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SEMESTER I

COURSE CODE	CATE GORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
MTMA101	EC	Advance Mathematics	60	20	20	0	0	3	1	-	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. 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.

Syllabus:

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

Stochastic or Random Process:

Introduction of Random or Stochastic processes, Markov Processes, Markov chain, Queuing theory: M/M/1: ∞ /FCFS, M/M/N: ∞ /FCFS.

UNIT IV

Fuzzy Set and Theorems:

Fuzzy set, Fuzzy relation, Fuzzy arithmetic, Fuzzy logic, Introduction of MATLAB, MATLAB

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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.

Text Books:

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

Reference Books:

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.s

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SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTES101	EC	Introduction to Embedded System	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 Objectives:-
The subject aims to provide the student with:
1. To understand the scientific principles and concepts behind embedded systems.
2. To familiarize the student with the architecture of embedded systems in general.
3. To learn the rationale and concepts for designing embedded systems.

Course Outcomes:- The students will have
1. an ability to apply knowledge of mathematics, science, and engineering
2. an ability to design and conduct experiments, as well as to analyze and interpret data
3. an ability to identify, formulate, and solve engineering problems
4. an ability to use the techniques, skills, and modern engineering tools

Syllabus

UNIT I
Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT II
Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Memory: ROM, RAM, Memory Shadowing, Memory selection for Embedded Systems

UNIT III

Study of various Sensors such as Light, Temperature, Weight, Gas sensor, Ultra Sonic, Light (LDR, Photo Diode), and Actuators such as Pneumatic, Hydraulic, Electric, Thermal, and communication interface like RS232, SPI, I2C, Ethernet.

UNIT IV

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches.

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UNIT V

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques.

TEXT BOOKS:

1. Shibu K.V, "Introduction to Embedded Systems", Mc Graw Hill.
2. Raj Kamal, "Embedded Systems", TMH.

REFERENCE BOOKS

1. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley.
2. Lyla, "Embedded Systems", Pearson, 2013
3. David E. Simon, "An Embedded Software Primer", Pearson Education.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTES102	EC	Microcontrollers & Interfacing	60	20	20	30	20	3	1	2	5

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. Implement 8 bit microcontroller based system design.

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

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 III

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

UNIT IV

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

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SEMESTER I

UNIT V

Interrupts: 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 I2Ccommunication protocols.

Case Studies: Design of Embedded Systems using 8051 microcontroller for applications in the areas of communication, automotive, and industrial control.

Text Books:

1. M.A. Mazadi & 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.

References Books:

1. 8-bit Embedded Controllers, INTEL Corporation 1990.
2. Jonathan W. Valvano, "Embedded Microcomputer systems, Real Time Interfacing", Brookes/Cole, Thomas learning, 1999.

List of Experiments:

Programs based on

1. Data Transfer
2. Arithmetic Instructions
3. Logical Instructions
4. Jump Instructions
5. Based on loops
6. LED interfacing
7. Glowing Alternate LED patterns
8. Display numbers and alphabets on 7 segment
9. Making a Counter
10. Generating waves with different duty cycles
11. Making a clock
12. To make an alarm
13. Interrupts
14. ADC and Serial Communication

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assess-ment*	END SEM University Exam	Teachers Assess-ment*				
MTES113	EC	HDL Fundamentals	60	20	20	30	20	3	1	2	5

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.

Reference Books
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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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTES123	EC	Data Acquisition & Signal Conditioning	60	20	20	30	20	3	1	2	5

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 and Sampling: Review of Sampling Theorem, Aliasing, Need for Pre-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, Sample and Hold Amplifiers.

UNIT IV

Signal Conversion and Transmission: Analog-to-Digital Converters (ADC), Multiplexers and demultiplexers, Digital multiplexer, A/D Conversion, 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, Data transmission systems, Schmitt Trigger, Pulse code formats, Modulation techniques and systems, Telemetry systems.

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, Modular Programming Techniques for Robust Systems, 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, Software Design Strategies, Hardware vs Software Interrupts, Foreground/background Programming Techniques, Limitations of Polling.

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

Reference Books:

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.

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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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SEMESTER I

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTDC202	EC	MODERN DIGITAL SIGNAL PROCESSING	60	20	20	30	20	3	1	2	5

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. Students are expected to demonstrate the ability to design FIR and IIR filters by hand to meet specific magnitude and phase requirements.
2. Perform Z and inverse Z transforms using the definitions, Tables of Standard Transforms and Properties, and Partial Fraction Expansion.
3. Determine if a DT system is linear, time-invariant, causal, and memoryless, determine asymptotic, marginal and BIBO stability of systems given in frequency domain.

Course Outcomes:

1. Students will be able to design and implement digital filters by hand and by using MATLAB.
2. Use computers and MATLAB to create, analyze and process signals, and to simulate and analyze systems sound and image synthesis and analysis.
3. To plot and interpret magnitude and phase of LTI system frequency responses.

Syllabus:

UNIT I

Introduction: DSP and Discrete Fourier transforms: Properties of the DFT Decimation in time and decimation in frequency FFT algorithms, discrete cosine transform. Linear filtering methods based on the DFT.

UNIT II

Design of digital filters: IIR Filter design: Butterworth design, Bilinear Transformation. Low Pass, High Pass, Band Pass and Band Stop digital filters. Spectral transformation of IIR filters.
FIR filter design: Symmetric and Antisymmetric linear phase. FIR filter by rectangular, triangular and Hamming window functions.

UNIT III

Finite word length effects in FIR and IIR digital filters: Quantization, round off errors and overflow errors.
Multi rate digital signal processing: Concepts, design of practical sampling rate converters, Decimators, Interpolators, Polyphase decompositions. Applications of Multirate signal processing, Digital filter banks, two channel quadrature mirror filter banks, M-channel QMF bank.

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SEMESTER I

UNIT IV

Adaptive filter: Applications of Adaptive filters, Adaptive direct form FIR filters, The LMS algorithm, Adaptive direct form filters, RLS algorithm.

UNIT V

Wavelet Transform: Introduction to Wavelets, wavelets and wavelet expansion systems, Discrete Wavelet Transform, multi resolution formulation of wavelet systems, Haar Wavelet and other wavelet representations, scaling function, wavelet functions.

Text Books:

1. John. G Proakis & D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms and Application", 4th Edition, Pearson Education.
2. S. K. Mitra, "Digital Signal Processing: A Computer Based Approach", 3rd Edition, TMH.
3. S.Salivahanan, A Vallavaraj & C.Gnanapriya, "Digital Signal Processing", TMH.
4. A.V. Oppenheim & R.W. Schaffer, "Digital Signal Processing", PHI.

Reference Books:

1. L. R. Rabiner & B. Gold, "Theory & application of Digital Signal Processing", PHI.
2. E.C. Ifeachor & B. W. Jarvis, " Digital Signal Processing: A Practitioner's approach", 2nd Edition, Pearson Education.
3. Thomas J. Cavicchi, "Digital Signal Processing", John Wiley & Sons.
4. Chi Tsong Chen, "Digital Signal Processing", Oxford.
5. Engelberg, Shlomo, "Digital Signal Processing", Springer.
6. D Antona & Gabriele, "Digital Signal Processing For Measurement", New Age International.
7. Robert. O. Cristi, "Modern Digital Signal Processing", Cengage Publishers.
8. Proakis, Rade & Ling, "Advanced DSP", Macmillan Publication.

List of Experiments:

1. Generation of basic signals with Proper Indexing.
2. Determine the Discrete Fourier Transform of the given sequence.
3. Determine circular convolution of given sequences.
4. Determine the DIT-FFT of the given sequence.
5. Design of frequency selective IIR filters.
6. Design of frequency selective FIR filters.
7. Implementation of up-sampling and down-sampling.
8. Implementation of LMS Algorithm.
9. Implementation of RLS Algorithm.
10. Implementation of Wavelet Transform for different applications.

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			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTES114	EC	Wireless Sensor Networks	60	20	20	30	20	3	1	2	5

Legends: **Th** - 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:
Wireless sensor networks are becoming an important application of embedded systems, giving scope for unique designs and applications. This course is aimed at imparting knowledge on wireless sensor networks and practical implementation.

Course Outcomes:
After the completion of this course, the student should be able to:
1. To understand the concepts of sensor networks.
2. To learn implementation issues and techniques wireless sensor nodes.

Syllabus

UNIT I
Basics of WSN: Introduction to WSN, Challenges for WSNs, Characteristic requirements, Required mechanisms, Sensor network scenarios- Optimization goals and figures of merit- Design principles for WSNs, Service interfaces of WSNs- Gateway concepts.

UNIT II
Node architecture: Sensor Node Technology, sensing subsystem, processor subsystem- architectural overview, communication interfaces. Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints. Energy consumption of sensor nodes, Operating systems and execution environments, Some examples of sensor nodes.

UNIT III
Deployment and Configuration: Localization and positioning, Coverage and connectivity, Single-hop and multihop localization, self configuring localization systems, sensor management, ranging techniques. Sensor Network Implementation: Sensor Programming: Introduction to TinyOS Programming, fundamentals of Programming sensors using nesC, Algorithms for WSN, Techniques for Protocol Programming.

UNIT IV
Architecture of WSN: An Introduction to the Concept of Cooperating Objects and Sensor Networks-System Architectures and Programming Models.

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SEMESTER I

UNIT V

Applications of WSN: Wireless sensor networks for environmental monitoring, Wireless sensor networks with mobile nodes, Autonomous robotic teams for surveillance and monitoring, Inter-vehicle communication networks.

Text Books:

1. Holger Kerl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Network", John Wiley and Sons, 2005 (ISBN: 978-0-470-09511-9).
2. Michel Banâtre, Pedro José Marrón, Anibal Ollero, Adam Wolisz, "Cooperating Embedded Systems and Wireless Sensor Networks", John Wiley & Sons, Inc .2008.
3. Seetharaman Iyengar, Nandhan, "Fundamentals of Sensor Network Programming Applications and Technology", John Wiley & Sons, Inc.2008.

References Books:

1. Raghavendra, Cauligi S, Sivalingam, Krishna M., Zanti Taieb, "Wireless Sensor Network", Springer 1st Ed. 2004 (ISBN: 978-4020-7883-5).
2. Feng Zhao, Leonidas Guibas, " Wireless Sensor Network",Elsevier, 1st Ed. 2004 (ISBN: 13- 978-1-55860-914-3).
3. B. Krishnamachari, "Networking Wireless Sensors", Cambridge University Press.
4. N. P. Mahalik, "Sensor Networks and Configuration: Fundamentals, Standards, Platforms, and Applications" Springer Verlag.
5. Kazem, Sohraby, Daniel Minoli, Taieb Zanti, "Wireless Sensor Network: Technology, Protocols and Application", John Wiley and Sons 1st Ed., 2007 (ISBN: 978-0-471-74300-2).
6. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory & Practice", John Wiley and Sons, (ISBN: 978-81-265-5125-5).

List of Experiments:

1. Study of various open source network simulator tools.
2. Study of the Network Simulator tool selected and learning its installation process.
3. Study of GUI for the packet transmission between different nodes.
4. Study of various routing protocols/algorithms available for wireless sensor networks.
5. Simulating the simple routing protocols/algorithm for transmitting packet between two nodes.
6. Simulating the Flooding routing protocol.
7. Simulating the Directed Diffusion routing protocol.
8. Comparing the above two protocols based on different quality of service parameters (QoS) w.r.t to network area and network size.

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Shri Vaishnav Vidyapeeth Vishwavidyalaya

Master of Technology (Embedded System)

SEMESTER I

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*	Th	T	P	CREDITS
MTDC105	EC	LINUX & C Programming	0	0	0	30	20	0	0	2	1

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 basic set of commands and utilities in Linux system.
2. Familiarize the student with the operating system of choice for computationally-intensive data analysis.
3. Introduce the student to the Linux computing environment.
4. To learn the C language and get experience programming in C.

Course Outcomes:

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

1. Understand the basic set of commands and utilities in Linux system.
2. Develop software for Linux system.
3. Design extensive programmes in C.
4. Implement the important Linux library function and system calls.

List of Experiments:

1. Experiments regarding Linux:
   a. Installation of Unix/Linux operating system.
   b. Study of logging/logout details.
   c. Study of Unix/Linux general purpose utility command list obtained from (man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown) commands.
   d. Study of vi editor. (http://www.tutorialspoint.com/unix/pdf/unix-vi-editor.pdf).
   e. Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
   f. Study of Unix/Linux file system (tree structure).
   g. Study of .bashrc, /etc/bashrc and Environment variables.
2. Write a C program to check the given integer is prime or not.
3. Write a C program to display Largest of three numbers.
4. Program to accept a number and print if it is positive or negative.

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5. Find smallest number in series of 10 numbers.
6. Accept a digit between 0 to 9 and print it in words.
7. Program to accept length and breadth of a rectangle and print its area.
8. Installation of VirtualBox (VMWare) on a PC having other operating system.
9. Installation of Cygwin on a PC having other operating system.
10. Installation of NS2 on a PC having Unix/Linux operating system.

Text Books:

1. David Haskins, "C Programming in Linux".

Reference Books:

1. Jasper Nuyens, "Linux C Programming: Fun and Powerful", Create Space Independent Publishing Platform.
2. Beginning Linux Programming 4th Edition, N.Matthew,R.Stones, Wrox, Wily India Edition.
3. N. B. Venkateswarly, "Introduction to Linux: Installation and Programming", B.S. Publications (2006)

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