PH.D. COURSE WORK: Theory paper II
(One paper out of two)

Advances in Electronics Engineering-I
Lectures: 4 Hrs./Week Theory: 100 Marks
Note: All Units are compulsory

UNIT 1

Mixed Signal Analysis: Signal integrity, techniques, equivalent models, characteristics, limitations, mixed signal processing, simulation, physical parameters.

Nano Technology: Present devices and materials, Advance materials such as Carbon nano tub es etc., advance devices, constraints, applications, Trad e o ffs.

UNIT 2

RF Systems: The techniques of RF amplifier, mixer and local oscillator designs, Advanced YIG and narrow band filters, amplifiers, Transmission line design, Design challenges in satellite frequency bands. **Microwave and Antennae:** Microwave sources, Passive devices, MMIC, MMIC fab rication techniques, Thick and Thin film technologies and materials, Microstrips, Microwave antennae.

UNIT 3Speech Processing: Speech recognition and synthesis techniques, modeling the speech signal, various algorithms, trade-offs and implementation issues.

Biomedical Engineering: Biomedical Signals, Bio medical Systems, Analysis, Implementation issues, Performance measures.

UNIT 4

Mo dern Control Theory: Control mechanisms and their modeling, Implementation aspects and related trade-offs, various applications, Selection criteria s of control systems for various applications, Perfo rmance evaluation techniques.

Huma n Machine Interface: Different techniques used for HMI, Algorithms, Related issues and constraints, Performance issues, Applications.

Ma chine Visio n: Human vision, Expert systems, Algorithms, Implementation issues and trade offs, Performance measures and analysis.

Reference Books:

1. Franssila S., “Introduction to Micro fabrication”, John Wiley Publications.
2. M. Burns, “Introduction to Mixed Signal IC Test and Measurement”, Oxford University Press Publications, New York.
3. Xilinx, “The Programmable Logic Data Book”, Xilinx, California.
4. Hu, Yu Hen, “Handbook of Neural Network Signal Processing”, CRC Press Publications.
5. Peebles, “Probability and Rando m Signals”, McGraw Hill Publications.
6. Balanis, “Antenna Theory analysis and Design”, John Wiley Publications.
7. Collin E.R., “Foundations for Microwave Engineering”, McGraw Hill Publications.
8. Freeman R.L., “Radio System Design for Telecommunication”, John Wiley Publications
9. Tompkins J.W., “Biomedical Digital Signal Processors”, PHI Publications.
10. Gold B., “Speech and Audio Signal Processing”, John Wiley Publications.
11. Kuo B.C., “Digital Control System”, Sound ers College Publications, New York.
12. *Carsten Steger, Markus Ulrich, Christian Wiedemann* **, “** Machine *Vision Algorithms and Applications”,* Wiley-VCH, Weinheim Publications.
13. Pires, J. Norberto, “Human Machine Interface for Industrial Robotic Cells”, Springer Publication s.
14. Park J., “Practical Embedded Controllers”, Elsevier Publications, Amsterdam.

Advances in Electronics Engineering-II

Lectures: 4 Hrs./Week Theory: 100 Marks

Note: All Units are compulsory

Unit 1

Microelectronics and VLSI: Microelectronic devices, characteristics, mathematical modeling, performance parameters, design aspects, parasitics, integration issues, layout rules, optimization techniques.

RFIC Design: RF Amplifiers, characteristics, mathematical models, power relations, stability considerations, stability circles, unconditio nal stability, stabilization methods, designs,
circles, circles.

Unit 2

Coding and Modulation Techniques: Digital communication system architectures, Source coding, Channel cod ing, Performance measures of co mmunication systems, PLD based system implementatio ns and related issues.

Communication Network: Various IEEE standards, Performance issues, Trade-offs, Network architectures, Security algorithms with their performance measures.

Wireless & Broadband Communication: IEEE/ITU/ ETSI communication standards and specifications, various trade-offs in functionality, implementation, Transmitter/Receiver architectures and related issues, Wireless embedded approach, Antennae and fro nt end design issues.

Unit 3

Advanced Topics in Signal Processing: Modeling different Signals and systems, various transforms, System design and Implementation issues, DSP architectures and related issues, Evaluation parameters for the various app lications.

Image Processing & Pattern Recognition:
Image representation formats, noise, processing techniques, Performance measures,
various algorithms, Pattern classifications and recognition techniques, Biometrics.

Unit 4

Processor Architectures: Design philosophy of RISC, CISC, Multi-core, Various processor architectures, Design of microco ntroller CPU.

Programma ble Architectures and Memories:
HDL programming, PLDs, floating point arithmetic, multipliers, modeling a sequential
machine, Barrel shifter, HDL mod els for memories and buses.

System on Chip and MEMS:
Chip architecture, Clock & power related issues, SRC, DRC, I/O architectures, Wire parasitic, Design validation, MEMS.

Reference Books:

1. M.J. Roberts, “Signals and Systems”, Tata McGraw Hill Publications, 2003.
2. Yacoub M.D., “Wireless Technology”, CRC Press Publications.
3. Comer “Digital Logic and State Machine Design”, Sounders College Publications, New York.
4. Prokis J.G., “Digital Signal Processing”, PHI Publications.
5. Alley, Charles L, “Micro Electronics”, McGraw Hill Publications.
6. Ha, Tri T., “Digital Satellite Communication”, McGraw Hill Publications.
7. Gray R.P.,” Analysis and Design of Analog ICs”, John Wiley Publications.
8. Kronsjo L., “Advances in Parallel Algorithm”, Blackwell Scientific Publication, London.
9. Xavier, Eugune S.P., “Statistical Theory of Communication”, New Age International Publication.
10. Baker R.J., “CMOS: Circuit Design, Layo ut and Simulation”, IEEE Press Publication.
11. McGillen C.D., “Continuous and Discrete Signal and System Analysis”, Oxford University Press.
12. Russ J.C., “The Image Processing Handbook”, CRC Press Publications.
13. Kabatiansky G., “Error Correcting Cod ing and Security for Data Network”, John Wiley Publications.
14. Lee K., “Semiconductor Device Modeling For VLSI”, PHI Publications.
15. Maxfield C.M., “The Design Warriors Guide to FPGA”, Elsevier Publications, Amsterdam.

PH.D. COURSE WORK: Theory paper III

(OPTIONAL PAPERS BASED ON SPECIALISATION: 1 OUT OF 13 PAPERS)

1. Mathematical Methods and Algorithms

Lectures: 3 Hrs./Week **Theory: 80 Marks**
Tutorial: 1 hrs/week **Term Work: 20 Marks**

Unit I

Introduction and Foundations: signal processing, Mathematical models,
Vector Spaces and Linear Algebra: Signal Spaces, Representation and Approximation in Vector Spaces, Linear operators and matrix inverses, matrix factorizations, Eigenvalues and Eigenvectors, Singular Value Decomposition (SVD), Kronecker Products and the vec operator

Unit II

Detection, Estimation, and Optimal Filtering: Detection theory, estimation theory, The Kalman Filter, Game theory and decision theory

Unit III

Iterative and Recursive Methods in Signal Processing: Basic concepts and methods of iterative algorithms, Iteration by composition of mappings, Clustering, Iterative methods for computing inverses of matrices, Algebraic reconstruction techniques (ART), Conjugate direction methods, The EM Algorithms

Unit IV

Methods of Optimization: Theor y of constrained optimization, linear programming and applications, shortest path algorithms and dynamic programming, Convex Optimization techniques.

References

1. Mathematical Methods and Algorithms for Signal Processing, Todd K. Moon, Wynn C. Stirling , Prentice-Hall, 2000
2. Fundamentals of Statistical Signal Processing, Volume 1: Estimation Theory ,Steven M. Kay, Prentice-Hall PTR, 1998
3. Fundamentals Of Statistical Processing, Volume 2: Detection Theor y ,Steven M. Kay, Prentice-Hall PTR, 1998
4. Convex Optimization, Stephen Boyd and Lieven Vandenberghe, Cambridge University Press.

2. MICROELECTRONICS DESIGN

Lectures: Theory: 3 Hrs./Week **Theory: 80 Marks**
Tutorial: 1 hrs/week **Term Work: 20 Marks**

UNIT 1

CMOS parasitics, technology scaling, CMOS Inverter, Voltage transfer Characteristics, Basic gates, W/L calculations, Static & dynamic power dissipations, PDP, Transmission gate, Applications of transmission gate,

UNIT 2

CMOS layout techniques, Subsystem design & layout, Domino logic, NORA logic, Transient response, Ultra fast VLSI ckts & materials used. Mixed signal design issues, MOS switch, MOS diode/active resistor; current sinks, Current sources; Inverters, Cascode amplifier, Difference amplifier design.

UNIT 3

Data objects, data types, modeling methods, subprograms, packages, configuration, attributes, synthesizable & non-synthesizable statements, VITAL, VHDL codes for FSM, Processing elements, memory.

UNIT4

Signal integrity issues, Floor planning methods, global routing, switch box routing, clock distribution, multiphase clock, off chip connections, I/O architectures, pad design, packages.

References

1. Allen and Holberg, “CMOS Analog Circuit Design”, Oxford Publication.
2. Pucknell and Kamran, “CMOS VLSI Design”, PHI Publication.
3. Perry, “VHDL”, TMH Publication.
4. Wayne Wolf, “Modern VLSI Design”, Pearson Publication.

3. ADVANCED DIGITAL SYSTEM DESIGN

Lectures: Theory: 3 Hrs./Week **Theory: 80 Marks**
Tutorial: 1 hrs/week **Term Work: 20 Marks**

UNIT 1

Digital System Design aspects for RISC and CISC CPU architectures, Control and Data path units of Processor, Practical design aspects for high frequency digital design such as clock skew and synchronous / asynchronous input signal handling.

UNIT2

Hazard analysis, fault tree analysis. Estimation of digital system reliability. System integrity. Design of digital system for network applications such as ATM switch design, ATM packet generator, ATM packet decoder.

UNIT3

Hardware testing and design for testability: Testing combinational and sequential logic, scan testing, boundary scan and BIST.

UNIT4

VHDL models for memories and buses such as SRAM memory, 486 bus model and memory interfacing with microprocessor bus.

Floating point arithmetic operations such as multiplications and others. Digital system design for asynchronous serial data transfer.

References

1. John F. Wakerly,"Digital Design principles and practices", 3 rd edition, PHI publications
2. Charles H. Roth, "Digital system design using VHDL", Thomson Publication
3. Balabanian, "Digital Logic Design Principles", Wiley publication.
4. Stephen Brown, "Fundamentals of digital logic", TMH publication.

4. WIRELESS AND MOBILE TECHNOLOGIES

Lectures: Theory: 3 Hrs./Week **Theory: 80 Marks**
Tutorial: 1 hrs/week **Term Work: 20 Marks**

UNIT 1

Wireless Communication Systems, Characteristics of radio propagation, Fading, Multipath propagation Mobile Networking: Mobile-IP, Ad-Hoc Networks and Ad-Hoc Routing,

UNIT 2

Wireless Protocols: Wireless TCP, Session Mobility, MAC protocols for digital cellular systems such as GSM. MAC protocols for wireless LANs such as IEEE802.11 and HIPERLAN I and II. The near far effect. Hidden and exposed terminals. Collision Avoidance (RTS-CTS) protocols.

UNIT 3

Mobile network layer protocols such as mobile-IP, Dynamic Host Configuration Protocol (DHCP). Mobile transport layer protocols such as mobile-TCP, indirect-TCP.

UNIT 4

Wireless Application Protocol (WAP). Mobile Agents, Transcending and Proxy Architecture, Wireless Web and WAP, Mobile Wireless Networks Simulation

References

1. T.S. Rappaport, Wireless communications; Principle and Practice, ISBN: 0-13-375536-3
2. J.Schiller, Mobile communications, ISBN: 0-321-12381-6, Addison-Wesley, 2003
3. A S. Tanenbaum, Computer Networks (Fourth Edition), Publisher: Prentice Hall PTR; ISBN: 0130661023; August, 2002
4. Dharjma Agrawal, An Zeng, " Introduction to Wireless and Mobile Systems", Thomson Publication.

5. **MACHINE INTELLIGENCE**

Lectures: Theory: 3 Hrs./Week **Theory: 80 Marks**
Tutorial: 1 hrs/week **Term Work: 20 Marks**

UNIT 1

Introduction, Soft Computing intelligence, comparison with conventional Artificial Intelligence, soft computing characteristics, Fuzzy sets, Fuzzy rules and Fuzzy inference systems,

UNIT 2

Different fuzzy Models : Mamdani, Sugeno, Tsu Kamoto, Fuzzy modeling, Least squares methods for system identification, Derivative based optimization.

UNIT 3

Neural networks, Adaptive networks, Supervised learning Neural networks, Perceptron, Backpropagation Multilayer perception, Radial basis function networks, Learning from reinforcement, Dynamic programming, Competitive learning, Kohonen s self organizing networks, Principle component networks, LVQ, Hopfield networks.

UNIT 4

Adaptive Neuro-Fuzzy interface systems, Advanced Neuro-Fuzzy modeling,
Data clustering algorithms, Neuro-Fuzzy control, Fuzzy filtered neural network,
Genetic algorithms in game playing.

References

1. S. R. Jang, C.T. Sun, E. Mizutani,„ Neuro-Fuzzy and Soft Computing , Pearson Education, ISBN 81-297-0324-6.
2. B. Kosko, „Neural Networks and Fuzzy Systems: a dynamical systems approach Prentice Hall Publication.
3. Simon Haykin, „ Neural Networks: Comprehensive Foundation , Prentice Hall, ISBN - 10: 0132733501.
4. Jacek M. Zurada , „Introduction to Artificial Neural Systems , Jaico publications

6. ADVANCED COMPUTING ARCHITECTURES

Lectures: Theory: 3 Hrs./Week **Theory: 80 Marks**
Tutorial: 1 hrs/week **Term Work: 20 Marks**

UNIT 1
Parallel Computer Models: The state of computing, Multiprocessors and multi-computers, Multivector and SIMD computers, Architectural development tracks Program And Network Properties: Conditions of parallelism, Data and resource dependences,
Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Program flow mechanisms, Control flow versus data flow, Data flow architecture, Demand driven mechanisms, Comparisons of flow mechanisms

UNIT 2
System Interconnect Architectures: Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network. Processors and Memory Hierarchy: Advanced processor technology, Instruction-set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar Processors, VLIW Architectures, Vector and Symbolic processors

UNIT 3
Memory Technology: Hierar chical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology.
Backplane Bus System: Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Cache addressing models, direct mapping and associative caches.

UNIT 4
Pipelining: Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles, Static arithmetic pipeline, Multifunctional arithmetic pipelines.
Vector Processing Principles: Vector instruction types, Vector-access memory schemes.
Synchronous Parallel Processing: SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, SIMD Computers and Performance Enhancement

References
1. Kai Hwang, “Advanced Computer Architecture”; TMH.
2. J. P. Hayes, “Computer Architecture And Organization”; MGH.
Harvey G. Cragon, “Memory System and Pipelined Processors”; Narosa Publication.
3. V. Rajaranam & C.S.R.Murthy, “Parallel Computer”; PHI.
4. R. K. Ghose, Rajan Moona & Phalguni Gupta, “Foundation of Parallel Processing”; Narosa Publications. Kai Hwang and Zu, “Scalable Parallel Computers Architecture”; MGH.

7. MEMORY TECHNOLOGIES

Lectures: Theory: 3 Hrs./Week
Theory: 80 Marks
Term Work: 20 Marks

UNIT 1
Static Random Access Memories (SRAMs), SRAM Cell Structures, MOS SRAM Architecture, MOS SRAM Cell and Peripheral Circuit, Bipolar SRAM, SOl, Advanced SRAM Architectures, Application Specific SRAMs; DRAMs, MOS DRAM Cell, BiCMOS DRAM, Error Failures in DRAM, Advanced DRAM Design and Architecture, Application Specific DRAM,

UNIT 2
High Density ROMs, PROMs, Bipolar & CMOS PROM, EEPROMs, Floating Gate EPROM Cell, OTP EPROM, EEPROMs, Nonvolatile SRAM, Flash Memories. RAM Fault Modeling, Electrical Testing, Pseudo Random Testing-Megabit DRAM Testing-Nonvolatile Memory

UNIT 3
Modeling and Testing-IDDQ Fault Modeling and Testing-Application Specific Memory Testing. General Reliability Issues, RAM Failure Modes and Mechanism, Nonvolatile Memory, Reliability Modeling and Failure Rate Prediction, Reliability Screening and Qualification. Radiation Effects, SEP, Radiation Hardening Techniques.

UNIT 4
Process and Design Issues, Radiation Hardened Memory Characteristics, Radiation Hardness Assurance and Testing, Ferroelectric Random Access Memories (FRAMs), Gallium Arsenide (GaAs) FRAMs, Analog Memories, Magneto Resistive Random Access Memories (MRAMs), Experimental Memory Devices. Memory Hybrids (2D & 3D), Memory Stacks, Memory Testing and Reliability Issues, Memory Cards, High Density Memory Packaging, Future Directions, Introduction to digital tablet PC, LCD, DVD player etc.

References
1.Ashok K.Sharma, " Semiconductor Memories Technology, Testing and Reliability ", Prentice-Hall of India Private Limited, New Delhi, 1997.
2. “Memories”, Springer Publication.
3. Wen C. Lin, “Handbook of Digital System Design”, CRC Press.

8. BIOMEDICAL SIGNALS AND SYSTEMS

Lectures: Theory: 3 Hrs./Week **Theory: 80 Marks**
Tutorial: 1 hrs/week **Term Work: 20 Marks**

UNIT 1

Introduction to Biomedical Signals,Natur e of Biomedical Signals, Examples of Biomedical Signals –EMG, ECG, EEG, ERPs,PCG,VMG, VAG, Objectives of Biomedical Signal Analysis, Difficulties in Biomedical Signal Analysis, Concurrent, Coupled, and Correlated Processes- Illustration of the Problem with Case-Studies. Filtering for Removal of Artifacts- Illustration of the Problem with Case-Studies,Time-Domain Filters, Frequency-Domain Filters, Optimal Filtering, The Wiener Filter, Adaptive Filters for Removal of Interference,

UNIT 2

Selecting an Appropriate Filter Application: Removal of Artifacts in the ECG, Event Detection, Detection of Events and Waves, Correlation Analysis of EEG channels, Cross-spectral Techniques. The Matched Filter, Detection of the P Wave, Homomorphic Filtering, Application- ECG Rhythm Analysis, Identification of Heart Sounds, Waveshape and waveform Complexity, Analysis of Event-related Potentials, Morphological Analysis of ECG Waves, Envelope Extraction and Analysis of Activity,

UNIT 3

Application- Normal and Ectopic ECG Beats, Analysis of Exercise ECG. Frequency-domain Characterization The Fourier Spectrum, Estimation of the Power Spectral Density Function, Measures Derived form PSDs.

Modeling Biomedical Systems, Point Processes Parametric System Modeling Autoregressive of All pole Modeling, Pole-Zero Modeling, Electromechanical Models of Signal Generation, Application- Heart-rate Variability, Spectral Modeling and Analysis of PCG. Analysis of Nonstationary Signals, Time-Variant Systems, Fixed Segmentation,

UNIT 4

Adaptive Segmentation, Use of Adaptive Filters for Segmentation, Application- Adaptive Segmentation of EEG Signals, Adaptive Segmentation of PCG Signals. Pattern Classification and Diagnostic Decision , Pattern Classification, Supervised Pattern Classification, Unsupervised Pattern Classification, Probabilistic Models and Statistical Decision , Logistic regr ession Analysis The Training and Test Steps, Neural Networks, Measures of Diagnostic Accur acy and Cost, Reliability of Classifier and Decisions

References

1. R. M. Rangayyan “Biomedical Signal Analysis- A case study approach”, Wiley Publications.
2. Eugene N Bruce, “Biomedical signal processing and signal modeling”, Wiley publications.

9. EMBEDDED VIDEO PROCESSING

Lectures: Theory: 3 Hrs./Week **Theory: 80 Marks**
Tutorial: 1 hrs/week **Term Work: 20 Marks**

UNIT 1

Digital video concepts, Subjective/Objective video quality measurement, Different standards for representing digital video ,Need & types of video compression techniques, DPCM, Transform coding ,DCT, DWT, Fast algorithms for the DCT, Implementation of DCT,

UNIT 2

Quantization, Entropy coding, , Huffman coding, Arithmetic coding, Different video coding standards such as JPEG, Motion JPEG, JPEG 2000,MPEG(1,2,4),H.261,H.263,H.26L etc,

UNIT 3

Motion estimation and compensation requirements, Different methods, Comparison, Enhancements to the motion models, Software and Hardware implementations, Pre- & Post-processing, Bit rate and distortion, Computational complexity, Transmission of coded video,

UNIT 4

Design for optimum QoS , Transmissin scenarios,Video codec interface, Design of a software and hardware CODEC, Design goals, Specifications, Designing the functional blocks and their testing. General purpose processors, DSP, Embedded processors, media processors, video signal signal processors, custom hardware, coprocessors, any two real –life applications in details.

References

1. Iain E. G. Richardson, “Video Codec Design- Developing image and video compression systems”, WILEY Publication.
2. Vasudev Bhaskaran, Konstantinos Konstantinides, “Image and video compression standards”, Kluwer academic publishers

10. RECONFIGURABLE COMPUTING

Lectures: Theory: 3 Hrs./Week **Theory: 80 Marks**
Tutorial: 1 hrs/week **Term Work: 20 Marks**

UNIT 1
Computing requirements, Area, Technology scaling, Instructions, Custom Computing Machine, Overview, Comparison of Computing Machines. Interconnects, Requirements, Delays in VLSI Structures; Partitioning and Placement, Routing; Computing Elements, LUT s, LU T Mapping, ALU and CLB s, Retiming, Fine-grained & Coarse-grained structures;

UNIT 2
Multicontext; Comparison of different architectur es viz. PDSPs, RALU, VLIW, Vector Processors, Memories, Arrays for fast computations, CPLDs, FPGAs, Multicontext, Partial Reconfigurable Devices; TSFPGA, DPGA, Mattrix; Best suitable approach for RD; Case study. Control Logic, Binding Time and Programming Styles, Overheads, Data Density, Data BW, Function density, Function diversity, Interconnect methods, Best suitable methods for RD;

UNIT 3
Contexts, Context switching; Area calculations for PE; Efficiency, ISP, Hot Reconfiguration; Case study. Architectures for existing multi FPGA systems, Compilation Techniques for mapping applications described in a HDL to reconfigurable hardware, Study of existing reconfigurable computing systems to identify existing system limitations and to highlight opportunities for research;

UNIT 4
Software challenges in System on chip; Testability challenges; Case studies. Modelling , Temporal portioning algorithms, Online temporal placement, Device space management, Dir ect communication, Third party communication, Bus based communication, Circuit switching, Network on chip, Dynamic network on chip, Partial reconfigurable design.

References
1. Andre Dehon, “Reconfigurable Architectures for General Purpose Computing”, MIT Publication.
2. IEEE Journal papers on Reconfigurable Architectures..
3. “High Performance Computing Architectures” (HPCA) Society papers.
4. Christophe Bobda, “Introduction to Reconfigurable Computing”, Springer Publication.
5. .Maya Gokhale, Paul Ghaham, “Reconfigurable Computing”, Springer Publication.

11. EMBEDDED AUTOMOTIVE SYSTEMS

Lectures: Theory: 3 Hrs./Week **Theory: 80 Marks**
Tutorial: 1 hrs/week **Term Work: 20 Marks**

UNIT 1

Current trends in Automobiles, open loop and closed loop systems - components for electronic engine management system. Electro magnetic interference suppression. Electromagnetic compatibility, Electronic dashboard instruments, onboard diagnostic system , security and warming system. Electronic management of chassis systems. Vehicle motion control.

UNIT 2

Sensors and actuators, and their interfacing. Basic sensor arrangement, types of sensors such as- oxygen sensors, crank angle position sensors- Fuel metering/ vehicle speed sensors and destination sensors, Attitude sensor, Flow sensor, exhaust temperature, air mass flow sensors.

UNIT 3

Throttle position sensor, solenoids, stepper motors, relays. Electronic ignition systems. Types of solid state ignition systems and their principle of operation. Digital engine control system. Open loop and closed loop control system, Engine cranking and warm up control. Acceleration enrichment. Deceleration learning and ideal speed control, Distributor less ignition – Integrated engine control system, Exhaust emission control engineering.

UNIT 4

Automotive Embedded systems. PIC, Freescale microcontroller based system. Recent advances like GLS,GPSS,GMS. Multiprocessor communication using CAN bus. Case study- cruise control of car. Artificial Intelligence and engine management.

References:

1. William B. Riddens, “Understanding Automotive Electronics”, 5 th Edition, Butterworth Hennimann Woburn, 1998.
2. Young A.P. & Griffiths, “ Automotive Electrical Equipment” , ELBS & New Press -1999.
3. Tom Weather Jr. & Cland c. Ilunter, “ Automotive computers and control system” , Prentice Hall Inc., New Jersey.
4. Crouse W.H., “ Automobile Electrical Equipment” , Mc Graw Hill Co. Inc., New York ,1995.
5. Bechhold, “ Understanding Automotive Electronic”, SAE,1998.
6. Robert Bosch,” Automotive Hand Book”, SAE (5 TH Edition),2000.

12. DIGITAL SIGNAL COMPRESSION

Lectures: Theory: 3 Hrs./Week **Theory: 80 Marks**
Tutorial: 1 hrs/week **Term Work: 20 Marks**

UNIT 1
Lossless vs. Lossy, Example Motivating Lossless, Math Preliminaries for Lossless Methods, Huffman & Aritmetic coding, Audio compression: Modelling sound, Sampling, Nyquist, Quantization-Scalar quantization,Uniform quantizers, Non-uniform quantizers.

UNIT 2
Compression performance, Speech compression-Speech coders,Predictive approaches,Silence compression,Pulse code modulation (ADPCM),Music compression,Streaming audio, MIDI . Math Preliminaries for Lossy Methods :Random Processes and Their Models, Distortion Criteria/Measures, Info Theory for Lossy, Rate-Distortion Theory .

UNIT 3
Quantization- Optimal and Adaptive Quantization, Uniform and nonuniform Quantizers, Entropy Coded, Vector Math for Transforms, Subbands, and Wavelets : Matrices and Vectors, Eigenvectors Coding : Transform coding Subband Coding- Intro and Multirate, Subband, Perfect Recon Filters.

UNIT 4
Wavelet Compression Methods :2-D Wavelet for Image Compression, choice of wavelet for image compression, Embedded Image Coding Using Zerotrees, EZW charts, SPIHT Charts. Video compression: Analogue video, Digital video, Moving pictures, MPEG, Basic principles, Temporal compression algorithms, Group of pictures, Motion estimation, Work in different video formats.

References:
1. Jayanth N S and Noll P, "Digital Coding of Waveforms - Principles and Application to Speech and Video," Prentice Hall, 1984.
2. Kondoz A M, "Digital Speech," John Wiley, 1994.
3. Gersho A and Gray R, "Vector Quantization and Signal Compression," Kluwer Acad Publication, 1992.
4. Hanzo L, Somernille F C A, Woodard J P, "Voice Compression and Communications," John Wiley, 2001
5. Yun Q. Shi, Huifang Sun "Image and Video Compression for Multimedia Engineering: Fundamentals, Algorithms, and Standards"CRC press
6. Ida Mengyi Pu, “Fundamental Data Compression”, Elsevier Publications

13. SOFTWARE DEFINED RADIO

Lectures: Theory: 3 Hrs./Week **Theory: 80 Marks**
Tutorial: 1 hrs/week **Term Work: 20 Marks**

UNIT 1
SDR concepts & history, Benefits of SDR, SDR Forum, Ideal SDR architecture, SDR Based End-to-End Communication, Worldwide frequency band plans, Aim and requirements of the SCA,

UNIT 2
Architecture Overview, Functional View, Networking Overview, Core Framework, Real Time Operating Systems, Common Object Request Broker Architecture (CORBA), SCA and JTRS compliance,

UNIT 3
Radio Frequency design, Baseband Signal Processing, Radios with intelligence, Smart antennas, Adaptive techniques, Phased array antennas, Applying SDR principles to antenna systems, Smart antenna architectur es,

UNIT 4
Low Cost SDR Platform, Requirements and system architecture, Conver gence between militar y and commercial systems, The Futur e For Softwar e Defined Radio, Cognitive Radio.

References:

1. Dillinger, Madani, Alonistioti (Eds.): Software Defined Radio, Architectures, Systems and Functions, Wiley 2003
2. Reed: Software Radio, Pearson
3. Software Defined Radio for 3G, 2002, by Paul Burns.
4. 4.Tafazolli (Ed.): Technologies for the Wireless Future, Wiley 2005
5. Bard, Kovarik: Software Defined Radio, The Software Communications Architecture, Wiley 2007