KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638 052
(Autonomous)

M.E. DEGREE IN APPLIED ELECTRONICS (FULL TIME)

CURRICULUM

(For the candidates admitted from academic year 2014 – 15 onwards)

SEMESTER – I

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
14AMT18	Applied Mathematics for Electrical Engineers	3	1	0	4	40	60	100
14AET11	Modern Digital Signal Processing	3	1	0	4	40	60	100
14AET12	System Theory	3	1	0	4	40	60	100
14AET13	CMOS VLSI Design	3	0	0	3	40	60	100
14AET14	Embedded Systems	3	0	0	3	40	60	100
14AET15	Computational Intelligence Techniques	3	1	0	4	40	60	100
	PRACTICAL							
14AEL11	Real Time Embedded Systems Laboratory	0	0	3	1	100	0	100
				Total	**23**			

CA - Continuous Assessment, ESE – End Semester Examination

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(Autonomous)

M.E. DEGREE IN APPLIED ELECTRONICS (FULL TIME)

CURRICULUM

(For the candidates admitted from academic year 2014 – 15 onwards)

SEMESTER – II

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
14AET21	Design of Analog Integrated Circuits	3	0	0	3	40	60	100
14VLT13	VLSI Signal Processing	3	1	0	4	40	60	100
14AET22	Digital System Design	3	1	0	4	40	60	100
	Elective – I (Professional)	3	0	0	3	40	60	100
	Elective – II (Professional)	3	0	0	3	40	60	100
	Elective - III (Professional)	3	0	0	3	40	60	100
	PRACTICAL							
14AEL21	EDA Tools Laboratory	0	0	3	1	100	0	100
14AEL22	Applied Electronics Laboratory	0	0	3	1	100	0	100
				Total	**22**			

CA - Continuous Assessment, ESE – End Semester Examination

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M.E. DEGREE IN APPLIED ELECTRONICS (FULL TIME)

CURRICULUM

(For the candidates admitted from academic year 2014 – 15 onwards)

SEMESTER – III

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
	Elective – IV (Professional)	3	0	0	3	40	60	100
	Elective – V (Professional)	3	0	0	3	40	60	100
	Elective – VI (Open)	3	0	0	3	40	60	100
	PRACTICAL							
14AEP31	Project Work – Phase I	0	0	12	6	50	50	100
				Total	**15**			

CA - Continuous Assessment, ESE – End Semester Examination

SEMESTER – IV

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	PRACTICAL							
14AEP41	Project Work – Phase II	0	0	24	12	100	100	200
				Total	**12**			

CA - Continuous Assessment, ESE – End Semester Examination

Total Credits: 72

KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638 052
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M.E. DEGREE IN APPLIED ELECTRONICS (PART TIME)

CURRICULUM

(For the candidates admitted from academic year 2014 – 15 onwards)

SEMESTER – I

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
14AMT18	Applied Mathematics for Electrical Engineers	3	1	0	4	40	60	100
14AET11	Modern Digital Signal Processing	3	1	0	4	40	60	100
14AET12	System Theory	3	1	0	4	40	60	100
				Total	**12**			

CA - Continuous Assessment, ESE – End Semester Examination

SEMESTER – II

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
14AET21	Design of Analog Integrated Circuits	3	0	0	3	40	60	100
14VLT13	VLSI Signal Processing	3	1	0	4	40	60	100
14AET22	Digital System Design	3	1	0	4	40	60	100
	PRACTICAL							
14AEL21	EDA Tools Laboratory	0	0	3	1	100	0	100
				Total	**12**			

CA - Continuous Assessment, ESE – End Semester Examination

KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638 052
(Autonomous)

M.E. DEGREE IN APPLIED ELECTRONICS (PART TIME)

CURRICULUM

(For the candidates admitted from academic year 2014 – 15 onwards)

SEMESTER – III

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
14AET13	CMOS VLSI Design	3	0	0	3	40	60	100
14AET14	Embedded Systems	3	0	0	3	40	60	100
14AET15	Computational Intelligence Techniques	3	1	0	4	40	60	100
	PRACTICAL							
14AEL11	Real Time Embedded Systems Laboratory	0	0	3	1	100	0	100
				Total	**11**			

CA - Continuous Assessment, ESE – End Semester Examination

SEMESTER – IV

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
	Elective – I (Professional)	3	0	0	3	40	60	100
	Elective – II (Professional)	3	0	0	3	40	60	100
	Elective - III (Professional)	3	0	0	3	40	60	100
	PRACTICAL							
14AEL22	Applied Electronics Laboratory	0	0	3	1	100	0	100
				Total	**10**			

CA - Continuous Assessment, ESE – End Semester Examination

KONGU ENGINEERING COLLEGE, PERUNDURAI, ERODE – 638 052
(Autonomous)

M.E. DEGREE IN APPLIED ELECTRONICS (PART TIME)

CURRICULUM

(For the candidates admitted from academic year 2014 – 15 onwards)

SEMESTER – V

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	THEORY							
	Elective – IV (Professional)	3	0	0	3	40	60	100
	Elective – V (Professional)	3	0	0	3	40	60	100
	Elective – VI (Open)	3	0	0	3	40	60	100
	PRACTICAL							
14AEP31	Project Work – Phase I	0	0	12	6	50	50	100
				Total	**15**			

CA - Continuous Assessment, ESE – End Semester Examination

SEMESTER – VI

Course Code	Course Title	Hours/ Week			Credit	Maximum Marks		
		L	T	P		CA	ESE	Total
	PRACTICAL							
14AEP41	Project Work – Phase II	0	0	24	12	100	100	200
				Total	**12**			

CA - Continuous Assessment, ESE – End Semester Examination

Total Credits: 72

LIST OF ELECTIVES					
Course Code	**Course Title**	**Hours/Week**			**Credit**
		L	**T**	**P**	
14CIE15	Bio Medical Signal Processing	3	0	0	3
14AEE01	Data Communication Networks	3	0	0	3
14MSE19	Design and Analysis of Algorithms	3	0	0	3
14CIE16	Wavelet Transforms and its Application	3	0	0	3
14COE16	Electromagnetic Interference and Compatibility	3	0	0	3
14AEE02	Industrial Electronics	3	0	0	3
14PEE10	Energy Conservation, Management and Auditing	3	0	0	3
14MSE20	Internet Technologies and Applications	3	0	0	3
14MME03	MEMS Design	3	0	0	3
14AEE03	Non Conventional Energy Systems *	3	0	0	3
14GEE01	Project Management	3	0	0	3
14CIE01	System Identification and Adaptive Control	3	0	0	3
14MME06	Virtual Instrumentation	3	0	0	3
14VLE01	Low Power Design of VLSI Circuits	3	0	0	3
14AEE04	Digital Image Processing *	3	0	0	3
14VLT14	Device Modeling	3	0	0	3
14AEE05	Quantum and Grid Computing	3	0	0	3
14AEE06	High Performance Communication Networks	3	0	0	3
14AEE07	DSP Processors and Architecture	3	0	0	3
14CIE17	Programmable Logic Controllers	3	0	0	3
14CIE18	SCADA and DCS	3	0	0	3

* - Open Elective

14AMT18 APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERS

(Common to Applied Electronics & Power Electronics and Drives)

3 1 0 4

UNIT – I **9**

Matrix Theory: Matrix factorizations – LU decomposition – The Cholesky decomposition – QR factorization – Least squares method – Generalized inverses – Singular value decomposition – Toeplitz matrices and Circulant matrices.

UNIT – II **9**

Calculus of Variations: Concept of variation – Euler equation – Variational problems with fixed boundaries – Variational problems involving several unknown functions – Functional involving first and second order derivatives – Functional involving several independent variables – Isoperimetric problems – Direct methods – Ritz method – Kantorowich method.

UNIT – III **9**

Stochastic Process: Definition – Classification of Stochastic Processes – Markov Chain -Transition Probability Matrices – Chapman Kolmogorov Equations - Classification of States – Continuous Time Markov Chains – Poisson Process - Birth and Death Processes**.**

UNIT – IV **9**

Queuing Models: Markovian queues – Single and Multi-server Models – Little's formula – Machine Interference Model - Non- Markovian Queues – Pollaczek Khintchine Formula.

UNIT - V **9**

Graph Theory: Introduction of graphs – Isomorphism – Subgraphs – Walks, paths and circuits – Connected graphs – Eulerian Graphs – Hamiltonian Paths and circuits – Digraph –Some types of digraphs – Connectedness – Adjacency matrix and incidence matrix of graphs – Shortest path algorithms – Dijkstra's algorithm – Warshall's algorithm – Trees – Properties of trees – Spanning trees – Minimal spanning trees – Prim's Algorithm – Kruskal's algorithm.

Lecture: 45, Tutorial: 15, TOTAL: 60

REFERENCE BOOKS

1. Richard Bronson, "Matrix Operations", Schaum's outline series, 2nd Edition, McGraw Hill, 2011.
2. Gupta, A.S., Calculus of Variations with Applications, Prentice Hall of India Pvt. Ltd., New Delhi, 1997.
3. Roy D.Yates and David J Goodman, "Probability and Stochastic Processes – A friendly Introduction for Electrical and Computer Engineers", John Wiley & Sons, 2005.
4. Donald Gross and Carl M. Harris, "Fundamentals of Queueing Theory", 2nd edition, John Wiley and Sons, New York,1985.
5. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", Prentice Hall, 2005.

Course Outcomes:

On completion of the course the students will be able to

- apply matrix computations in signal processing
- solve variational problems
- adopt Markov process and queuing models in engineering problems
- use graph structures in electrical networks

14AET11 MODERN DIGITAL SIGNAL PROCESSING

3 1 0 4

Pre-requisites: Digital Signal Processing

UNIT – I **9**

Discrete Random Signal Processing: Discrete time random process - Random process: Ensemble averages- Gaussian process – Stationary process - The auto covariance and autocorrelation matrices – White noise - power spectrum. Parseval's theorem -Wiener Khintchine relation- Filtering random process - Spectral factorization.

UNIT – II **9**

Filters: The FIR Wiener filter - Filtering - Linear prediction - IIR Wiener Filter - Non causal IIR Wiener filter - Causal IIR Wiener filter. Adaptive Filter: Concepts of adaptive filter - FIR adaptive filter - LMS algorithm

UNIT – III **9**

Multirate Digital Signal Processing: Mathematical description of sampling rate – Interpolation and Decimation by integer factor – Sampling rate conversion by rational factor- Filter design for sampling rate conversion - Direct form FIR structures, Polyphase structures. Multistage implementation of sampling rate conversion.

UNIT – IV **9**

Uniform and Two Channel Filter Banks and Applications of DSP: Digital Filter Banks – Two - channel Quadrature Mirror Filter Bank – M-Channel QMF Bank.

Applications: Noise cancellation using adaptive filtering technique, Sub band coding of speech signals, Design of decimation and interpolation filters.

UNIT – V **9**

Sparse Signal Processing: Sparse Signal Representation- Introduction-Sparse signals-Compressible signal-Over complete dictionaries- Coherence between the bases-Compressed sensing and signal reconstruction- Sensing in the presence of noise-Restricted isometry property.

Lecture : 45, Tutorial : 15 TOTAL : 60

REFERENCE BOOKS:

1. Hayes, Monson H. "Statistical Digital Signal processing and Modeling", John Wiley and Sons, Inc., 1996
2. Proakis, John G. and Manolakis, Dimitris G. "Digital Signal Processing: Principles Algorithms and Applications", PHI, 2006.
3. Ifeachor, Emmanuel C. and Jervis, Barrie N. "Digital Signal Processing: A Practical Approach", Addison-Wesley Publishing Company, 2002
4. Dionitris G. Manolakis, Vinay K. Ingle, Stepen M. Kogon, "Statistical & Adaptive signal processing, spectral estimation, signal modeling, Adaptive filtering & Array processing", McGraw-Hill International edition 2000.
5. K.P.Soman R.Ramanathan , " Digital Signal and Image Processing –The Sparse Way", Elseveir Publisher,2012.

Course Outcomes:

On completion of the course the students will be able to

- illustrate the importance of random signal processing
- analyse and design adaptive filters for DSP applications
- develop Direct Form FIR and Polyphase structure implementation for sampling rate converters
- apply the techniques to problems in real time applications

14AET12 SYSTEM THEORY

(Common to Applied Electronics & Power Electronics and Drives)

3 1 0 4

Pre-requisites: Control Systems

UNIT - I **9**

Introduction to Digital Control System: Elements of Digital control system- Classifications of discrete time signals – Time domain models for discrete time systems.

Sampling and reconstruction of signals –Frequency domain representation of sampling theorem-Nyquist rate, Aliasing. Mathematical model of sample and hold circuits-Practical aspects of choice of sampling rate

UNIT - II **9**

Z-Plane Analysis of Discrete-Time Control Systems: Review of Z transform- Relationship between s plane and z plane - Difference equation representation of discrete time system-Pulse transfer function -Modified Z transform- Digital PID controllers– Zeigler – Nichols tuning method

UNIT - III **9**

State Space Analysis and its Solution: Review of state space representation- Conversion of continuous state model to discrete state model – State diagram-Solution of discrete time state model: autonomous, non-autonomous systems – State transition matrix –Controllability and Observability – Multi variable discrete systems

UNIT - IV **9**

State Feedback Control: Design of state feedback controller – Design of reduced and full order observers – Steady state error in state space-PI feedback- Digital compensator design– Digital filter properties– Kalman's filter.

UNIT - V **9**

Stability Analysis: BIBO stability-Effect of sampling rate on stability-Jury's stability test-Root Locus analysis –Asymptotic stability-Liapunov Stability Analysis of discrete time systems: Linear and Non-linear systems- Direct,Indirect method-Construction of Liapunov energy function.

Lecture: 45, Tutorial: 15, TOTAL: 60

REFERENCE BOOKS:

1. Gopal, M., "Digital Control and State Variable Methods", 4th edition, Tata McGraw-Hill, New Delhi, 2012.
2. Kuo, B.C., "Digital Control Systems", 2nd edition Oxford University Press, Oxford, 2007.
3. Ogata, K., "Discrete Time Control Systems", second edition Prentice Hall, New Jersey, 2011.
4. M.Sami Fadali, Antonio Visioli, "Digital control Engineering Analysis and design" Elsevier, 2012.

Course Outcomes:

On completion of the course the students will be able to

- understand mathematical models of linear discrete-time control systems using transfer functions and state-space models
- analyze transient and steady-state behaviors of linear discrete-time control systems
- design controllers for linear discrete-time control systems as per the design criteria

14AET13 CMOS VLSI DESIGN

3 0 0 3

Pre-requisites: VLSI Systems

UNIT – I **9**

VLSI Design Process and Basic CMOS: Types of ASICs - Design flow -VLSI Design Process – Architectural Design – Logical Design – Physical Design – Layout Styles –Full custom, Semicustom approaches. NMOS and PMOS transistors, Threshold voltage- Body effect- Design equations- Second order effects. MOS models and small signal AC characteristics.

UNIT – II **9**

Inverters, CMOS Logic and Circuit Characterization: Basic CMOS technology NMOS and CMOS Inverters - Stick diagram, Inverter ratio, DC and transient characteristics , switching times, Super buffers, Driving large capacitance loads - CMOS logic structures - Transmission gates - Static CMOS design - dynamic CMOS design - Résistance estimation - Capacitance estimation.

UNIT – III **9**

Performance Estimation: MOS capacitor characteristics - Device capacitances - Diffusion capacitance - SPICE modeling of MOS capacitance - Routing capacitance - Distributed RC effects - Inductance - Switching characteristics - Rise time - Fall time - Delay time - Empirical delay models - Gate delays - CMOS gate transistor sizing - Power dissipation- Scaling of MOS transistor dimensions.

UNIT – IV **9**

Logic Synthesis and Simulation: Simulation - Gate-level modeling and simulation - Switch-level modeling and simulation - Combinational Logic Synthesis - Binary Decision Diagrams - Two Level Logic Synthesis.

UNIT – V **9**

System Partitioning and Routing: System partition - FPGA partitioning - partitioning methods - floor planning - placement - physical design flow –global routing - detailed routing - special routing - circuit extraction - DRC.

TOTAL : 45

REFERENCE BOOKS:

1. Neil H.E. Weste CMOS VLSI Design: “A Circuits and Systems Perspective” (For VTU), 3/e, Pearson Education, 2012.
2. Gerez S.H., "Algorithms for VLSI Design Automation", John Wiley & Sons, reprint 2008.
3. M.J.S. Smith, “Application Specific Integrated Circuits”, Pearson Education, 1997.
4. Wolf Wayne, “Modern VLSI Design-System on chip Design”, Prentice Hall Inc., Third Edition, 2002.

Course Outcomes:

On completion of the course the students will be able to

- describe VLSI design flow and CMOS technologies
- design and develop various logic structures in CMOS
- simulate and synthesis various logic circuits and illustrate the concepts of FPGA

14AET14 EMBEDDED SYSTEMS

3 0 0 3

Pre-requisites: Microprocessors and Microcontrollers

UNIT – I **9**

Introduction :Introduction to Embedded systems – Von Neumann and Harvard architecture – Need of Microcontrollers – selection criterion.

PIC Microcontroller 16F87X: Architecture – Features – Resets –Memory Organisations: Program Memory, Data Memory – Instruction Set – Simple programs using Assembly language Instruction sets – Interrupts.

UNIT – II **9**

Physical Interface Support Using PIC :PIC Peripherals – I/O Parallel Ports – Timers – Capture/Compare/PWM (CCP) Modules - Control registers – Serial ports – Master Synchronous serial Port (MSSP) in I^2C mode and in SPI mode – USART – Interfacing of PIC: Analog-to-digital Converter (ADC) – Registers associated with the peripherals – Initializing the Peripheral modules using Assembly language.

UNIT – III **9**

Arm Processor And Programming :General concepts - ARM7 - Instruction Set Architecture, Levels in architecture, Functional description - processor and memory organization - Introduction to RISC architecture, pipelining, Instruction issue and execution - Instruction formats - Addressing modes - Data alignment and byte ordering – Simple programs using Assembly language Instruction sets.

UNIT – IV **9**

Embedded Programming: Programming in Assembly Language (ALP) Vs High level language – C Program elements, Macros and Functions – Use of pointers – NULL pointers – use of function calls – Multiple function calls in a cyclic order in the main function pointers – Function queues and interrupt Service Routines queues - pointers. C program compilers – Cross compiler – optimization of memory codes.

UNIT – V **9**

Real-Time Operating Systems and Design :Introduction - RTOS Necessity - Operating system services –I/O subsystems – Network operating systems –Interrupt Routines in RTOS Environment – RTOS Task scheduling models – IEEE standard POSIX functions for standardization of RTOS and inter-task communication functions - Fifteen point strategy for synchronization between processors, ISRs, OS Functions and Tasks – OS security issues - Embedded system design and Co-Design Issues in System Development process – Design cycle in the development phase for an embedded system – Issues in Embedded System Design.

TOTAL : 45

REFERENCE BOOKS:

1. Ajay V Deshmukh, “Microcontrollers: Theory and Applications, Tata McGraw Hill, New Delhi, 2007.
2. Raj Kamal, “Embedded Systems Architecture, Programming and Design”, Tata McGraw-Hill, New Delhi, 2007.
3. Wayne Wolf., “Computers as Components: Principles of Embedded Computing System Design”, Morgan Kaufman Publishers, San Francisco, second edition, 2001.
4. Vahid, Frank and Givargi, Tony, “Embedded System Design: A Unified Hardware/Software Introductions”, John Wiley & Sons, New York, 2001.

Course Outcomes:

On completion of the course the students will be able to

- illustrate the basic architecture and interfacing concepts of PIC16 microcontroller and ARM processor
- apply the programming skills for peripheral interfacing and real time applications
- apply the concepts of RTOS and real-time systems design techniques to various software programs

14AET15 COMPUTATIONAL INTELLIGENCE TECHNIQUES

(Common to Applied Electronics, Power Electronics and Drives & Mechatronics)

3 1 0 4

Pre-requisites: Numerical methods

UNIT – I **9**

Artificial Neural Networks: Introduction to Soft computing – Neural Networks – Model – activation functions – architecture – Supervised learning – Perceptrons – Adaline and Madaline – Back propagation algorithm – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self Organizing Networks – Learning Vector Quantization – Hebbian Learning.

UNIT – II **9**

Fuzzy logic: Fuzzy Sets – Basic Definition and Terminology – Set theoretic operations – Membership function formulation and parameterization - Extension principle and Fuzzy Relations- Fuzzy if-then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models –Sugeno Fuzzy Models –Tsukamoto Fuzzy Models – Input Space Partitioning - Fuzzy Modeling.

UNIT – III **9**

Optimization techniques: Derivative based Optimization: Descent Methods –The Method of steepest Descent – Classical Newton's Method – Step Size Determination – Derivative free Optimization: Genetic Algorithms – Simulated Annealing – Particle swarm Optimization - Ant colony optimization.

Unit – IV **9**

Neuro Fuzzy modeling: Adaptive Neuro Fuzzy Inference Systems – Architecture – Hybrid learning Algorithm –learning methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy spectrum.

UNIT – V **9**

Applications: Printed Character Recognition – Inverse kinematics Problem – Applications of soft computing techniques for power electronics: MPPT, speed control for electrical machines, harmonic elimination techniques in power converters.

Lecture:45, Tutorial:15, TOTAL: 60

REFERENCE BOOKS:

1. J.S.R Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, Pearson Education, 2004.
2. Laurene V. Fausett, "Fundamentals of Neural Networks: Architectures, Algorithms and Applications", Pearson Education, III Edition, 2008
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
4. David E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, New York, 1989.
5. Bimal K Bose, "Neural Network Applications in Power Electronics and Motor Drives-An Introduction and Perspective" , IEEE Transactions on Industrial Electronics, Vol.54, Issue: 1, pp.14-33,February 2007.
6. Whei-Min Lin , Chih-Ming Hong and Chiung-Hsing Chen, "Neural Network Based MPPT Control of a Stand Alone Hybrid Power Generation System" IEEE Transactions on Power Electronics, Vol.26, Issue: 12, pp.3571 – 3581,December 2011.

Course Outcomes:

On completion of the course the students will be able to

- describe the characteristics and algorithms of intelligent systems
- design intelligent controllers and its hybrid topology for various applications
- gain fundamental knowledge on optimization techniques and its implementation procedures

14AEL11 REAL TIME EMBEDDED SYSTEMS LABORATORY

0 0 3 1

LIST OF EXPERIMENTS:

1. RS232C Bus Interfacing with PIC Microcontroller
2. LED interfacing with Embedded PIC Microcontroller
3. LED and Switch Interfacing with Embedded PIC Microcontroller
4. LED and Key matrix Interfacing with Embedded PIC Microcontroller
5. EEPROM Interfacing with Embedded PIC Microcontroller (I2C-Communication)
6. LCD Interfacing with Embedded PIC Microcontroller
7. Rolling Display in LCD /LED using Embedded PIC Microcontroller
8. Stepper Motor Interfacing with Embedded PIC Microcontroller
9. ADC Interfacing with Embedded PIC Microcontroller(I2C-Communication)
10. RTC interfacing with Embedded PIC Microcontroller(I2C-Communication)
11. Study of Convolution Algorithm Implementation using DSP Processor
12. Study of Matrix Multiplication using DSP Processor

TOTAL : 45

REFERENCES / MANUALS / SOFTWARE:

- MPLAB IDE (any version)
- WinX Talk
- PICC compiler

Course Outcomes:

On completion of the course the students will be able to

- write Basic and on-chip peripheral Interfacing Programs using PIC
- develop a simple Real time Applications using PIC by interfacing with off-chip peripherals
- design an application specific system using PIC and write basic programs for DSP processor

14AET21 DESIGN OF ANALOG INTEGRATED CIRCUITS

3 0 0 3

Pre-requisites: Electron Devices, Electronic Circuits, Analog Integrated Circuits

UNIT – I **9**

Integrated Circuits , Device Models and Measurement of model parameters: Introduction to Analog Device Design – Depletion region of a PN junction- DC, Small Signal and High Frequency Model for Diode, BJT and MOS Transistor. Measurement of Model Parameters Switches, Active resistors

UNIT – II **9**

Circuit configuration of IC and Current Sources and Sinks, Current Mirrors : Circuit configuration of IC- Simple Wilson, Cascade current sources.,Voltages and Current References-Band gap voltage references.

UNIT – III **9**

Basic Analog amplifiers and Differential Amplifiers :MOS and BJT inverting amplifier, improving the performance of inverting amplifier. CMOS and BJT Differential amplifiers. Characteristics of Operational amplifiers Types: Two stage BJT and CMOS- Cascade- Folded cascade- Transconductance amplifiers.

UNIT – IV **9**

Filters, **Comparators, and Multipliers:**Low pass filters, High pass filters, Band pass filters, Switched Capacitor filters,comparators, and multipliers.

UNIT-V **9**

Data Converters: Data Converter fundamentals, DAC Architectures: Current Switched, Resistive, Charge redistribution, Hybrid, Segmented D/A Converters. ADC architectures: Flash, Integrating, Successive Approximation and folding A/D Converters. Over sampling Converters

TOTAL : 45

REFERENCE BOOKS:

1.Paul R. Gray, Paul J. Hurst,StephenH.Lewis,RobertG.Meyer ., "Analysis and Design of Analog Integrated Circuits", Fifth Edition , John Wiley& Sons, New York, 2001.

2.Allen Phillips E, and Holberg Douglas R., "CMOS Analog Circuit Design", Second Edition, Oxford University Press, Oxford, 2003.

3.Johns David A., and Martin Ken, "Analog Integrated Circuit Design", John Wiley & Sons, NewYork, 2002.

4.Randall L.Geiger, Phillips E. Allen, Noel R.Strader,"VLSI design Techniques for Analog and Digital circuits", MCgraw Hill International Editions, 1990

5.VineetaP.Gejji," Analog and mixed mode VLSI design", PHI, New Delhi, 2011

6.Gray Hurst, Lewis and Meyer, "Analysis and Design of Analog Integrated Circuits", 4 Edition,John Wiley& Sons, New York, 2001.

Course Outcomes:

On completion of the course the students will be able to

- acquire design skills in the areas of digital and simple signal circuits complemented with knowledge in semiconductor devices
- develop an understanding of device and estimate the low and high frequency model and behavior of linear circuits, including noise
- develop , analyse and design transistor current mirrors, filters, multipliers, voltage and current references ,amplifiers, and differential amplifiers
- understand the fundamentals of multipliers and modulators, architecture and basic operation of data converters

14VLT13 VLSI SIGNAL PROCESSING

(Common to VLSI Design & Applied Electronics)

3 1 0 4

Pre-requisites: Digital Signal Processing

UNIT – I **9**

Introduction to DSP Systems: Introduction To DSP Systems -Typical DSP algorithms; Iteration Bound – data flow graph representations, loop bound and iteration bound, Algorithms For Computing Iteration Bound, Iteration Bound of Multirate Data Flow Graphs. Pipelining and parallel processing – Pipelining of FIR digital filters, parallel processing, pipelining and parallel processing for low power

UNIT – II **9**

Retiming and Unfolding: Retiming - definitions and properties Retiming techniques; Solving systems of inequalities, Retiming Techniques. Unfolding – an algorithm for Unfolding, properties of unfolding, Critical path Unfolding and Retiming applications of Unfolding- sample period reduction and parallel processing application

UNIT – III **9**

Folding: Folding – Folding transformation – Register minimizing techniques –Register minimization in folded architectures-Folding of Multirate systems.

Fast Convolution: Fast convolution – Cook-Toom algorithm, modified Cook-Took algorithm – Wino grad Algorithm, Modified Wino grad Algorithm -Design of Fast Convolution algorithm by inspection

UNIT – IV **9**

Algorithmic strength reduction: Algorithmic strength reduction in Filters-Parallel FIR Filters, DCT and Inverse DCT, Parallel architectures for rank order Filters.

UNIT – V **9**

Pipelined and Parallel Recursive filters Adaptive Filters:– Inefficient/efficient single channel interleaving, Look- Ahead pipelining in first- order IIR filters, Look-Ahead pipelining with power-of-two decomposition parallel processing of IIR filters, combined pipelining and parallel processing of IIR filters, pipelined adaptive digital filters-relaxed look-ahead, pipelined LMS adaptive filter.

Lecture: 45, Tutorial: 15, TOTAL: 60

REFERENCE BOOKS::

1. Parhi, Keshab K., "VLSI Digital Signal Processing Systems, Design and Implementation", John Wiley, Inter Science, New York, 1999.
2. Isamail, Mohammed and Fiez, Terri, "Analog VLSI Signal and Information Processing", McGraw-Hill, New York, 1994**.**
3. www.pdf-search-engine.com/vlsi-signal-processing-pdf.html
4. Magdy A. Bayoumi, Magdy A. Bayoumi, E. Swartzlander, "VLSI Signal Processing Technology", Kluwer Academic Publishers.October 1994
5. Ray Liu K J, "High Performance VLSI Signal Processing, Innovative architectures and Algorithms",IEEE Press,1998

Course Outcomes:

On completion of the course the students will be able to

- design filters using the concept of retiming, folding and unfolding techniques
- analyse and design pipelined and parallel recursive adaptive filters

14AET22 DIGITAL SYSTEM DESIGN

3 1 0 4

Pre-requisites: Digital Logic Circuit, VLSI systems

UNIT – I **9**

Advanced Topic in Sequential Logic Design: ASM Chart – ASM Realization for Synchronous Logic circuit –Analysis of Asynchronous Sequential Circuit (ASC) – Flow Table Reduction – Races in ASC – State Assignment – Problem and the Transition Table – Design of ASC – Static and Dynamic Hazards – Essential Hazards.

UNIT – II **9**

System Design Using VHDL: VHDL Description of Combinational Circuits – Arrays – VHDL Operators – Compilation and Simulation of VHDL Code – Modeling using VHDL – Flip Flops – Registers - Counters – Sequential Machine – Combinational Logic Circuits – VHDL Code for Serial Adder, Binary Multiplier – Binary Divider – Complete Sequential Systems – Design of a Simple Microprocessor.

UNIT – III **9**

Field Programmable Gate Arrays: Types of FPGA – XILINX XC3000 series – Logic Cell Array (LCA) – Configurable Logic Blocks (CLB) – Input/Output Blocks (IOB) – Programmable Interconnection Points (PIP) – XILINX XC4000 Series –Introduction to Xilinx SPARTAN, VIRTEX FPGA – Design examples.

UNIT – IV **9**

Fault Modeling and Simulation: Introduction to Testing – Faults in digital circuits – Modeling of faults - Logical Fault Models – Fault detection – Fault location – Fault dominance – Logic Simulation – Types of simulation – Delay models – Gate level Event Driven simulation.

UNIT – V **9**

Fault Diagnosis and Testability Algorithms: Fault Table Method – Path Sensitization Method – Boolean Difference Method – D Algorithm – Tolerance Techniques – The Compact Algorithm – Practical PLA‟s – Fault in PLA – Test Generation – Masking Cycle – DFT Schemes – Built-in Self Test.

Lecture : 45, Tutorial : 15, TOTAL : 60

REFERENCE BOOKS:

1. Roth Jr. Charles H. Lizy Kurian John, “Digital System Design Using VHDL”, 2/e, Cengage learning publication, 2012.
2. Michael L Bushnell, Vishwani D Agrawal, “Essentials of Electronic Testing For digital memory and mixed signal VLSI circuits”, Kluwer academic Publications, USA, 2002.
3. Nripendra N Biswas “Logic Design Theory” Prentice Hall of India, 2001.
4. Parag K.Lala, “An Introduction to Logic Circuit Testing” Morgan and Claypool publishers, 2009.
5. Balabanian, “Digital Logic Design Principles”, Wiley publication, 2007.
6. Stephen D Brown, “Fundamentals of Digital Logic”, TMH publication, 2007.

Course Outcomes:

On completion of the course the students will be able to

- design and analyze asynchronous sequential circuits
- write VHDL code for various digital logic circuits
- illustrate the architecture and features of FPGA families
- model, detect and diagnose the faults in a VLSI circuit

14AEL21 EDA TOOLS LABORATORY

0 0 3 1

LIST OF EXPERIMENTS :

1. Simulation of an amplifier circuit and Design PCB layout using ORCAD.
2. Simulation of Wien Bridge Oscillators and Design PCB layout using ORCAD.
3. Simulation of three phase diode bridge rectifier and PCB layout using ORCAD.
4. Design and Simulation of three phase fully controlled bridge converter with R and RL load using PSIM.
5. Design and Simulation of Boost and Buck chopper using PSIM.
6. Design and Simulation of single phase and three phase inverter circuit using PSIM.
7. Implementation of Image Processing Algorithm using MATLAB.
8. Simulation of Adaptive and Non adaptive control systems using MATLAB.
9. Implementation of Neural networks Algorithms using MATLAB.
10. Implementation of Genetic Algorithm and PSO using MATLAB.
11. Implementation of Fuzzy Logic using MATLAB.

TOTAL : 45

Course Outcomes:

On the completion of the course the students will be able to

- design and analyze the electronic circuits using ORCAD
- simulate and analyze the electrical circuit using PSIM
- implement soft computing techniques for real time applications

14AEL22 APPLIED ELECTRONICS LABORATORY

0 0 3 1

LIST OF EXPERIMENTS:

1. Design and Simulation of Digital circuits using VHDL.
2. Design and Simulation of Digital circuits using Verilog.
3. Design of Simple NMOS/PMOS circuits using SPICE
4. Design of Dynamic latches using SPICE.
5. FPGA Implementation of 4 Bit ALU & Power analysis.
6. FPGA Implementation of Real Time Clock & RTL view.
7. Simulation of realizing an OP-AMP using SPICE.
8. Design of Switched Capacitor filters using SPICE.
9. Design and Simulation of Analog Multiplier using SPICE.
10. Design & Simulation of Dynamic CMOS circuits using SPICE.

TOTAL : 45

Course Outcomes:

On the completion of the course the students will be able to

- write VHDL and Verilog code for various logic circuits
- simulate and implement real time clock and ALU in FPGA
- design and simulate various analog circuits using SPICE

14CIE15 BIO-MEDICAL SIGNAL PROCESSING

3 0 0 3

Pre-requisites: Digital Signal Processing, Bio Medical Instrumentation

UNIT – I **9**

Biomedical Signals,Filtering and Modeling : Nature of Biomedical signals, Types: Action, Potential,Electroneurogram(ENG),Electromyogram(EMG),Electrocardiogram(ECG),Electroencephal ogram (EEG), Event related potentials, Electrogastrogram (EGG), Phonocardiogram (PCG), Speech signals

UNIT – II **9**

Stationary versus non-stationary processes: Time domain filters, Frequency domain filters, Optional filters, Adaptive filters for removal of Interference, Selection of Appropriate filters, Applications. Parametric System modeling, Autoregressive or All-pole modeling, Pole-zero modeling, Electromechanical Models of Signal Generation, Application: Heart-rate variability – Spectral modeling and Analysis of ECG signals

UNIT – III **9**

Non Stationary Signals, Classification and Decision: EEG rhythms and waves, characterization of non stationary signals and dynamic systems, Fixed segmentation, Adaptive segmentation

UNIT – IV **9**

Pattern classification and Compression Techniques: Supervised, Unsupervised Pattern classification, Probabilistic models and Statistical Decision, Regression analysis-Compression and Advanced Topics: Direct Digital compression Techniques, Transformation Compression Techniques, Other Compression Techniques and Comparison.

UNIT – V **9**

Introduction to Wavelet Transforms: Application of Wavelet Transform on Biomedical Signals, Multi Resolution Analysis. Neural Networks in Processing and Analysis of Bio medical Signals.

TOTAL : 45

REFERENCE BOOKS:

1. Rangaraj M. Rangayyan, "Biomedical Signal Analysis, A case study Approach," IEEE Press,2001
2. Bronzino Joseph D, "The Biomedical Engineering Handbook", CRC Press, IEEE Press,2000
3. Reddy D.C., "Biomedical Signal Processing, Principles and Techniques",Tata McGraw Hill, New Delhi,2005
4. Banner Kenneth E and Arce Gonzalo R "Nonlinear Signal and Image Processing: Theory Methods and Applications", CRC Press, New York,2003
5. Akay Metin "Nonlinear Bio Medical Signal Processing", IEEE Press,2000

Course outcomes:

On completion of the course the students will be able to

- apply and select the bio signals and filters
- understand the difference between stationary and non-stationary signals
- apply the pattern classification and compression techniques on bio signals
- analyze and study the wavelet transform and neural network applications on biomedical signals

14AEE01 DATA COMMUNICATION NETWORKS

(Common to Applied Electronics & Power Electronics and Drives)

3 0 0 3

Pre-requisites: Computer Networks

UNIT – I **9**

Introduction: Definition of Networks – Classification of Networks – LAN, MAN, WAN, internet – Network Topology – Protocols and Standards – Network Models – OSI, TCP/IP Models of networking – Internet

UNIT – II **9**

Physical Layer: Review of Signals – Data Rate Limits – Performance Issues – Bandwidth, Throughput, Latency, Bandwidth-Delay Product, Jitter. Digital Transmission and Analog Transmission: Line coding techniques, PCM and Delta Modulation techniques – ASK, FSK, PSK, and QAM Techniques – Bandwidth Utilization: Multiplexing and Spreading

UNIT– III **9**

Communication Media and Data Link Layer: Data Transmission using Telephone Networks – Dial-up MODEMS, Digital Subscriber Line (DSL).Error Detection and Correction techniques – Data Link Control: Framing, Flow and Error Control – HDLC and PPP protocols. Multiple Access Techniques – CSMA, CSMA/CD, CSMA/CA – Channelization – TDMA, FDMA, and CDMA

UNIT– IV **9**

Wired LANs and WANs: Wired LANs– IEEE 802 standards - Ethernet – IEEE 802.3 MAC Frame – Token Ring LAN - IEEE 802.5 MAC Frame – Wireless LANs – IEEE 802.11 standard – Bluetooth Technology – Interconnection of LANs.

Wired WANs: Wired WANs -Circuit-Switched Networks, Datagram Networks, Virtual Circuit-ched Networks, Structure of Circuit and Packet Switches - Wireless WANs – Introduction to Cellular Telephone and Satellite networks

UNIT – V **9**

Internetworking: Internetworking – tunneling – IP Addressing Scheme – Structure of IP Datagram – IP Routing – TCP as Transport Layer Protocol – Structure of TCP Segment – TCP Connection: Establishment and Closing – SMTP Protocol for E- Mail Application.

TOTAL : 45

REFERENCE BOOKS:

1. Forouzan Behrouz A., "Data Communications and Networking", Fourth Edition, Tata McGraw-Hill, New Delhi, 2006.
2. Peterson Larry L. and Davie Bruce S., "Computer Networks: A Systems Approach", Fourth Edition, Elsevier Publications, New Delhi, 2007.
3. Rowe Stanford H. and Schuh Marsha L., "Computer Networking", Pearson Education, New Delhi 2005.
4. Kurose James and Ross Keith," Computer Networking: Top Down Approach featuring the Internet", Pearson Education, New Delhi,2002

Course outcomes:

On completion of the course the students will be able to

- acquire the knowledge of basic concepts of networking
- acquire the knowledge of various performance parameters and modulation techniques
- identify the network components and illustrate the functions of data link layer
- classify various IEEE standards of wireless networks
- manipulate the addressing scheme and summarize the operations of TCP/IP

14MSE19 DESIGN AND ANALYSIS OF ALGORITHMS

3 0 0 3

UNIT - I **9**

Basic Concepts of Algorithm Analysis : Introduction – notion of algorithm – fundamentals of algorithmic problem solving – important problem types – fundamentals of analysis framework – asymptotic notations and basic efficiency classes

UNIT - II **9**

Mathematical Analysis & Brute Force Techniques-Mathematical analysis: non-recursive and recursive algorithms – Fibonacci numbers – Empirical analysis of algorithms – algorithm visualizations.Brute force Techniques: Selection and Bubble sort, Sequential search and String matching.

UNIT - III **9**

Algorithmic Techniques: Divide and Conquer: Merge sort, Quick sort, Binary search, Binary tree, traversals and related properties. Decrease and conquer: Insertion sort, Depth First Search and Breadth First Search. Transform and conquer: Presorting, balanced search trees, AVL trees, Heaps and Heap sort.

UNIT - IV **9**

Dynamic Programming & Greedy Techniques: Dynamic Programming: Warshall's and Floyd's algorithms, and Optimal Binary Search Trees Greedy Techniques: Prim's and Kruskal's algorithms, Dijkstra's algorithm and Huffman trees.

UNIT - V **9**

Backtracking, Branch & Bound Techniques : Backtracking-N-Queen's problem, Hamiltonian circuit problem and Sum of sub-sets problem.Branch and Bound: Assignment problem, Knapsack problem and Travelling Salesman Problem – Overview of NP problems.

TOTAL: 45

REFERENCE BOOKS:

1. Levitin Anany., "Introduction to Design and Analysis of Algorithms", Second Edition, Pearson Education Asia, Singapore 2007.
2. Jon Kleinberg and Éva Tardos, "Algorithm Design", Pearson Education Asia, Singapore 2008
3. Cormen T.H., Leiserson C.E., Rivest R.L, and Stein C., "Introduction to Algorithms", Prentice Hall of India, New Delhi, 2001
4. Aho A.V, Hopcroft J.E. and Ulman J.D., "The Design and Analysis of Computer Algorithms", Pearson Education Asia, Singapore, 2003.

Course Outcomes:

On completion of the course the students will be able to

- analyze worst-case running times of algorithms using asymptotic analysis
- argue the correctness of algorithms using inductive proofs and invariants
- apply the algorithms and design techniques to solve problems
- analyze the complexities of various real world problems in different domains

14CIE16 WAVELET TRANSFORMS AND ITS APPLICATIONS

3 0 0 3

Pre-requisites: Digital Signal Processing

UNIT - I **9**

Introduction: Vector spaces - properties - dot product - basis-dimension, orthogonality and orthonormality-relationship between vectors and signals-signal spaces-concept of convergence-Hilbert spaces for energy signals.

UNIT - II **9**

Fourier Analysis and STFT: Fourier Transform-drawbacks of Fourier analysis- window function - Short-time Fourier Transform (STFT) analysis-spectrogram plot-phase-space plot in time-frequency plane. Heisenberg's uncertainty principle-Tilling of the time-frequency plane for STFT.

UNIT - III **9**

Continuous Wavelet Transform: Wavelet transform properties-concept of scale and its relation with frequency-continuous Wavelet Transform (CWT)-scaling function and wavelet functions: Daubechies, Haar, Coiflet, Mexican hat, Sine, Gaussian, Bi-orthogonal wavelets - Tilling of time scale plane for CWT.

UNIT - IV **9**

Discrete Wavelet Transform and Multi-Resolution Analysis: Discrete Wavelet Transform (DWT)-Filter bank and sub-band coding principles. Multi-resolution analysis-Time scale difference equations for wavelets and scaling functions-Wavelet filters-scale variation in discrete domain-Mallet's algorithm for DWT-Inverse DWT computation by filter banks. Introduction to multiwavelet transforms.

UNIT - V **9**

Wavelet Packet Analysis and Applications: Haar wavelet packets – application –best basis selection and cost functions. Sub-band coding of images-Image compression-Image de-noising – image coding using wavelet tree coder – EZW code and SPIHT code. Introduction to second generation wavelets.

TOTAL: 45

REFERENCE BOOKS:

1. Mallat, S. "A Tour on Wavelet Signal Processing", Elsevier, New Delhi, December 2005
2. Rao .R. M and Bopardikar.A.S, "Wavelet Transforms", Addison Wesley, 1999
3. Soman K.P. and Ramachandran K.I. "Insight into Wavelets-From Theory to Practice", Prentice Hall of India, New Delhi, 2010.
4. Strang G and Nguyen T., "Wavelets and Filter Banks", Wellesley Cambridge Press, 1996
5. Vetterli M, and Kovacevic J., "Wavelets and Sub- band Coding", Prentice Hall, 1995

Course outcomes:

On completion of the course the students will be able to

- identify the limitations of Fourier transforms and its applications
- develop wavelet transform based coding
- analyze signals and images using wavelet transforms

14COE16 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY

(Common to Communication Systems, VLSI Design, Applied Electronics & Control and Instrumentation Engineering)

3 0 0 3

Pre-requisites: Microwave Communication

UNIT – I **9**

EMI Environment : EMI/EMC concepts and definitions, Sources of EMI, conducted and radiated EMI, Transient EMI, Time domain Vs Frequency domain EMI, Units of measurement parameters, Emission and immunity concepts, ESD

UNIT – II **9**

EMI Coupling Principles: Conducted, Radiated and Transient Coupling, Common Impedance Ground Coupling, Radiated Common Mode and Ground Loop Coupling, Radiated Differential Mode Coupling, Near Field Cable to Cable Coupling, Power Mains and Power Supply coupling

UNIT – III **9**

EMI/EMC standards and measurements : Civilian standards - FCC, CISPR,I EC, EN, Military standards - MIL STD 461D/462, EMI Test Instruments /Systems, EMI Shielded Chamber, Open Area Test Site, TEM Cell, Sensors/Injectors/Couplers, Test beds for ESD and EFT, Military Test Method and Procedures (462).

UNIT – IV **9**

EMI control techniques : Shielding, Filtering, Grounding, Bonding, Isolation Transformer, Transient Suppressors, Cable Routing, Signal Control, Component Selection and Mounting

UNIT – V **9**

EMC design of PCBs : PCB Traces Cross Talk, Impedance Control, Power Distribution Decoupling, Zoning, Motherboard Designs and Propagation Delay Performance Models

TOTAL : 45

REFERENCE BOOKS:

1. Ott, Henry W., "Noise Reduction Techniques in Electronic Systems", John Wiley & Sons, New York, 1988
2. Paul, C.R., “Introduction to Electromagnetic Compatibility”, John Wiley & Sons, New York, 1992
3. Kodali, V.P., "Engineering EMC Principles, Measurements and Technologies", IEEE Press, London, 1996.
4. Keiser, Bernhard., "Principles of Electromagnetic Compatibility", Third Edition, Artech House, Dedham, 1986.

Course Outcomes:

On completion of the course the students will be able to

- formulate the various aspects EMI/EMC coupling
- identify a suitable EMI testing and controlling techniques
- develop the EMC design of PCBs

14AEE02 INDUSTRIAL ELECTRONICS

(Common to Applied Electronics & Mechatronics)

3 0 0 3

Pre-requisite : Electron Devices, Electrical Machines, Power Electronics

UNIT – I **9**

Power Semiconductor Devices: Principle of operation – Characteristics of power diodes, SCR, TRIAC, GTO, Power BJT, Power MOSFET and IGBT – Thyristor protection circuits.

UNIT – II **9**

Phase Controlled Rectifiers: Single phase half and full converters – Three phase half and full converters – Triggering circuits. Inverters: Single phase and three phase inverters – Types of PWM techniques: Sinusoidal PWM, modified sinusoidal PWM and multiple PWM.

UNIT – III **9**

DC-DC Converters: Chopper: Principle of operation – Step up and step down chopper – Control Strategies –Voltage, Current and Load commutated chopper.

UNIT – IV **9**

AC-AC Converters: Principle of single phase AC voltage controller – Phase control – ON-OFF control. Cycloconverters: Step up and step down operation - Three phase to single phase and three phase to three phase cycloconverters - Introduction to Matrix Converters

UNIT-V **9**

Solid State DC and AC Drives: DC Drives: Conventional speed control methods for DC motors – DC motor control using rectifiers and choppers – AC drives: Conventional speed control methods for AC motors – Control of induction motor by Voltage, frequency, V/f and slip power recovery scheme. Speed control methods of single phase induction motors and synchronous motors- Sensorless control of Induction motor drives

TOTAL : 45

REFERENCE BOOKS:

1. Muhammad.H.Rashid, "Power Electronics: Circuits Devices and Applications", 3rd Edition, Pearson education, 2003.
2. Ned Mohan, Tore M. Undeland, William P. Robbins, "Power Electronics:- Converters, Applications and Design" 3rd Edition, Wiley India, 2012.
3. K.B.Khanchandani, M.D.Singh, "Power Electronics", 2nd Edition, Tata Mc Graw Hill Publishers, New Delhi, 2006.
4. Gopal K.Dubey, "Fundamentals of Electrical Drives", 2nd Edition, Narosa Book Distributors Pvt. Ltd, 2012.
5. Dubey, G. K, "Power Semiconductor Controlled Drives", Prentice Hall International, New York, 2001.

Course Outcomes:

On completion of the course the students will be able to

- understand the characteristics of power semiconductor devices like SCR, MOSFET, IGBT and their switching waveforms
- analyze the various types of power converters and PWM techniques
- understand the conventional and modern control of AC and DC drives

14PEE10 ENERGY CONSERVATION, MANAGEMENT AND AUDITING

(Common to Power Electronics and Drives & Applied Electronics)

3 0 0 3

Pre-requisites: Transmission and Distribution, Electric Power Utilization and Energy Auditing

UNIT – I **9**

Energy: Energy Scenario – India and World – Energy Resources Availability in India– Energy consumption – Pattern, Energy Conservation Potential – Various Industries and Commercial Establishments, Energy Intensive Industry .

UNIT – II **9**

Energy Conservation and Energy Efficiency – Needs and Advantages. Characteristic Method Employed in Certain Energy Intensive Industries –Various Energy Conservation measures in Steam Systems – Losses in Boiler – Methodology of upgrading Boiler program – Energy Conservation in Refrigeration and Air- conditioning Systems.

UNIT– III **9**

Energy Management: Importance of Energy Management, Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Life Cycle Cost, risk and Sensitivity Analysis, Financing Options, Energy Performance Contract and Role of ESCOS– Energy Consumption, Production, Cumulative sum of differences (CUSUM).

UNIT – IV **9**

Energy Management In Power System: Captive Power Generation Systems – Biomass, Wind and Diesel Power Generation – KVA Demand Estimation – Wheeling and Banking Concept – EB Bill detailing. Basics of Monitoring and Targeting – Elements of Monitoring and Targeting, Data and Information Analysis Techniques

UNIT – V **9**

Energy Audit: Energy Auditing – Principle, Types, Methodologies, Barriers, Role of Energy, Manager and Auditor – Energy Audit Questionnaire – Energy Conservation Act 2003. Purpose and Methodology with respect to Process Industries, Power Plants, Boilers etc. –Performance Evaluation of (i) Transformers (ii) Energy Distribution - Cable Selection and Cable losses (iii) Capacitors (iv) Electric Motors (v) Electrical Heating and Lighting Systems

TOTAL: 45

REFERENCE BOOKS:

1. Hamies, “Energy Auditing and Conservation; Methods, Measurements, Management & Case Study”, Hemisphere, Washington, 1980
2. CB Smith, “Energy Management Principles”, Pergamon Press, New York, 1981
3. Write, Larry C, “Industrial Energy Management & Utilization”, Hemisphere Publishers, Washington, 1998
4. Trivedi, P.R., and Jolka, K.R, “Energy Management, Common Wealth Publication”, New Delhi, 1997
5. “Handbook on Energy Efficiency”, TERI, New Delhi, 2001.
6. Bureau of Energy Efficiency Exam Materials Volume I,II,III and IV

Course Outcomes:

On completion of the course the students will be able to

- apply energy management and energy conservation schemes in electrical systems
- perform economic analysis and load management on Electrical Systems

14MSE20 INTERNET TECHNOLOGIES AND APPLICATIONS

3 0 0 3

Pre requisite: Data Communication Concepts

UNIT-I **9**

Introduction to Internet : Internet-network edge - network core - access networks & physical media – NAPs, ISPs and Internet backbones- delay & loss in packet-switched networks- protocol layers & their service models

UNIT-II **9**

Network Applications: Principles of Network applications- Application layer protocols: World Wide Web Architecture, HTTP and its working principle, File Transfer Protocol, e-mail components and SMTP, Internet directory service DNS-Streaming Audio and Video – Internet Radio- VoIP-Content Delivery.

UNIT-III **9**

Transport and Network Layers: Transport layer services and principles - multiplexing and demultiplexing applications -connectionless transport: UDP - principles of reliable data transfer – TCP connection establishment and termination- Introduction & network service models –Virtual circuit and datagram networks-– Internet Protocol (IP)- forwarding and addressing- Fragmentation and reassembly – IPv6.

UNIT-IV **9**

WEB 2.0: Introduction-search-content networks- blogging- social networking-social media-tagging-social bookmarking-software development-Rich Internet Applications-Web services-location based services-XML- RSS- Atom-JSON-Monetization models-business models-Future of the web.

UNIT-V **9**

XHTML and Cascading Style Sheets: Introduction-Editing XHTML-W3C-Headings-Linking-Images-Lists-Tables-Forms-Internal Linking-meta elements-web resources-CSS-different categories of CSS-positioning elements-backgrounds-element dimensions-box model and text flow-media types-building CSS drop down menu-user style sheets.

TOTAL: 45

REFERENCE BOOKS:

1. Kurose, K.F and Ross, K.W, "Computer Networking: A Top - Down Approach Featuring The Internet", Fifth Edition, Pearson Education, New Delhi, 2009.
2. Tanenbaum, Andrew S. "Computer Networks", Fifth Edition, Pearson Education, New Delhi, 2010.
3. P.J Deitel and H.M.Deitel, “Internet & World Wide Web How to Program”, Fourth Edition, Pearson Education, New Delhi, 2009.
4. http://www.w3schools.com

Course Outcomes:

On completion of the course the students will be able to

- summarize the protocols and technologies involved in the Internet
- build Internet application using WEB 2.0
- create web pages using cascading style sheets

14MME03 MEMS DESIGN

(Common to Mechatronis, Applied Electronics, Control and Instrumentation Engineering & VLSI Design)

3 0 0 3

Pre requisites: Sensors and Instrumentation, Bridge course mechanical

UNIT – I **9**

Materials for MEMS and Scaling Laws: Overview - Microsystems and microelectronics - Working principle of Microsystems – Si as a substrate material - Mechanical properties - Silicon compounds - Silicon piezoresistors - Gallium aresenside - Quartz-piezoelectric crystals - Polymer -Scaling laws in Miniaturization.

UNIT – II **9**

Micro Sensors, Micro Actuators: Micro sensors – Types- Micro actuation techniques- Microactuators – Micromotors – Microvalves – Microgrippers – Micro accelerometer – introduction – Types - Actuating Principles, Design rules ,modeling and simulation, Verification and testing –Applications- Fundamentals of micro fluidics- Micro-pump- Types, Actuating Principles, Design rules ,modeling and simulation, Verification and testing –Applications

UNIT – III **9**

Mechanics for Microsystem Design: Static bending of thin plates - Mechanical vibration - Thermo mechanics - Thermal stresses - Fracture mechanics - Stress intensity factors, fracture toughness and interfacial fracture mechanics-Thin film Mechanics-Overview of Finite Element Stress Analysis.

UNIT – IV **9**

Fabrication Process and Micromachining: Photolithography - Ion implantation - Diffusion – Oxidation – CVD - Physical vapor deposition - Deposition by epitaxy - Etching process- Bulk Micro manufacturing - Surface micro machining – LIGA –SLIGA.

UNIT – V **9**

Micro System Design, Packaging and Applications: Design considerations - Process design - Mechanical design – Mechanical Design using Finite Element Method-Micro system packaging – Die level - Device level - System level – Packaging techniques - Die preparation - Surface bonding - Wire bonding – Sealing – CAD tools to design a MEMS device- Applications of micro system in Automotive industry, Bio medical, Aerospace and Telecommunications.

TOTAL : 45

REFERENCE BOOKS:

1. Mohamed Gad-el-Hak, "The MEMS Hand book", CRC press, 2009.
2. Tai-Ran Hsu, "MEMS and Microsystems Design and Manufacture", Tata McGraw-Hill, New Delhi, 2008.
3. M.-H. Bao, "Micromechanical Transducers: Pressure sensors, accelrometers, and gyroscopes", Elsevier, New York, 2000.
4. Julian W. Gardner, Vijay K. Varadan, Osama and Awadel Karim, O., "Microsensors MEMS and Smart Devices", John Wiley & sons Ltd., New York, 2001.
5. Tai---Ran Hsu, "MEMS & Microsystems: Design, Manufacture, and Nanoscale Engineering", 2nd Edition, Wiley & Sons ISBN: 978---0---470---08301---7, March 2008.
6. Chang Liu, "Foundations of MEMS", Prentice Hall, 2006.
7. IEEE/ASME: Journal on Microelectromechanical Systems.

Course Outcomes:

On completion of the course students will be able to

- understand the basic concepts of microsensors, microactuators and micromechanics
- know the microfabrication and micromanufacturing techniques
- apply the knowledge to design a microsystem for various applications

14AEE03 NON CONVENTIONAL ENERGY SYSTEMS

3 0 0 3

UNIT-I **9**

Introduction: Energy Conservation and Energy Efficiency – Needs and Advantages, Different types of Renewable Energy Sources - Availability of Energy Resources in World –Environmental aspects of energy utilization – Energy Conservation Act 2001 - Statistical Report on Renewable energy scenario in India - Distributed generations.

UNIT-II **9**

Solar Energy and its Power Converters: Introduction to solar energy: Solar radiation, availability, measurement and estimation – Solar thermal conversion devices and storage – solar energy collectors - Solar heating and cooling techniques – Solar desalination – Solar Pond – Solar cooker – Solar Drying – Solar pumping– solar cells and photovoltaic conversion – PV systems – MPPT. Applications of PV Systems.

UNIT-III **9**

Wind Energy and its Power Converters: Introduction – Basic principles of wind energy conversion – wind data and energy estimation – site selection consideration – basic components of wind energy conversion system –Types of wind machines – basic components of wind electric conversion systems. Schemes for electric generations – generator control, load control, energy storage – applications of wind energy – Inter connected systems.

UNIT-IV **9**

Geothermal and Biomass Energy: Introduction, estimation of geothermal power, nature of geothermal fields, geothermal sources, inter connection of geothermal fossil systems, prime movers for geo thermal energy conversion. Application of geothermal energy. Energy from biomass: Introduction, Biomass conversion technologies, photosynthesis, classification of biogas plants. Biomass Energy conversion, Energy from waste.

UNIT-V **9**

Chemical Energy Sources: Introduction – fuel cells – design and principles of operation of a fuel cell – classification of fuel cells. Types of fuel cells – conversion efficiency of fuel cells. Types of electrodes, work output and EMF of fuel cell, Applications of fuel cells. Hydrogen energy: Introduction – hydrogen production – electrolysis, thermo chemical methods, Westing House Electro-chemical thermal sulphur cycle. Fossil fuel methods. Hydrogen storage, Utilization of hydrogen gas.

TOTAL: 45

REFERENCE BOOKS:

1. SP Sukatme, "Solar Energy – Principles of thermal collection and storage, second edition, Tata McGraw Hill, 2008.
2. Rai. G.D, "Non Conventional Energy Sources", Khanna publishes, 1993.
3. Efstathios E (Stathis) Michaelides, "Alternate Energy Sources". Springer Science and Business Media, 2012.
4. D.Y. Goswami, F. Kreith and J.F. Kreider, "Principles of Solar Engineering, 2nd edition CRC press, 2000.
5. D.D. Hall and R.P. Grover, "Bio-Mass Regenerable Energy, John Wiley, Newyork, 1987.
6. J. Twidell and T. Weir, "Renewable Energy Resources", Taylor and Francis, 2006.

Course Outcomes:

On completion of the course the students will be able to

- understand the importance of energy conservation and energy efficiency
- select the appropriate non-conventional energy as an alternate for conventional power in real time applications
- understand the use of future energies like fuel cells and hydrogen

14GEE01 PROJECT MANAGEMENT

(Common to Applied Electronics & Power Electronics and Drives)

3 0 0 3

UNIT – I **9**

Philosophy and Concepts: Need – Goals- Evolution-Different Forms -Project Management in Manufacturing, Service and Government Sectors; Systems Development Cycle – Conception phase: proposal, contracting – Definition phase – Execution phase: production / build, implementation – Operation phase- System Development in Industries, service and government sectors - case study.

UNIT – II **9**

Planning Fundamentals: Planning Steps – Project master plan - Tools for project planning – work break down structure, responsibility matrix, events and mile stones- Gantt charts. Network Scheduling – the critical path – early & late times – slack –float – calendar scheduling.

UNIT – III **9**

PERT: Time estimates – probability of finishing by target completion date – criticisms of PERT - CPM – Time cost relationship – reducing project duration – shortest duration – total project cost; Scheduling with Resource Constraints – resource loading and leveling – constrained resources; Introduction to GERT network - case studies in PERT/CPM.

UNIT – IV **9**

Project Cost Estimation: Process – classification-expert opinion, analogy estimate, parametric estimate, cost engineering, Contingency amount - Elements of budgets and Estimates – direct labour, direct non- labour, overhead, general and administrative expenses, profit and total billing.Project cost accounting – budgeting using cost accounts - cost summaries, cost schedules and forecasts – case study. Project Management Information Systems (PMIS): Functions – Computer based PMI Systems – Web-Based project management

UNIT – V **9**

Project Control : Cost accounting systems- project control process - Project control emphasis- Performance Analysis – cost, schedule, work package analysis, performance indices, updating time estimates, technical performance measurement- Performance Index monitoring – variance limits, controlling changes, contract administration, control problems, case study.

Project Evaluation: Review meetings, reporting, terminating, termination responsibilities, closing the contract, project extensions, project summary evaluation.

TOTAL : 45

REFERENCE BOOKS:

1. Nicholas, John M., "Project Management for Business and Technology", Prentice Hall India, New Delhi, 2011.
2. Pagnoni, Anastasia., "Project Engineering: Computer Oriented Planning and Operational Decision Making", Springer-Verlag, Berlin, 2012
3. Pannerselvam R, "Project Management"' PHI Learning Pvt, Ltd ,2010.

Course outcomes:

On completion of the course the students will be able to

- develop a system development cycle for their technical/business project
- develop an understanding of managing project management system
- develop a procedure for planning, scheduling, budgeting for project activities, analyzing, controlling and evaluating the work to achieve project goal in the work place

14CIE01 SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL

(Common to Control and Instrumentation Engineering & Applied Electronics)

3 0 0 3

UNIT – I **9**

System Identification:

Introduction: Dynamic systems, Models for Linear Time-invariant Systems, Time varying systems and nonlinear systems, The system identification procedure. **Non-parametric methods**- Transient analysis, Frequency analysis, Correlation analysis and Spectral analysis.**Parametric methods**: Least Square- Prediction error method -Maximum Likelihood – Instrumental Variable methods

UNIT – II **9**

Recursive methods and Closed Loop Identification :

Recursive methods: Recursive least squares method- The recursive prediction error method - Recursive instrumental variable method- Input signal design for identification. **Identification of systems operating in closed loop**: Identifiability considerations – Direct and indirect identification – Joint input / output identification.

UNIT – III **9**

State Estimation:

Linear Optimal State Estimation: Kalman filter **-** Stability Analysis **Non-Linear State Estimation:** Extended Kalman filter – Bucy filter **Adaptive Strate Estimation:** Parameter Identification via Extented Kalman filter

UNIT – IV **9**

Adaptive Control Schemes:

Internal Model Control (IMC) schemes: Known parameters -Adaptive Internal Model Control schemes – Stability and robustness analysis. **Robust adaptive control:** Problem formulation - Ordinary direct adaptive control with dead zone – New robust direct adaptive control - Robust adaptive control with least prior knowledge. Indirect adaptive periodic control: Problem formulation – Adaptive control scheme and control law.

UNIT – V **9**

Applications of Adaptive Control:

Optimal adaptive tracking for nonlinear systems: Problem statement – Adaptive tracking – adaptive back stepping – Inverse concepts – Design of strict feedback system. **Adaptive inverse for actuator compensation**: Plants with actuator non-linearities – Parameterized inverses – State feedback designs– Output feedback inverse control and designs – Designs for multivariable systems and non-linear dynamics. Stable MIMO adaptive fuzzy/ neural control.

TOTAL : 45

REFERENCE BOOKS:

1. Torsten Soderstrom T and Petre Stoica, "System Identification", Prentice Hall International, Second Edition, London, 2001.
2. Gang Feng and Rogelio Lozano, "Adaptive Control Systems", Newnes publisher, First Edition, Jordan Hill, 1999.
3. Lennart Ljung, "System Identification: Theory for the User", Prentice-Hall, Second Edition, New Jersey, USA, 1999.
4. Karl J.Astrom and Bjorn Wittenmark, 'Adaptive Control", Pearson Education, Second Edition, New Delhi, 2003.
5. Eveleigh,V.W. "Adaptive Control and optimization Techniques", Tata McGraw Hill Newyork,1967.

Course Outcomes:

On completion of the course the students will be able to

- understand the basics of system identification
- gain the knowledge of identification methods
- apply the concepts of closed loop method and state estimation
- know the adaptive control schemes and their applications

14MME06 VIRTUAL INSTRUMENTATION

(Common to Mechatronics, Applied Electronics & Power Electronics and Drives)

3 0 0 3

Pre-requisites: Sensors and Instrumentation

UNIT – I **9**

Introduction to Virtual Instrumentation: Historical perspective and traditional bench top instruments, advantages of virtual instrument, block diagram of virtual instrument, physical quantities and analog interfaces - User Interfaces and architecture of a virtual instrument and its relation to the operating system.

UNIT – II **9**

LabVIEW Programming Basics –I: Front panel - Block diagram, Tools, Control and Function palette, modular programming - VI and sub VI –structures –FOR – WHILE loops, Case, Sequence Structures, event structures- Formula nodes- local and global variables.

UNIT – III **9**

LabVIEW Programming Basics –II: Arrays, Clusters, string and File – High level and Low level file I/O – Time and Dialog control- Waveform- graph- chart operations- string functions- Report generation and publishing measurement data in web.

UNIT – IV **9**

Data Acquisition System: Instrument control – GPIB – VISA – instrument drivers-serial port communication. Data Acquisition review: Review of Transducer and Signal conditioning, DAQ hardware- AI- AO- DI/O- DAQ assistant and configurations.

UNIT – V **9**

Applications of Virtual Instrumentation: Networking basics for office and industrial applications - Development of process database management system – Simulation of system using VI - Image acquisition and processing – Motion control.

TOTAL : 45

REFERENCE BOOKS:

1. Jeffery Travis and Jim kring, “LabVIEW for Everyone: Graphical Programming Made Easy and Fun”, Third Edition, Pearson Education, India, 2009.
2. Gupta, Joseph, John, “Virtual Instrumentation using LabVIEW”, Second Edition, Tata McGraw Hill, 2010.
3. Wells, Lisa K. Travis and Jeffrey, “LabVIEW for Everyone”, Prentice Hall of India, New Delhi, 2009.
4. Bruce mihure, Austin and Texas, “LabVIEW for data acquisition”, Prentice Hall of India, New Delhi, 2001.
5. LabVIEW Basics I and II Manual, National Instruments, India, 2013.
6. Barry E. Paton, “Sensor, Transducers and LabVIEW”, Prentice Hall of India, New Delhi, 2000.

Course Outcomes:

On completion of the course the students will be able to

- illustrate the fundamentals of Virtual Instrumentation
- develop LabVIEW programming
- interface data acquisition system with real-time applications

14VLE01 LOW POWER DESIGN OF VLSI CIRCUITS

(Common to VLSI Design & Applied Electronics)

3 0 0 3

Pre-requisites: VLSI Design Techniques

UNIT – I **9**

Power dissipation in CMOS: Hierarchy of limits of power – Sources of power consumption – Physics of power dissipation in CMOS FET devices – Long Channel and Submicron Effect-Basic principle of low power design.

UNIT – II **9**

Power optimization : Logic level power optimization – Circuit level low power design – circuit techniques for reducing power consumption in adders and multipliers.

UNIT – III **9**

Design of Low Power CMOS circuits : Computer arithmetic techniques for low power system – reducing power consumption in memories – low power clock, Inter connect and layout design – Advanced techniques –Special techniques.

UNIT – IV **9**

Power estimation: Power Estimation techniques – logic power estimation – Simulation power analysis –Probabilistic power analysis.

UNIT – V **9**

Synthesis and software design for low power : Synthesis for low power – Behavioral level transform – software design for low power.

TOTAL: 45

REFERENCE BOOKS::

1. Kaushik Roy and S.C.Prasad, “Low power CMOS VLSI circuit design”, Wiley, 2000.
2. Dimitrios Soudris, Chirstian Pignet, Costas Goutis, “Designing CMOS Circuits for Low Power”, Kluwer, 2002.
3. J.B.Kulo and J.H Lou, “Low voltage CMOS VLSI Circuits”, Wiley 1999
4. A.P.Chandrasekaran and R.W.Broadersen, “Low power digital CMOS design”, Kluwer,1995
5. Gary Yeap, “Practical low power digital VLSI design”, Kluwer, 1998.
6. Abdelatif Belaouar, Mohamed.I.Elmasry, “Low power digital VLSI design”, Kluwer, 1995.
7. James B.Kulo, Shih-Chia Lin, “Low voltage SOI CMOS VLSI devices and Circuits”, John Wiley and sons, inc. 2001.

Course Outcomes:

On completion of the course the students will be able to

- analyze different sources of power dissipation in CMOS
- implement various power optimization technique at circuit level, architecture level and programming level

14AEE04 DIGITAL IMAGE PROCESSING

(Common to Applied Electronics & Computer Science and Engineering)

3 0 0 3

Pre-requisites: Digital Signal Processing

UNIT – I **9**

Introduction: Elements of Digital Image processing-Elements of visual perception: light – luminance – brightness, contrast, hue, saturation, mach band effect– simultaneous contrast. Two dimensional sampling theory. **2D Image Transforms:** DFT, DCT, Hadamard, Haar, Walsh, KL and SVD.

UNIT – II **9**

Classification of Image Processing operations: Arithmetic operations – Logical operations-Geometrical operations – Interpolation techniques

Image Enhancement: Image quality and need for enhancement – Image enhancement point operations: Linear and non-linear functions – piecewise linear functions – Histogram based techniques. Spatial Filtering: Image smoothing spatial filters – Image sharpening spatial filters.

UNIT – III **9**

Image Restoration: Image restoration model – Noise modeling- Image restoration in the presence of noise only: Mean filters – Order-statistics filters. Image restoration techniques: Constrained method – Unconstrained method: Wiener filter – Inverse Filter

Image Segmentation: Edge detection – Types of edge detectors - Segmentation based on thresholding-Region based: Region growing-Region splitting and merging.

UNIT – IV **9**

Image Morphology: Need for morphological processing – Morphological operators – Hit or Miss Transform –Basic morphological algorithms : Boundary extraction – Noise removal – Thinning – Thickening – Skeletonization

Image Compression: Need for Compression- Run length encoding-Huffman coding-Arithmetic coding – Predictive Coding -Transform based compression-Vector quantization- Block truncation coding- Wavelet based image compression

UNIT – V **9**

Image Representation: Representation: chain codes – polynomial approximations – signatures – boundary descriptors – Regional descriptors: Texture regional descriptor.

Colour Image Processing: Light and color- Colour formation: Additive and subtractive, colour models-RGB, HIS and its conversions-Histogram equalization- Colour image segmentation.

TOTAL : 45

REFERENCE BOOKS:

1. Gonzalez, Rafel C. and Woods, Richard E., “Digital Image Processing”, Second Edition, Prentice Hall, New York, 2006.
2. Jain, Anil K., “Fundamentals of Digital Image Processing”, Prentice Hall of India, New Delhi, 2003
3. S.Sridhar, “ Digital Image Processing “, Oxford University Press, Newdelhi,2011.
4. Jayaraman. S, Esakkirajan. S, and Veerakumar. T, “Digital Image Processing” Tata McGraw-Hill, New Delhi 1st ed 2009 .

Course Outcomes:

On completion of the course the students will be able to

- understand digital image processing fundamentals, sampling and quantization concepts for 2D images
- apply image processing techniques in both the spatial and frequency domains using various transform techniques
- develop simple algorithms for smoothening, sharpening and segmentation of 2D images
- use various image processing techniques for real time applications

14VLT14 DEVICE MODELING

(Common to VLSI Design & Applied Electronics)

3 0 0 3

Pre-requisites: Electron Devices

UNIT – I **9**

Semiconductor Physics and Modeling of Passive Devices: Carrier Concentration- Transport Equation- Mobility and Resistivity- Carrier Diffusion- Carrier Generation and Recombination-Continuity equation- Modeling of Resistors-Modeling of Capacitors-Modeling of Inductors.

UNIT – II **9**

Diode and Bipolar Device Modeling : Abrupt and linear graded PN junction- Ideal diode current equation- Static, Small signal and Large signal models of PN junction Diode-SPICE model for a Diode- Temperature and Area effects on Diode Model Parameters Transistor Action-Terminal currents -Switching- Static, Small signal and Large signal Eber-Moll models of BJT-Temperature and area effects

UNIT – III **9**

MOSFET Modeling: MOS Transistor – NMOS- PMOS – MOS Device equations - Threshold Voltage – Second order effects - Temperature Short Channel andNarrow Width Effect- Models for MOSFET.

UNIT – IV **9**

Noise Models and BSIM4 MOSFET Model: Noise Sources in MOSFET-Flicker Noise Modeling-Thermal Noise Modeling- BSIM4 MOSFET Model-Gate Dielectric Model-Enhanced Models for Effective DC and AC Channel Length and width-Threshold Voltage Model-I-V Model.

UNIT – V **9**

Other MOSFET Models: EKV Model-Model Features-Long Channel Drain Current Model-Modeling Second order Effects of Drain Current-Effect of Charge Sharing-Modeling of Charge storage Effects-Non-quasi static Modeling-Noise Models-Temperature Effects-MOS Model 9-MOSAI Model

TOTAL: 45

REFERENCE BOOKS::

1. Massobrio Giuseppe and Antognetti Paolo, “Semiconductor Device Modeling with SPICE”, Second Edition, McGraw-Hill Inc, New York, 1993
2. Sze S. M., “Semiconductor Devices-Physics and Technology”, 2nd Edition, John Wiley and Sons, New York, 2002.
3. Trond Ytterdal,Yuhua Cheng and Tor A.Fjeldly,,”Device Modeling for Analog and RF CMOS Circuit Design”John Wiley &Sons Ltd ,2003.
4. M.S. Tyagi, “Intorduction to Semiconductor Materials and Devices”, John Wiley, New York, 2003
5. Ben,G.Streetman, “Solid State Circuits”, 5th Edition, Prentice Hall of India, New Delhi, 2005.
6. De Graaf H.C and Klaasen F M.- “Compact Transistor Modeling for Circuit Design”, SpringerVerlag, New York,1990.

Course Outcomes:

On completion of the course the students will be able to

- analyze different properties and characteristics of semiconductor devices for developing applications
- model and simulate diodes and transistors

14AEE05 QUANTUM AND GRID COMPUTING

3 0 0 3

Pre-requisites: Data structures and Analysis of Algorithms

UNIT – I **9**

Grid Computing: Introduction - Anatomy and Physiology of Grid-Review of Web Services-OGSA-WSRF. Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- Grid Security

UNIT – II **9**

Grid Scheduling :A Brief Security Primer-PKI-X509 Certificates - Grid Scheduling and Resource Management -Scheduling Paradigms - Working principles of Scheduling - A Review of Condor, SGE, PBS and LSF - Grid Scheduling with QoS Grid Portals

UNIT – III **9**

Generation And Case Studies: First- Generation Grid Portals - Second-Generation Grid Portals. List of globally available grid Middlewares - Case Studies - Current version of Globus Toolkit and gLite - Architecture, Components and Features.

UNIT – IV **9**

Quantum Computing :Introduction - Overview of traditional computing – Church-Turing thesis – circuit model of computation –reversible computation – quantum physics and computation – Dirac notation and Hilbert Spaces – dual vectors – operators – the spectral theorem – functions of operators – tensor products – Schmidt decomposition theorem

UNIT – V **9**

Qunatum System And Algorithms :State of a quantum system – time evolution of a closed system – composite systems – measurement – mixed states and general quantum operations – Superdense coding – quantum teleportation – probabilistic versus quantum algorithms –the Deutsch algorithm – Jozsa algorithm – Simon's algorithm – Shor's algorithm for order finding – quantum counting

TOTAL : 45

REFERENCE BOOKS:

1. Maozhen Li, Mark Baker, "The Grid: Core Technologies", John Wiley & Sons, 2005.
2. P. Kaye, R. Laflamme, and M. Mosca, "An introduction to Quantum Computing", Oxford University Press, 1999.
3. Joshy Joseph and Craig Fellenstein, "Grid Computing", Pearson Education , 2004
4. Fran Berman, Geoffrey Fox, Anthony J.G.Hey, "Grid Computing: Making the Global Infrastructure a Reality", Wiley, 2003.
5. V. Sahni, "Quantum Computing", Tata McGraw-Hill Publishing Company, 2007.

Course Outcomes:

On completion of the course the students will be able to:

- describe Grid Architecture and Grid systems
- discuss the Grid Management and scheduling principles
- conceptualize the quantum Computing and quantum algorithms

14AEE06 HIGH PERFORMANCE COMMUNICATION NETWORKS

3 0 0 3

UNIT – I **9**

Packed Switched Networks: OSI and IP Models, Ethernet,(IEEE 802.3), Token IEEE 802.5) Wireless LAN (IEEE 802.11) FDDI,DQDB,SMDS: Internet Working with SMDS.

UNIT – II **9**

ISDN and broadband ISDN:ISDN Overview, Interfaces and Functions, layers and Services-Signalling Systems, Broadband ISDN- Architecture and Protocols

UNIT – III **9**

ATM and frame relay: ATM: Main Features- Addressing, Signaling and Routing, ATM Header structure-Adaptation Layer, Management and Control, ATM Switching and Transmission.
Frame Relay: Protocols and Services, Congestion Control ,Internet working with ATM, Internet and ATM, Frame relay via ATM.

UNIT – IV **9**

Advanced Network Architecture: IP forwarding architectures overlay model – Multi Protocol Label Switching (MPLS) – Integrated services in the Internet – Resource Reservation Protocol (RSVP) – Differentiated services

UNIT -V **9**

Blue Tooth Technology: The Blue tooth module – Protocol stack Part I: Antennas – Radio interface – Base band – The Link controller – Audio – The Link Manager – The Host controller interface -The Blue tooth module – Protocol stack Part I: Logical link control and adaptation protocol – RFCOMM – Service discovery protocol – Wireless access protocol – Telephony control protocol

TOTAL : 45

REFERENCE BOOKS:

1. Jean Walrand and Pravinvaraiya , “High Performance Communication networks”, 2nd Edition, Harcourt and Morgan Kauffman, London, 2000.
2. William Stallings, “ISDN and Broadband ISDN with Frame Relay and ATM”, 4th Edition, Pearson education Asia, 2002.
3. Kasera Pankaj Sethi, “ATM Networks”, Tata McGraw-Hill, New Delhi, 2000
4. Leon Gracia, Widjaja, ”Communication Networks”, Tata McGraw-Hill, New Delhi, 2000
5. Jennifer Bray and Charles F.Sturmen, “Bluetooth”, Pearson Education, Asia, 2001.

Course Outcomes:

On completion of the course the students will be able to

- understand architectures and mechanisms of high-performance communication networks
- learn communication network analysis and design of service, availability, and security
- gain knowledge about various networks, and protocols

14AEE07 DSP PROCESSORS AND ARCHITECTURE

3 0 0 3

Pre-requisites: Digital Signal Processing, Microprocessors and Microcontrollers

UNIT – I **9**

Introduction To Digital Signal Processing Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems, DSP using MATLAB.

UNIT – II **9**

Computational Accuracy in DSP Implementations Number Formats for signals and coefficients in DSP systems, Dynamic range and precision, Sources of error in DSP implementations, A/D conversion errors, DSP computational errors, D/A conversion errors, Compensating filter.

UNIT – III **9**

Architectures for Programmable DSP Devices : Basic architectural features, DSP computational building blocks, Bus architecture and memory, Data addressing capabilities, Address generation unit, Programmability and program execution, Speed issues, Features for external interfacing.

Execution Control and Pipelining : Hardware looping, Interrupts, Stacks, Relative branch support, Pipelining and performance, Pipeline depth, Interlocking, Branching effects, Interrupt effects, Pipeline programming models

UNIT – IV **9**

Programmable Digital Signal Processors Commercial digital signal-processing devices, Data addressing modes of TMS320C54XX DSPs, Memory space of TMS320C54XX Processors, Program control, TMS320C54XX instructions and programming, On-Chip peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX processors

UNIT – V **9**

Interfacing Memory And I/O Peripherals to Programmable DSP Devices Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA)- A multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example

TOTAL : 45

REFERENCE BOOKS:

1. Avatar Singh, S. Srinivasan, "Digital Signal Processing- Implementation using DSP Microprocessors with Examples from TMS320C54xx", Thomson India,2004
2. B Venkataramani and M Bhaskar "Digital Signal Processors, Architecture, Programming and Applications", TMH, 2nd, 2010
3. Peter Pirsch "Architectures for Digital Signal Processing", John Weily, 2007
4. Lapsley et al, "DSP Processor Fundamentals, Architectures & Features", S. Chand & Co, 2000.

Course Outcomes:

On completion of the course the students will be able to

- identify the basic architectural elements of DSP hardware
- illustrate the control and pipelining techniques
- develop applications based on TMS320C54XX Processors
- realize the interfacing techniques of peripheral devices

14CIE17 PROGRAMMABLE LOGIC CONTROLLERS

(Common to Applied Electronics & Power Electronics and Drives)

3 0 0 3

UNIT – I **9**

Introduction to Programmable Logic Controller: Overview of Programmable Logic Controller - Parts of a PLC – Principles of operation - modifying the operation - PLC vs Computer - PLC Size and applications - I/O Modules: Discrete, Analog, Special – I/O Specifications – CPU – Memory design and types – Programming devices – Recording and Retrieving data – PLC Workstations

UNIT – II **9**

Basic PLC Programming: Fundamentals of Logic – Processor Memory Organization – Program Scan – PLC programming languages – Relay-Type Instructions - Instruction addressing – Branch and Internal relay instructions – Entering the Ladder diagram – Electromagnetic Control relays – Contactors – Motor Starters – Manual operated switches and Mechanically operated switches

UNIT – III **9**

Advanced PLC Programming: Programming Timers – Programming Counters – Program Control Instructions – Data Manipulation Instructions – Math Instructions – Sequencer and Shift Register Instructions.

UNIT – IV **9**

PLC Installation and Troubleshooting: PLC Enclosures – Electrical Noise – Leaky Inputs and Outputs – Grounding – Voltage Variations and Surges – Program Editing – Programming and Monitoring – Preventive Maintenance – Connecting PC and PLC – Process Control: Types of processes – structure of control system – Controllers – Data Acquisition Systems

UNIT – V **9**

PLC Communication and its Applications : Computer Fundamentals – Computer-Integrated Manufacturing – Data Communications – Computer numeric control – Robotics - PLC Applications: Bottle filling system – pneumatic stamping system – material handling system – PLC in Individual process – Continuous process – Container filling system – liquid heating system.

TOTAL : 45

REFERENCE BOOKS:

1. Frank D. Petruzella, "Programmable Logic Controllers" Tata McGraw-Hill Edition, New Delhi,2010
2. Webb John W and Reis Ronald A., "Programmable Logic Controllers", Prentice Hall Publications, New Delhi, 2005
3. Bolton W, "Programmable Logic Controllers", ELSEVIER , New York, 2006
4. Rockwell Automation, "Logix 5000 Controllers" – system reference

Course Outcomes:

On completion of the course the students will be able to

- understand the basics of PL hardware and PLC programming
- design a PLC system, component, or process to meet a set of specifications
- apply the PLC in various industrial applications

14CIE18 SCADA AND DCS

(Common to Applied Electronics & Power Electronics and Drives)

3 0 0 3

Pre-requisites: Digital Logic Circuits

UNIT – I **9**

Automation: Fundamentals of industrial automation, need and role of automation, evolution of automation. HMI systems, Text display – operator panels – Touch panels – Panel PCs – Integrated displays (PLC & HMI), Rack installation, Grounding and shielding, physical, electrical, maintenance requirements-Troubleshooting.

UNIT – II **9**

SCADA: Concept of SCADA systems, Programming techniques for : Creation of pages, Sequencing of pages, Creating graphics & animation, Dynamos programming with variables, Trending, Historical data storage & Reporting, Alarm management, reporting of events and parameters. Comparison of different SCADA packages. Application Development using SCADA system.

UNIT – III **9**

DCS Introduction: Location of DCS in Plant, functions, advantages and limitations, Comparison of DCS with PLC. DCS components/ block diagram, Architecture, Functional requirements at each level. Layout of DCS, Controller Details, Redundancy, I/O Card Details, Junction Box and Marshalling Cabinets.

UNIT – IV **9**

Distributed Control System: Distributed Control Systems (DCS) – Difference between SCADA system and DCS –local control unit – programming language – communication facilities – operator interface – engineering interfaces.

UNIT – V **9**

Applications: Applications of SCADA & DCS – Case studies of Process plants using SCADA & DCS – Advanced features / options in SCADA & DCS – Role of PLC in DCS and SCADA – comparison – field devices (Transducers, drives etc) in DCS / SCADA.

TOTAL : 45

REFERENCE BOOKS:

1. Lukas, Michael P., "Distributed Control Systems", Van Nostrand Reinfold Company, 2002.
2. Dobrivojie Popovic, Vijay P. Bhatkar, "Distributed Computer Control for Industrial Automation", CRC Press, 1990
3. WiNCC Software Manual, Siemens, 2003.
4. RS VIEW 32 Software Manual, Allen Bradly, 2005.
5. CIMPLICITY SCADA Packages Manual Fanuc India Ltd, 2004.

Course Outcomes:

On completion of the course the students will be able to

- understand the basics of SCADA and DCS programming
- design a DCS and SCADA system for a process to meet a set of specifications
- apply the SCADA and DCS in various industrial applications