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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*				
MTMA 101		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.

Syllabus

Unit-I

Solution of Partial Differential Equation (PDE) by separation of variable method, numerical solution of PDE (Laplace, Poisson's, Parabola) using finite difference methods, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.

Unit-II

Probability, compound probability and discrete random variable. Binomial, Normal, Poisson's distribution. Sampling distribution, elementary concept of estimation and theory of hypothesis, recurred relations.

Unit-III

Stochastic process, Markov process transition probability transition probability matrix, just and higher order Markov process, Markov chain. Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/ Infinity/ FC FS), (M/M/1: N/ Infinity/ FC FS), (M/M/S: Infinity/ Infinity/ FC FS).

Unit-IV

Operations of fuzzy sets, fuzzy arithmetic & relations, fuzzy relation equations, fuzzy logics. MATLAB introduction, programming in MATLAB scripts, functions and their application.

Unit-V

Introduction and definition of reliability, derivation of reliability functions, Failure rate, Hazard rate, mean time t future & their relations, concepts of fault tolerant analysis, Elementary idea about decision theory and goal programming.

References

1. *B.V. Ramana, Higher Engineering Mathematics by Tata Mc Hill.*
2. *Ervin Kreszig, Advance Engineering Mathematics by Wiley Easten Edd.*
3. *Steven C chapra, Applied Numerical Methods with MATLAB by Tata Mc Graw Hill.*
4. *S.S. Shastry, Introductory Methods of Numerical Analysis*

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5. *Forberg, Introduction of Numerical Analysis*
6. *M. K. Jain, Numerical Solution of Differential Equation*
7. *James B. Scarborogh, Numerical Mathematical Analysis*
8. *J. N. Sheddon, Fourier Transforms*
9. *T. J. Ross, Fuzzy Logic in Engineering*
10. *H. J. Zimmersoms, Fuzzy Sets Theory & its Applications*

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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*				
MTDI101		Digital Integrated Circuit Design	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 Educational Objectives (CEOs):

1. To study the CMOS based Inverter logic.
2. To be able to analyze various parameters related to NMOS Logic Design.
3. To be able to Realize the Boolean Expression in terms of NMOS Logic.
4. To be able to Design various NMOS digital Combinational & sequential logic Design.
5. To be able to Organize various Semiconductor Memories.

Course Outcomes (COs):
After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes
The students will be able to

1. Analyze the NMOS logic digital design.
2. Realize the NMOS logic digital design.
3. Design NMOS Logic.
4. Design NMOS Combinational & Sequential Logic Circuits.
5. Organize, Analyze and Design Semiconductor Memories.

Syllabus

Unit-I

MOS Design: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

Unit-II

Combinational MOS Logic Circuits: MOS logic circuits with NMOS loads, Primitive CMOS logic gates-NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, De-signing with Transmission gates.

Unit-III

Sequential MOS Logic Circuits: Behavior of Bistable elements, SR Latch, Clocked latch and flip-flop circuits, CMOS D latch and edge triggered flip-flop.

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Unit-IV

Dynamic Logic Circuits: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

Unit-V

Semiconductor Memories: Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

References

1. Ken Martin, Digital Integrated Circuit Design –Oxford University Press, 2011.
2. Sung-Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits Analysis and Design – TMH, 3rd Ed., 2011.

List of experiments.

1. Design all gates using VHDL.
2. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. Half adder b. Full adder
3. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. Multiplexer b. Demultiplexer
4. Write VHDL program for encoder and check the wave forms and the hardware generated.
5. Write a VHDL program for a Down counter and check the wave forms and the hardware generated.
6. Write a VHDL program for a BCD to GRAY code converter and check the wave forms and the hardware generated.
7. Implement Half Adder using FPGA & CPLD.
8. Implement Full Adder using FPGA & CPLD.
9. Implement Delay Flip flop using FPGA & CPLD.

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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*				
MTDI 102		Industrial & Process Instrumentation	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 Educational Objectives (CEOs):
Expose students to the advanced control methods used in industries and research. This course prepares the student to take up such challenges in his profession.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

1. Student will be able to desirable dynamics of various processes.
2. Student will be able to learn and analyze the effect of various controllers tuning.
3. Student will be able to impart knowledge on the final control elements.
4. Student will be able to know evaluation criteria and tuning techniques of controllers.
5. Student will be able to understand and explain the concept of multi loop control techniques.

Syllabus

Unit-I

Process Dynamics

Introduction to process control, Need for process control & classification of process variables - Degrees of freedom, Elements of Process Dynamics, Types of processes- Dead time, Single & multi capacity, self-Regulating, non self regulating, Interacting, non-interacting, Linear/non linear, and Selection of control action for them. Study of Liquid Processes, Gas Processes, Flow Processes, Thermal Processes in respect to above concepts.

Unit-II

Analysis of control Loop

Steady state gain, Process gain, Valve gain, Process time constant, Variable time Constant, Transmitter gain, Linearising a equal percentage valve, Variable pressure drop.
Analysis of Flow Control, Pressure Control, Liquid level Control, Temperature control, SLPC-features, faceplate, functions, MLPC- features, faceplate, functions, SLPC and MLPC comparison. Scaling: types of scaling, examples of scaling.

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Unit-III

Feeddback Control

Basic principles, Elements of the feedback Loop, Block Diagram, Control Performance Measures for Common Input Changes, Selection of Variables for Control Approach to Process Control. Factors in Controller Tuning, Determining Tuning Constants for Good Control Performance, Correlations for tuning Constants, Fine Tuning of the controller tuning Constants. The performance of feedback Systems, Practical Application of Feedback Control: Equipment Specification, Input Processing, Feedback Control Algorithm, Output Processing.

Unit-IV

Controller Tuning

Evaluation criteria, IAE, ISE,ITAE and ¼ decay ratio, Tuning:-Process reaction curve method, Continuous cycling method and Damped oscillation method, Determination of optimum settings for mathematically described processes using time response and frequency response approaches, Auto tuning.

Unit-V

Multi loop Control

Feed-forward control, Ratio control, Cascade control, selective control, override control, Auctioneering control , plant wide control ,Split range and introduction to multi variable control, Examples from distillation column and boiler systems, IMC (Integral Model Controller), Model Predictive Control, P&ID diagram.

References

1. *C.D. Johnson, "Process control Instrumentation Technology"Prentice Hall Inc.,2007.*
2. *Bella G. Liptak,"Process control and Optimization", Instrument Engineers Handbook, volume 2,CRC Press and ISA,2005*
3. *D.R.Coughanowr,, "Process system analysis and control",Mcgraw-Hill International, Edition 2004.*
4. *D.P. Eckman,"Automatic Process control"John Willey, 7th Edition, NewYork1990.*
5. *D.M Consedine," Process Instruments and control Handbook", Second Edition, Mcgraw,1999.*
6. *D.E. Seborg, T.F. Edger, and D.A. Millichamp, 'Process Dynamics and Control', John Wiley and Sons, 2nd Edition, 2004.*
7. *B.W. Bequette, 'Process Control: Modeling, Design and Simulation', PHI, 2006.*

List of experiments.

1. To Study Pressure to Current & Current to Pressure conversion through Trainer kit.
2. To Study of Process Control Training Plant and Compact Flow Control Unit.
3. To Study Different Pneumatic Valves & Pneumatic Actuator and their working using Advanced Pneumatic Trainer.
4. To Design of ON/OFF Controller for the Temperature Process.
5. To perform of Water Level control on process control trainer plant.
6. To study and analysis of PID controllers.
7. To Study the working of LSM Controller over Conveyor and X-Y Position Table.

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8. To perform and analysis Different Hydraulic and Pneumatic operation on Hsimulators & Psimulators.
9. To perform operation on Pneumatic double acting and single acting cylinder using ABB PLC programming kit.
10. Design and Implementation of Multi loop PI Controller on the Three tank system.
11. Analysis of Multi input -Multi output system.(Four Tank Systems)
12. To study and analysis of auto tuning of PID controllers in process control plant.

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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*				
MTDI 111		Wireless Sensor and Network	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 Educational Objectives (CEOs):

1. Understanding of ad hoc networks, design and implementation issues, and available solutions.
2. Knowledge of the 802.15. This includes their designs, operations, plus approaches to interoperability.
3. Use of sensor networks and their characteristics. This includes design of MAC layer protocols, understanding of power management, query processing, and sensor databases.
4. Hands-on experience in designing and implementing ad hoc network functionality using network simulation tools.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

Student will be able to

1. Demonstrate the principles and characteristics of wireless sensor networks (WSNs).
2. Use proactive and reactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
3. Apply hybrid routing protocols function and their ability to balance speed and bandwidth consumption.
4. Solve the issue of broadcast storms and flooding, and how some techniques attempt to reduce them.
5. Demonstrate the limitations of wireless sensor networks and the workarounds needed to develop real-life applications.

Syllabus

Unit-I

Characteristics of WSN:

Characteristic requirements for WSN - Challenges for WSNs – WSN vs Adhoc Networks - Sensor node architecture – Commercially available sensor nodes –Imote, IRIS, Mica Mote, EYES nodes, BTnodes, TelosB, Sunspot -Physical layer and transceiver design considerations in WSNs, Energy usage profile, Choice of modulation scheme, Dynamic modulation scaling, Antenna considerations.

Unit-II

Medium Access Control Protocols:

Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts - Contention- based protocols - Schedule-based protocols - SMAC - BMAC - Traffic-adaptive medium access protocol

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(TRAMA) - The IEEE 802.15.4 MAC protocol.

Unit-III

Routing and Data Gathering Protocols:

Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping – Data centric Routing – SPIN – Directed Diffusion – Energy aware routing - Gradient-based routing - Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS – Location Based Routing – GF, GAF, GEAR, GPSR – Real Time routing Protocols – TEEN, APTEEN, SPEED, RAP - Data aggregation - data aggregation operations - Aggregate Queries in Sensor Networks - Aggregation Techniques – TAG, Tiny DB.

Unit-IV

Embedded Operating Systems:

Operating Systems for Wireless Sensor Networks – Introduction - Operating System Design Issues - Examples of Operating Systems – TinyOS – Mate – MagnetOS – MANTIS - OSPM - EYES OS – SenOS – EMERALDS – PicOS – Introduction to Tiny OS – NesC – Interfaces and Modules-Configurations and Wiring - Generic Components -Programming in Tiny OS using NesC, Emulator TOSSIM.

Unit-V

Applications of WSN:

WSN Applications - Home Control - Building Automation - Industrial Automation – Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications - Wildfire Instrumentation-Habitat Monitoring Nanoscopic Sensor Applications.

Case Study:

IEEE 802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling.

References

1. *Kazem Sohraby, Daniel Minoli and Taieb Znati, " Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley & Sons, 2007.*
2. *Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Ltd, 2005.*
3. *K. Akkaya and M. Younis, "A survey of routing protocols in wireless sensor networks", Elsevier Ad Hoc Network Journal, Vol. 3, no. 3, pp. 325—349*
4. *Philip Levis, " TinyOS Programming"*
5. *Anna Ha c, "Wireless Sensor Network Designs", John Wiley & Sons Ltd,*

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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*				
MTDI 112		Advanced logic design	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 Educational Objectives (CEOs):

To Develop and apply the skill of logic design using latest tools and technology

Course Outcomes (COs):

1. Student will be able to study the basics of logic design.
2. Student will be able to apply and develop the research work, about the design methods.
3. Student will be able to have problem solving techniques for controlling logical system.
4. Student will be able to take awareness of latest technologies and developments.
5. Student will be able to test the logical system.

Syllabus

UNIT –I

Number systems & codes, Binary arithmetic, Boolean algebra and switching function. Minimization of switching function, Concept of prime implicant, Karnaugh map method, Quine & McCluskey's Method, Cases with don't care terms, Multiple output switching function.
Introduction to logic gates, Universal gate, Half adder, Half subtractor, Full adder, Full subtractor circuits, Series & parallel addition, BCD adders, Look-ahead carry generator.

UNIT- II

Strategy for minimization, Incompletely specified functions, Multiple output circuits, Multilevel synthesis & Analysis Building Block of combinational circuits, Multiplexers Decoders, Encoders Code Converters, sequential circuits: flip-flop,registers counters.

UNIT- III

Linear wave shaping circuits, Bistable, Monostable & Astable multivibrator, Schmitt trigger circuits & Schmitt-Nand gates. Logic families: RTL, DTL, All types of TTL circuits, ECL, I2L, PMOS, NMOS & CMOS logic, Gated flip-flops and gated multivibrator, interfacing between TTL to MOS.

UNIT – IV

Introduction of Analog to Digital & Digital to Analog converters, sample & hold circuits and V-F converters.

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UNIT V

Subsystem Design: Data-paths; adder, Shift registers ALU, Semiconductor memories: Organization and construction of RAM, SRAM, DRAM, RAMBUS ROM, PROM, EPROM, EEPROM, PAL and PLAs.

Book:

Introduction to Logic Design – MARCOVITZ – (Text)

References:

References:

1. *M. Mano : Digital Logic and Computer Design, Pearson Education*
2. *W.H. Gothman : Digital Electronics, PHI.*
3. *Millman and Taub : Pulse, Digital and Switching Waveforms, MGH*
4. *Salivahanan and Ari Vahagan : Digital Circuits and Design, Vikas Publishing House*
5. *Leach and Malvino : Digital Principles and Applications, TMH*
6. *Rajkamal : Digital Systems – Priciples and Design, 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*				
MTDI 113		Artificial Intelligence and Robotics	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 Educational Objectives (CEOs):

1. To study about the Basic Concepts of Artificial Intelligence.
2. To study about the Basic Concepts of Robotics.
3. To Analyze various problem solving Techniques used in Artificial Intelligence.
4. To Study about the task planning.
5. To study about the Direct Kinematics & Inverse Kinematics.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

Student will be able to

6. Study the basics of logic design.
7. To understand the Basic Concepts of Artificial Intelligence.
8. To understand the Basic Concepts of Robotics.
9. To Analyze various problem solving Techniques used in Artificial Intelligence.
10. To Analyze the task planning.
11. To understand Direct Kinematics & Inverse Kinematics.

Syllabus

Unit-I

Intelligent Robotics:

Automation and Robots, Robot Classification, Robot Specifications, Sensory perception, Robot control and Intelligence

Unit-II

Basic Concepts of Artificial Intelligence:

Intelligence, Problem representation in Artificial Intelligence, Problem-solution Techniques used in Artificial Intelligence. Elements of Knowledge Representation: Logic, Production Systems, Semantic Networks, Expert Systems.

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Unit-III
Task Planning:

Task-Level Programming, Uncertainty, Configuration Space, Gross-Motion Planning, Grasp Planning, Fine-Motion Planning, Task Planning Problem. Applications in Biomedical Engineering: Application in rehabilitation, Clinical and Surgery.

Unit-IV
Direct Kinematics:

Coordinate Frames, Rotations, Homogeneous Coordinates, The arm Equation, (DK analysis of - 2 Axis and 3 Axis Planar robot, Four axis SCARA Robot, Five axis Articulated robot).

Unit-V
Inverse Kinematics:

General Properties of Solutions, Tool Configuration, (IK analysis of - 2 Axis and 3 Axis Planar robot, Four axis SCARA Robot, Five axis Articulated robot).

References

1. *Staughard; Robotics and AI - Prentice Hall of India.*
2. *Robert Schilling ;Fundamentals of Robotics-Analysis and control- - Prentice Hall of India.*
3. *J.J,Craig ;Introduction to Robotics -- Pearson Education*
4. *Rich & Knight ; Artificial Intellegence*

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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*				
MTDI 114		Digital Image Processing	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 Educational Objectives (CEOs):
To introduce the student to various image processing techniques.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

Student will be able

12. To study the image fundamentals and mathematical transforms necessary for image processing.
13. To study the image enhancement techniques.
14. To study image restoration procedures.
15. To study the image compression procedures.
16. To study the image segmentation and representation techniques.

Syllabus
Unit-I
Digital image fundamentals
Introduction: Digital Image- Steps of Digital Image Processing Systems-Elements of Visual Perception -Connectivity and Relations between Pixels. Simple Operations- Arithmetic, Logical, Geometric Operations.Mathematical Preliminaries - 2D Linear Space Invariant Systems - 2D Convolution - Correlation 2D Random Sequence - 2D Spectrum

Unit-II
Image transforms and enhancement
Image Transforms: 2D Orthogonal and Unitary Transforms-Properties and Examples. 2D DFT- FFT – DCT -Hadamard Transform - Haar Transform - Slant Transform - KL Transform -Properties And Examples.Image Enhancement:- Histogram Equalization Technique- Point Processing-Spatial Filtering-In Space And Frequency -Nonlinear Filtering-Use Of Different Masks.

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Unit-III

Image restoration and construction

Image Restoration: Image Observation And Degradation Model, Circulant And Block Circulant Matrices and Its Application In Degradation Model - Algebraic Approach to Restoration- Inverse By Wiener Filtering – Generalized Inverse-SVD And Interactive Methods - Blind Deconvolution-Image Reconstruction From Projections.

Unit-IV

Image compression & segmentation

Image Compression: Redundancy And Compression Models -Loss Less And Lossy. Loss Less-Variable-Length, Huffman, Arithmetic Coding - Bit-Plane Coding, Loss Less Predictive Coding, Lossy Transform (DCT) Based Coding, JPEG Standard - Sub Band Coding.

Image Segmentation: Edge Detection - Line Detection - Curve Detection - Edge Linking And Boundary Extraction, Boundary Representation, Region Representation And Segmentation, Morphology-Dilation, Erosion, Opening And Closing. Hit And Miss Algorithms Feature Analysis

Unit-V

Color and multispectral image processing

Color Image-Processing Fundamentals, RGB Models, HSI Models, Relationship Between Different Models. Multispectral Image Analysis - Color Image Processing Three Dimensional Image Processing-Computerized Axial Tomography-Stereometry-Stereoscopic Image Display-Shaded Surface Display.

References

6. *Kenneth R Castleman ;Digital Image Processing, , Pearson Education,1995.*
7. *S. Jayaraman, S. Esakkirajan; T. Veerakumar, Digital Image Procesing, McGraw Hill Education ,2009. Pvt Ltd, NewDelhi.*
8. *, Anil Jain.K; Fundamentals of Digital image Processing, Prentice Hall of India, 1989.*
9. *Sid Ahmed ;Image Processing, , McGraw Hill, New York, 1995.*

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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*				
MTDI 121		Industrial Standards	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 Educational Objectives (CEOs):

1. To understand the basic need of industrial engineering.
2. To understand the basic standards for working in an industry.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

10. Student will be able to analyses industrial issues.
11. Student will be able to work in industrial environment effectively.
12. Student will be aware of all the industrial standards for quality control.
13. Student will able to work for customer satisfaction by improving product quality using all standards.

Syllabus

Unit-I

Industrial Engineering: Evolution of Industrial engineering, industrial engineering functions, role of industrial engineer, qualities of successful industrial engineers.

Unit-II

Attributes of quality, Evolution of philosophy of Quality Management, Economics of quality and measurement of cost of quality, Data presentation techniques for quality analysis, Statistical process control, Use of control charts and process engineering techniques for implementing quality plan, Machine and process capability analysis, statistical tolerance analysis.

Unit-III

Statistical process control, Use of control charts and process engineering techniques for implementing quality plan, Machine and process capability analysis, statistical tolerance analysis, Acceptance sampling: Single, double and multiplesampling plans, Acceptance sampling for variables.

Unit-IV

Total quality management principles: customer relations and customer satisfaction, customer perception of quality, customer complaints and redressal, product satisfaction index.

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Unit-V

Fundamentals of TQM: Customer orientation, Continuous improvement, Total participation; Some important philosophies and their impact on quality (Deming, Juran, Crosby), QC Tools, Components of Total Quality System (TQS), Quality audit, Introduction to ISO 9000 and 14000 standard.

References

1. *Mitra A, Fundamental of Quality Control and Improvement, PHI*
2. *Juran J M and Gryna F M, ;Quality Planning and AnalysisTata McGraw Hill*
3. *Grant Eugere, Heaven worth: structural quality control, seventh eddition,- McGraw Hill pub.*
4. *Juran J.M., Gryna, Jr. Fran, M. 3rd Edition, quality planning and analysis;- McgRAW Hill*
5. *Feignbaum A. V. ;Total quality control reward, McGraw hill Pub, 1991*

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Master of Technology in Digital Instrumentation

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*				
MTDI 122		Advanced Digital signal Processing	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 Educational Objectives (CEOs):

The purpose of this course is to provide in-depth treatment on methods and techniques in discrete-time signal transforms, digital filter design, optimal filtering, power spectrum estimation, multi-rate digital, signal processing, DSP architectures, which are of importance in the areas of signal processing, control and communications.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

Student will be able to

1. Have a more thorough understanding of the relationship between time and frequency domain interpretations and implementations of signal processing algorithms
2. Understand and be able to implement adaptive signal processing algorithms based on second order statistics
3. Be familiar with some of the most important advanced signal processing techniques, including multi-rate processing and time-frequency analysis techniques.
4. Understand the processes of analog-to-digital and digital-to-analog conversion.
5. Understand the implementation of the DFT in terms of the FFT, as well as some of its applications (computation of convolution sums, spectral analysis.
6. Demonstrate the effect of the time window length on the achievable spectral resolution.

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Syllabus

Unit-I

Introduction

Signal Processing; What is DSP?; Advantages and disadvantages; Quantisation and sampling; Aliasing; Anti-aliasing and reconstruction filters, integer sampling rate conversion. Interpolation and decimation filters. Design of practical sampling rate converters.

Unit-II

Theoretical Foundations

Difference equations and z transforms; Finite and infinite impulse response filters (FIRs and IIRs); Poles, zeros and frequency response; Correlation.

Unit-III

Design of Digital Filters; FIRs and IIRs; Butterworth, Chebyshev and Elliptical filters; Linear-phase, windowing, bilinear transform & frequency warping; Direct synthesis by CAD; Hardware & software implementations; Word length, precision and stability.

Frequency Domain Processing; Continuous and discrete Fourier transforms; The fast Fourier transform (FFT); Applications; Convolution; Correlation.

Unit-IV

DSP Hardware: A/Ds, D/As and over-sampling; Microprocessors; DSP processors; Fixed and floating point comparisons; Programming and debugging techniques.

ASIC Implementation: Technologies; Architectures for high performance; Pipelining and bit-slices; Carry-save and carry-look-ahead; Array multipliers.

Unit-V

Estimation theory, optimal linear filter theory, recursive methods for optimal filters, classical and modern spectrum analysis, and adaptive filtering, the singular value decomposition.

Some Typical DSP Applications: Speech recognition; Control; Image recognition; Radar; sonar, biomedical.

References

1. *Schaum's Outline of Digital Signal Processing, M. Hays, McGraw-Hill, 1999*
2. *Discrete-Time Signal Processing, A. Oppenheim and R. Schafer, Prentice Hall, Second edition*
3. *MATLAB Reference Guide: High-Performance Numeric Computation and Visualization Software, The MathWorks, Inc., South Natick, MA, 1984-92.*
4. *Computer-Based Exercises for Signal Processing Using MATLAB 5, J. McClellan (Ed.), Prentice Hall, 1997.*
5. *Digital Signal Processing Using MATLAB (r), V. Ingle, J. Proakis, Brooks/Cole Pub. Co., 1999.*
7. *A Course in Digital Signal Processing, B. Porat, J. Wiley and Sons, 1996.*
8. *Understanding Digital Signal Processing, R. Lyons, Prentice-Hall, 1996.*
9. *Digital Signal Processing: Principles, Algorithms and Applications, J. Proakis, D. Manolakis, Prentice-Hall, 2006 (4-th edition)*

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10. Digital Filter Design, T. W. Parks and C. S. Burras, J. Wiley & Sons, 1987
11. The Fast Fourier Transform and its Applications, E. O. Brigham, Prentice-Hall, 1988:
12. Digital Signal Processing, R. Roberts and Cliff Mullis, Addison Wesley, 1987
13. Introduction to Signal Processing, S. Orfandis, Prentice Hall, 1995

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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*				
MTDI 123		Advance microprocessor & controller	60	20	20	0	0	3	1	0	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
Q/A – Quiz/Assignment/Attendance, MST Mid Sem Test.

Course Objectives:-

To learn the architecture and programming of advanced Microprocessors & Microcontroller..

Course Outcomes:-

14. Student should understand the generalized architecture of advanced microprocessors and advanced microcontroller.
15. Design circuits for various applications using microprocessor & microcontrollers.
16. Apply the programming techniques in designing assembly language programs for solving simple problems by using instruction sets of microprocessor and microcontroller.
17. Students should be able to use an Integrated Development Environment (IDE) as a modern software tool for embedded system development.

Syllabus

Unit-I

16 bit microprocessor (8086), Architecture, pin diagram, registers,addressing modes,instruction set,minimum & maximum mode,assembly language programming .

Unit-II

80186 Architecture,80286 Architecture–Real and Virtual Addressing Modes,Interrupts, 80386 Architecture –Special Registers ,Memory Management ,Memory Paging Mechanism , 80486 Architecture – registers, Cache Memory Techniques, Exception Handling , Comparison of Microprocessors (8086 – 80186 –80286 – 80386 – 80486)

Unit-III

The RISC design philosophy, ARM processor families,ARM core dataflow model, Registers,current program status register,pipeline, SPSR, Instruction set ARM Programming.

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Unit-IV

Architecture of 8-bit 8051 Micro controller 8051 Assembly language programming and hardware interfacing: I/O port programming, interrupt programming, Bit manipulation, interfacing to LED, LCD, keyboard, ADC, DAC, Stepper motors and sensors.

Unit-V

Data types in 8051 C, programming for time delay, I/O programming in 8051 C, Logic operations in 8051 C, Control statements and loops in C, Functions and Arrays in embedded C, writing programs in C and testing the same using Keil IDE. 8051 Timer/Counter and Programming, 8051 Serial Port and Programming, External Memory Interfacing,

References

17. *The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2/e by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay (Second Edition , Pearson Education)*
18. *The 8051 Microcontroller & Embedded Systems using Assembly and C By K. J. Ayala, D. V. Gadre (Cengage Learning , India Edition). Using the MCS-51 Microcontrollers By Han Way Huang Oxford Uni Press*
19. *Programming and Customizing the 8051 Microcontroller by Myke Predko Tata Mcgraw Hill.*
20. *Andrew N. Sloss,Dominic Symes, Chris Wright "ARM System Developer's Guide Designing and Optimizing System Software".*
21. *Advanced Microprocessors and peripherals by AK Ray & KM Bhurchandi*

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTDI 124		Biomedical Instrumentation	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 Educational Objectives (CEOs):

8. With widespread use and requirements of medical instruments, this course gives knowledge of the principle of operation and design of biomedical instruments.
9. It attempts to render a broad and modern account of biomedical instruments.
10. It gives the introductory idea about human physiology system which is very important with respect to design consideration

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

Students should be able to

13. Students will have a clear knowledge about human physiology system.
14. They will have knowledge of the principle operation and design and the background knowledge of biomedical instruments and specific applications of biomedical engineering

Syllabus

Unit-I

Bioelectric Signals and Electrodes:Bio-potentials and their origin: ECG, EEG, EMG, ENG, ERG, EOG, MEG. Bio-potential electrodes, generalized medical instrumentation system-
Man machine interface.

Unit-II

Diagnostic Equipments:ECG: normal and abnormal waveform, diagnosis interpretation, ECG leads connections, Einthoven triangle, Plethysmography, Blood pressure measurement: direct and indirect methods, Cardiac output measurements, Phonocardiography. Respiratory volume measurement, Impedance pneumograph, Spirometers, Pneumotachometers. EEG: signal amplitudes and frequency bands, EEG machine. Audiometers, Auto analyzer, Bloodcell counter, Pulse oximeters, Endoscopes, Laparoscopes and Camera pill.

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Unit-III

Therapeutic Equipments:Heart lung machine, Dialyzers: basic principle of dialysis, different types of dialyzer, membranes, portable type. Cardiac pacemakers: external and Implantable pacemaker. Cardiac defibrillator: DC defibrillator, implantable defibrillator and defibrillator analyzer. Ventilators, Anesthesia machine, Short wave diathermy, microwave diathermy, ultrasonic therapy unit, electrotherapy.

Unit-IV

Imaging with Ionizing Radiation: Digital X-Rays: Principles and production of soft and hard x-rays, Scattered radiation, Angiography, Fluoroscopy, Image intensifier, Multi section radiography, Radiation detectors, X-ray Computerized Tomography (X-ray CT) -imaging modes and types, Single Photon Emission Computed Tomography (SPECT), Positron Emission Tomography (PET).

Magnetic Resonance Imaging (MRI):Physics of nuclear magnetic resonance, T1and T2 relaxation time, spin-echo sequences, electronics and instrumentation of MRI.

Ultrasound and other Techniques: Propagation of ultrasound waves in fluids, solids and tissue. Doppler Effect, Ultrasonic transducers and instrumentation, modes of ultrasonic imaging.

Unit-V

Patient Safety:Electric shock hazards, leakage currents, electrical safety analyzer, testing of biomedical equipments. Calibration and testing of biomedical equipments.

References

18. *Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education India, Delhi, 2004.*
19. *Myer Kutz, "Standard Handbook of Biomedical Engineering & Design," McGraw-Hill Publisher, New York, 2003.*
20. *Webster, "Medical Instrumentation – Application & Design," John Wiley and sons Inc, Netherlands, 2009*
21. *Arumugam.M. "Biomedical Instrumentation", Anuradha Agencies Publishers, Kumbakonam, 2006.*
22. *R.B.Khandpur, "Handbook of Biomedical Instrumentation", Prentice Hall of India, New Delhi, 2003.*
23. *Cromwell, "Biomedical Instrumentation and Measurements", Prentice Hall of India, New Delhi, 2007*

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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*				
MTDI104		Simulation and Modeling-1	0	0	0	30	20	0	0	4	2

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objectives (CEOs):

1. introducing the students to the practical aspects of control techniques,
2. Develop skills for modeling and identification of the processes,
3. Learn to students how to analyze the real time step response;
4. Learn how to use MATLAB/SIMULINK to do a simulation of the open / closed loop system

Course Outcomes (COs):

Students should be able to

1. This course brings together the knowledge gained in designing Instrumentation
2. This course also intends to provide the students with sufficient background to understand Various EDA tool like Matlab/simulink
3. The student will be introduced to the modeling and computational techniques that are incorporated in Designing and control.

List of Experiment

1. To obtain a transfer function from given poles and zeroes
2. To obtain zeros and poles from a given transfer function
3. To obtain the step response of a transfer function of the given system.
4. Performance of First order and second order systems
5. To plot the root locus for a given transfer function of the system.
6. To obtain bode plot for a givan transfer function of the system.
7. Mathematical Modeling of Physical Systems
8. Modeling of Physical Systems using SIMULINK
9. Linear Time-invariant Systems and Representation
10. Block Diagram Reduction

References

1. *G. Franklin, D. Powell and A. Emani-Naeini, Feedback Control of Dynamic Systems – 6th ed., 2010, Pearson Education.*
2. *Access to Matlab / Simulink (note: access is available in the computer lab).*

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3. *Userful Reference Materials Matlab/Simulink User Guides*
4. *Modern Control Design with MATLAB and SIMULINK, 2002, Wiley. Klee, H. and Allen, R. Simulation of Dynamic Systems with MATLAB and Simulink, 2nd ed., 2011, CRC Press.*

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