Calling Functions, Passing Arguments. **Modules**: Creating modules, import statement, from import statement, name spacing.

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Board of Studies

UNIT IV

Python packages, Introduction to PIR Installing Packages via PIR Using Python Packages Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data Hiding.

UNIT V

Python IDE for Raspberry Pi, Python expressions, functions and operations for controlling the pins of Raspberry Pi, File Handling: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data.

Text Books:

1. Adrian McEwen, Hakim Cassimally "Designing the Internet of Things", John Wiley & Sons, 2013
2. Wolfram Donat "Learn Raspberry Pi programming in python", Apress ,2014

References:

1. Richard Grimmett, "Raspberry Pi Robotics Essentials", Packet Publishing Ltd 2015

List of Experiments:

1. Understanding Python IDE and Raspberry Pi board.
2. Understanding Raspberry Pi Board Architecture.
3. Installing and configuring Raspbian OS on Raspberry Pi.
4. Blinking LED using Raspberry Pi.
5. Network configuration on Raspberry Pi.
6. Interfacing Sensor using Raspberry Pi.
7. Develop programs to understand the control structures of python.
8. Write a Python program to get a list, sorted in increasing order by the last element in each tuple from a given list of non-empty tuples: Sample List: [(2, 5), (1, 2), (4,4), (2,3), (2,1)] Expected Result: [(2, 1), (1, 2), (2, 3), (4, 4), (2, 5)]
9. Write a Program that Reads a Text File and Counts the Number of Times a Certain Letter Appears in the Text File.
10. Write a Program to find the most frequent words in a text read from a file.

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