Pre Ph.D./ M.Phil.
Electronics
Paper I : Research Methodology and Computer Applications

Section I

UNIT 1 : Research Methodology : An Introduction

Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India.

Defining the Research Problem :

What is a Research Problem? Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration, Conclusion.

Research Design :

Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Conclusion.

UNIT 2 : Methods of Data Collection :

Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Schedules, Difference between Questionnaires and Schedules, Some Other Methods of Data Collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.

Testing of Hypotheses (Parametric or Standard Tests of Hypotheses) :

What is a Hypothesis? Basic Concepts Concerning Testing of Hypotheses, Procedure for Hypothesis Testing, Flow Diagram for Hypothesis Testing, Measuring the Power of a Hypothesis Test, Tests of Hypotheses, Important Parametric Tests, Hypothesis Testing of Means , Hypothesis Testing for Differences between Means, Hypothesis Testing for Comparing Two Related Samples, Hypothesis Testing of Proportions, Hypothesis Testing for Difference between Proportions, Hypothesis Testing for Comparing a Variance to Some Hypothesized Population Variance, Testing the Equality of Variances of Two Normal Populations, Hypothesis Testing of Correlation Coefficients, Limitations of the Tests of Hypotheses,

Interpretation and Report Writing :

Meaning of Interpretation, Why Interpretation? Technique of Interpretation: Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Report, Conclusions.

Section II

UNIT 3 : OST overview:

Evolution & development of OST and contemporary technologies, Factors leading to its growth. Open Source Initiative (OSI), Free Software Foundation and the GNU

Project, principle and methodologies. Contexts of OST (India & international). Applications of open source

Introduction to SCILAB, Explaining the SCILAB GUI (Graphical User Interface), Usage of SCILAB Help/ docs/ basics, Variables and constants , Functions (Built in), Introduction to Matrices, Scripts and functions, Conditional statements and loops, Debugging , Basics of plotting in SCILAB, Linear equations and Numerical integration

UNIT 4 : Case Studies

SCILAB,

Case study 1 : Design of PID – Fuzzy control system
Case study 2 : Pseudo Random Noise/ White noise generator
Case study 3 : Design of Digital filter
Case study 4 : Neural control Design

NS2 Simulator : basic concepts

Case study 1 : AdHoc Network realization
Case study 2 : Network performance study

PSPICE : basic concepts

Case study 1 : Buck, Boost and Buck-boost regulator design
Case study 2 : R.F. Amplifier Design
Case study 3 : Frequency Multiplier (Doubler, Tripler)

Xilinx Webpack :

Case Study 1 : Multiplexer as Universal building block
Case study 2 : Intelligent ALU design

Reference Books

1. C.R. Kothari, Research Methodology, New Age International Publishers, New Delhi 2011
2. SPICE for Circuits and Electronics Using PSPICE (2nd Edition) [Muhammad H. Rashid, PHI
3. Programming in Scilab 4.1, Das, Vinu V., PHI Publications
4. Perspectives on Free and Open Source Software, The MIT Press, dited by Joseph Feller, Brian Fitzgerald, Scott A. Hissam and Karim R. Lakhan
5. Online documentation of SciLab, NS2, PSPICE, and XIlinx

Pre Ph.D./ M.Phil.
Electronics
Paper II : Recent Trends in Electronics

Unit 1: Digital system and VLSI design

EDA from methodologies to algorithms, Tools for integrated circuits and systems, Categories of EDA tols, Challenge and Opportunities in EDA paradigm, Designing SoC using soft IP cores, Types of IP cores, Design issues pertaining to Soft IP Cores, FPGA as a prototyping platform, Different flavors of languages in EDA.

SoC Term and Scope, Constitutes of generic SoC, Processor Cores, Buses, on chip memory, timing reference, ASIC Vs FPGA comparison in context with SoC, Full Custom Design, Standard cell based design, Semicustom ASIC, Structured ASIC.

Case studies: Development of Network on Chip, ECG Logger, Multifunction Interface based on FPGA, FPGA based high resolution A to D Converter.

Unit 2: Embedded System Design

Microprocessor and Microcontroller Architecture, Peripherals, Power modes, Embedded Communication Protocols, Programming Languages and tools, Real Time Operating System.

Unit 3: Satellite and Optical Communications

Satellite Navigation and Global Positioning System, Optical fiber link design

Unit 4: Power Electronics and Systems

Phase Controlled Rectifiers firing circuits, triggering circuits., DC-DC, switch mode converters, step down (Buck) converter, step-up (Boost) converter, Buck-Boost converter, Cuk-dc-dc converter full bridge dc to dc converter. Cycloconverters Dual converters, microprocessor based firing schemes for dual converter. Inverters and uninterruptible power supplies. DC motor Drives and Induction Motor Drives

Unit 5: Wireless Systems

Speech Coding, Wireless Networking

Unit 6: Soft Computing

Introduction to Soft Computing, Synergism of Genetic Algorithms and Fuzzy Systems, GA-Fuzzy System Approach and its applications, , Integration of Neural Networks and Fuzzy Systems, Adaptive Neuro-Fuzzy Inference Systems, Constraints of ANFIS, Neuro-Fuzzy Approach of Modeling, ANN-GA-Fuzzy Synergism and its applications, Training of ANN, ANN Learning using GA.

Reference Books

Unit 1:

1. Modern VLSI Design: IP based Design, by Wayne Wolf, 4th Ed, PHI Publications
2. Harnessing VLSI System Design with EDA Tools, R.K. Kamat, S.A. Shinde, P.K. Gaikwad and Hansraj Guhilot, Springer, 2013
3. Unleash the System On Chip using FPGAs and Handel C, R.K. Kamat, S.A. Shinde and Vinod G. Shelake, Springer 2012

Unit 2 :

1. Deshmukh, Ajay V., "Microcontroller Theory and Applications", Tata McGraw-Hill.

2. Sloss, Symes, Wright,"ARM system developers guide"Morgan Kaufman,Elsevier, publication
3. Steve Furber, ARM System-on-chip Architecture, Addison Wesley
4. Kenneth Ayala, The 8051 Microcontroller, 3rd Edition, Delmar Cengage Learning.
5. Myke Predko, Programming & Customizing PICmicro Microcontrollers, TMH.
6. Qing Li, Caroline Yao, Real-Time Concepts for Embedded Systems, CMP Books.
7. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", TMH, 2003.
8. Jean J. Labrosse, MicroC OS II: The Real Time Kernel, Publisher: CMP Books
9. Microcontroller datasheets for I2C, SPI, CAN and USB specifications and configuration

Unit 3 : Satellite and Optical Communications

1. Timothy Pratt, Charles W.Bostian and Jeremy E.Allnutt, Satellite Communications, John Wiley and Sons, 2007
2. Harold Colimbiris, Fiber Optics Communication, Pearson 2010

Unit 4: Power Electronics and Systems

1. Power Electronics, P. C. Sen, Tata McGraw-Hill Education
2. Power Electronics and Its Applications, Alok Jain Penram International Publishing (India) Pvt. Ltd., 2004
3. Power Electronics: Circuits, Devices, and Applications, M.H. Rashid Pearson Education India, 2004
4. Electrical Drives Concept and Applications, Vedam Subramanyam, Tata McGraw-Hill Education

Unit 5 : Wireless Systems

1. Theodore S. Rappaport, Wireless Communications Principles and Practice, PHI Learning Private Limited, New Delhi, 2008.

Unit 6 : Soft Computing

1. Dr. D.K. Chaturvedi, "Soft Computing Techniques and its Applications in Electrical Engineering", Springer-Verlag Berlin Heidelberg, (2008)
2. Amit Konar, "Artificial intelligence and soft computing: behavioral and cognitive modeling of the human brain", CRC Press, London, (2000)
3. Michael Negnevitsky, "Artificial Intelligence: A Guide to Intelligent Systems", Second Edition, Addison-Wesley, Pearson Education Limited, England, (2002)
4. S. N. Sivanandam, S. N. Deepa,"Principles of Soft Computing", Wiley, India (P) Ltd., First Indian Edition, (2008)
5. S. Rajsekaran, G. A. Vijayalaxmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and applications", PHI, New Delhi, (2000)
6. Rajkumar Roy, Mario Koppen "Soft Computing and Industry: Recent Applications", Springer, (2005)
7. F.O. Karray & C.D. "Silva, Soft Computing and Intelligent Systems Design-theory, tools and applications", Pearson Education
8. J.S.R. Jang, C.T. Sun & E. Mizutani, "Neuro-Fuzzy and Soft Computing-A computational approach to learning and machine intelligence", Pearson Education

Pre Ph.D./ M.Phil.
Electronics
Paper III : Digital Image Processing

Unit I:

Image representation, Resolution, Image Formats, Colour Spaces, Reading/writing images in Matlab, Image formation, Mathematical representation, Image capture, digitization, noise, Pixels, operations on pixels, histograms Image Enhancement, Filters, Filtering for noise removal, filtering for edge detection, Fourier transforms and frequency-domain processing - Frequency space, Calculation of the Fourier spectrum, 1-D/2-D Fourier transform, frequency-space filtering, convolution theorem, optical transfer function, digital Fourier transforms

Unit II:

Image restoration, Imaging models, Restoration by the inverse Fourier filter, Wiener–Helstrom filter, Constrained deconvolution, Blind deconvolution, Iterative deconvolution, Matrix formulation of image restoration, least-squares solution, generalized Gauss–Markov estimator.

Geometry - description of shape, Shape-preserving transformations, Shape transformation, Affine transformation in homogeneous coordinates, procrustes transformation, projective transform, Nonlinear transformations, Warping, Overdetermined spatial transformations

Unit III:

Morphological processing - Binary images, Structuring elements and neighbourhoods, Dilation and erosion, Structuring element decomposition, Morphological opening and closing, Boundary extraction, Extracting connected components, Region filling, hit-or-miss transformation, 'don't care' pixels, Skeletonization, Opening by reconstruction, grey-scale morphology, top-hat transformation

Image features - Landmarks and shape vectors, Single-parameter shape descriptors, Signatures and the radial fourier expansion, Statistical moments as region descriptors, Texture features based on statistical measures, Principal component analysis, Dimensionality reduction,

Unit IV:

Image segmentation – Use of Image properties and features in segmentation, Intensity thresholding, Region growing and region splitting, Split-and-merge algorithm, edge detection, the laplacian of Gaussian and difference of Gaussians filters, Interest operators, Watershed segmentation, Image segmentation with markov random fields

Classification - Purpose, Supervised and unsupervised classification, Design of classification systems, Simple classifiers: prototypes and minimum distance criteria, Linear discriminant functions, Bayesian classification, Ensemble classifiers, Unsupervised learning

References Books

1. Fundamentals of Digital Image Processing, A Practical Approach with Examples in Matlab, Chris Solomon, Toby Breckon, Wiley Blackwell Publishing.
2. Digital Image Processing Using MATLAB, Ralph C. Gonzalez, Richard E. Woods, , Steven L. Eddins, Tata McGraw - Hill Education (2010)

Pre Ph.D./ M.Phil.
Electronics
Paper III : Antenna Design and Measurements

1. Antenna Parameter Measurement [15]

   Introduction, directional pattern, gain, absolute method, comparison method, celestial radio sources, radar techniques, phase, direct method, reference antenna method, deferential method, polarization, impedance, efficiency, directivity/gain method, radiometric method, random field method, wheeler cap method, other measurement ,method for small antennas, current distribution, vector network analyzer, field strength meter.

   (Ref. Antenna and wave propagation John D Kraus, Ronald J Marhefka Ahmad S Khan, Tata McGraw Hill Education Private Limited Fourth Edition)

2. Antenna Measurement Ranges [15]

   Introduction, Basic Concept, reciprocity in antenna measurement, Near-field, far-field, Co-ordinate system, measurement ranges, elevated ranges, ground reflection ranges, anechoic chambers and absorbing materials, compact antenna test ranges, near field ranges, testing of ranges, instrumentation, transmitter and receiver, data processing. Typical sources error in antenna measurement, phase error and amplitude taper, reflections, other sources of error.

   (Ref. Antenna and wave propagation John D Kraus, Ronald J Marhefka Ahmad S Khan Tata McGraw Hill Education Private Limited Fourth Edition)

3. Antennas for Satellite communication [15]

   The earth segment, receive only home TV system, the outdoor unit, the indoor unit for analog(FM) TV, master antenna TV system, DTH TV System, transit-receive Earth station. Transmission losses, free space transmission, Feeder losses, antenna misalignment losses, antenna noise, Amplification noise temperature, System noise, effect of rain. Satellite dish antenna, Antenna design considerations for satellite communication, example on parabolic dish design.

   (Ref. Satellite Communication Dennis Robby McGraw Hill Publication Fourth Edition international Edition)

4. Microstrip patch antenna [15]

   Basic characteristics, feeding methods, methods of analysis, Rectangular patch, circular patch, quality factor, bandwidth and frequency, input impedance, Fractal antenna introduction and geometry, Fractal patch antenna design, Koch loop method, Sierpinski loop method.

   (Ref. Antenna Theory - Analysis and Design, C. A Balanis , , John Wiley & Sons Inc., 2nd edition and
   The Fractal Geometry of Nature, B. B. Madelbrot New York :W. H. Freeman)

Reference Books

1. Antenna and wave propagation John D Kraus, Ronald J Marhefka Ahmad S Khan, Tata McGraw Hill Education Private Limited Fourth Edition

2. Antenna and Wave propagation G.S.N. Raju Pearson Publication Fifth Impression-2011
3. Satellite Communication Dennis Reddy McGraw Hill Publication Fourth Edition, 2006
4. Antenna Theory - Analysis and Design, C. A Balanis, John Wiley & Sons Inc., 2nd edition 1997.
5. The Fractal Geometry of Nature, B. B. Madelbrot, New York: W. H. Freeman 1983

Pre Ph.D./ M.Phil.
Electronics
Paper III : Wireless Sensor Networks

Unit 1: Overview of Wireless Sensor Networks

Introduction to Sensor Networks, Advantage of Sensor Networks, Applications of Sensor Networks, Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

Unit 2 : Architectures

Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway concepts.

Unit 3 : Networking

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

Unit 4 : Sensor Network Platforms

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming, Tiny OS, Mate, Magnet OS.

Reference Books

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007
3. N. P. Mahalik, “Sensor Networks and Configuration: Fundamentals, Standards, Platforms, and Applications” Springer Verlag
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, And Applications”, John Wiley, 2007
5. Raghavendra, Cauligi S, Sivalingam, Krishna M., Zanti Taieb, “Wireless Sensor Network”, Springer 1st Ed. 2004 (ISBN: 978-4020-7883-5)
6. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003
7. Fundamentals of Sensor Network Programming: Applications and Technology By Sridhar S. Iyengar, NandanParameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye, Wiley.

Paper III

Biomedical Engineering

Unit 1:

Cell as a Bioelectric Generator, The Heart and Circulatory System, Electrocardiography (ECG), Brian and Nervous System, Electroencephalography (EEG), The Skeletal, Muscle and Skin System, Electromyography (EMG) and Evoked Potentials (EP),Blood Pressure and Flow, Blood Oxygen Saturation, Heart Rate and Heart Sounds, Respiration and Temperature ,Ear and Responses.

Unit 2:

Electrodes, Basic Instrumentation, Electrocardiograph, Electroencephalograph, Electromyograph, Phonocardiograph,

Unit 3:

Transducers, Blood Pressure, Blood Flow and Pulse Oximeters, Heart Rate, Respiration Rate and Temperature Meters, Fetal Monitor, Audiometer and Hearing Aid,X-Ray Physics, Fluoroscopy and Radiography-Ray Tubes,X- Ray Equipment.

Unit 4:

Ultrasonic Scanner, Computed Tomography(CT-SCAN),Magnetic Resonance Imaging(MRI),Endoscope and Electron Microscope, Thermograph and Nuclear Imaging, Electric Shock, Electric Shock Hazards in Hospital Environment, Examples of Shock Hazards Safety Education and Precaution

References:

1. "Medical Electronics by A.G.Patil".
2. **"**Maintenance of Hospital Equipment, part II: Recording Equipment**"**by A.G.Patil, ALCTE, CEP, 1996
3. "Patient Safety", Appliction Note No.AN/18, by M/s Hewlett Packard,U.S.A.
4. "Biomedical Instrumentation and Measurement" by Leslie Cromwell, Fred j. Weibell, Erich A.PHI-India, 1998
5. "Biomedical Measurement" by Glenn R.Blackwell, PE, Biomedical Instrumentation &Technology

Paper III

Modern communication System

Unit-1: Antenna Parameter Measurement [15]

Introduction, directional pattern, gain, absolute method, comparison method, celestial radio sources, radar techniques, phase, direct method, reference antenna method, deferential method, polarization, impedance, efficiency, directivity/gain method, radiometric method, random field method, wheeler cap method, other measurement method for small antennas, current distribution, vector network analyzer, fieldstrength meter.

(Ref. Antenna and wave propagation John D Kraus, Ronald J Marhefka Ahmad S Khan Tata McGraw Hill Education Private Limited Fourth Edition)

Unit-2: Antenna Measurement Ranges [15]

Introduction, Basic Concept, reciprocity in antenna measurement, Near-field, far-field, Co-ordinate system, measurement ranges, elevated ranges, ground reflection ranges, anechoic chambers and absorbing materials, compact antenna test ranges, near field ranges, testing of ranges, instrumentation, transmitter and receiver, data processing. Typical sources error in antenna measurement, phase error and amplitude taper, reflections, other sources of error

(Ref. Antenna and wave propagation John D Kraus, Ronald J Marhefka Ahmad S Khan Tata McGraw Hill Education Private Limited Fourth Edition)

Unit-3: Satellite communication [15]

The earth segment, receive only home TV system, the outdoor unit, the indoor unit for analog(FM) TV, master antenna TV system, DTH TV System, transit-receive Earth station, Transmission losses, free space transmission, Feeder losses, antenna misalignment losses, antenna noise, Amplification noise temperature, System noise, effect of rain, Satellite dish antenna, Antenna design considerations for satellite communication, example on parabolic dish design.

(Ref. Satellite Communication Dennis Robby McGraw Hill Publication Fourth Edition (International Edition))

Unit-4: Antenna positioning System and Algorithms [15]

Pointing error sources, models, control algorithms, command preprocessor, AZ track imperfection, conscan, (Ref. Wodek Gawronski, ”Control and Pointing Challenges of the NASA deep space Network antennas,” 8th IEEE International Conference on methods and model in automation and robotics szczcin, Poland, Sept 2002.)

Antenna under test (Control engineer point of view), performance criteria and design goals, PI controller, LQG controller, H∞ controller, Hardware restriction.

(Ref. Wodek Gawronski, ”Antenna Control System: From PI to H∞,” IEEE antennas and Propagation Vol. 43, No. 1, 2001)

Open loop model, PI controller and rigid antenna, LQG controller and flexible antenna, Properties of LQG weight, limits of LQG weight, LQG controller tuning procedure.

(Ref. Wodek Gawronski,”Antenna LQG controllers: Properties, Limits of Performance and Tuning Procedure,” Proceeding of the 16th IFAC world congress 2005 vol. 16, part.1)

Mechanical drives, gear drives, classification of gears, selection of types of gears, law of gearing, standard system of gear teeth, backslash, number of teeth face width
(Ref. Design of Machine Elements V.B. Bhandari Tata McGraw Hill Education Private Limited Third Edition-2011)

References

1. Antenna and wave propagation John D Kraus, Ronald J Marhefka Ahmad S Khan Tata McGraw Hill Education Private Limited Fourth Edition
2. Antenna and Wave propagation G.S.N. Raju Pearson Publication Fifth Impression-2011
3. Satellite Communication Dennis Reddy McGrawHill Publication Fourth Edition(International Edition) 2006
4. Design of Machine Elements V.B. Bhandari Tata McGraw Hill Education Private Limited Third Edition-2011
5. Wodek Gawronski, "Control and Pointing Chanllenges of NASA deep space network antennas", 8th IEEE international conference on methods and model in automation and robotics szczcin, Poland, sept 2002
6. Wodek Gawronski, Antenna control system: from PI to H∞", IEEE antennas and propagation vol. 43 No.1 2001
7. Wodek Gawronski,"Antenna LQG controllers: Properties, Limits of Performance and Tuning Procedure," Proceeding of the 16th IFAC world congress 2005 vol. 16, part.1

Paper III

Advances in Power Electronics

UNIT 1: Power Semiconductor devices

Ideal switch, diode, transistor, power MOSFET, IGBT, Diac, MCT MOSFET, Snubber circuit, power factor and convertor

DC-DC line regulation – line regulator topology, parameter of line regulator, Analysis of regulators, Basic DC-DC convertor (Boost, BUCK, Buck-Boost) practical issues.

UNIT 2: DC-AC switch mode convertor

Inverter topology, self-driven inverter, quassi-square wave inverter, three phase inverter and PWM inverter.

Design of magnetics

Dissipative components flux and flux density, potential transformer, current transformer, etc.

Modeling of system – I/O relations, transfer function, block diagram, bode graphs and space vector modeling.

UNIT 3: Control system essentials

Representation of system in digital domain, Z-transform, digital filter, mapping between S-plane and Z- plane, effect of sampling, control system basics, state space method.

Digital controller design – control design technique, bode diagram method, PID controller, root locus method, state space method, full state feedback, tracker controller design, IM control with o/p feedback, optimal and robust controller design

UNIT 4: Discrete computation essentials

Number formulas, normalization, Arithmetic operations. Thermal aspects, reliability modeling and predictions.

References

1. Power Electronics: Essentials and Applications, L Umanand, Wiley
2. Power Electronics: Circuits, Devices And Applications, M.H.Rashid, Pearson Education India, 01-Sep-2003
3. Modern Power Electronics and AC Drives, Bimal K Bose, Academic Press, 28-Jul-2006

Paper III

Advances in Embedded Systems and VLSI Design

Unit-1: State of Art Techniques in Embedded System Design (15)
Latest design techniques in Embedded systems, hardware/software codesign, Embedded micro controller cores, embedded memories, Examples of embedded systems, sensors and interfacing techniques, Real-time concepts, real-time operating systems, Required RTOS services/capabilities (in contrast with traditional OS). Resource Management/scheduling paradigms: static priorities, static schedules, dynamic scheduling, best effort current best practice in scheduling (e.g. Rate Monotonic vs. static schedules), Real-world issues: blocking, unpredictability, interrupts, caching, Examples of OSs for embedded systems - RT Linux, VRTX.

Unit-2: Programming Aspect of Embedded Systems (15)
Programming languages for embedded systems e.g., Handel-C and Esterel, system support for embedded systems, selected embedded system-based applications: process-control, robotics, etc. Software Development Methodology: Model based development, Statecharts, etc. Case studies, Controlling an Injection molding process, Flight simulator, digital call center handler, codec.

Unit-3: Latest Techniques in VLSI Design (15)
Introduction to hierarchical structural design.Role of CAD in VLSI design process. Techniques and algorithms for symbolic layout and routing. CMOS processing technology, CMOS building blocks and other approaches for reusing digital soft IP cores

Unit-4: Advances in VLSI System Design (15)
Use of pipelining and parallelism, self-synchronized esigns, VLSI computing structures. Introduction to systolic arrays, mapping algorithms on systolic arrays, design of systolic arrays, system examples and design exercises.

References:
1. Jack Ganssle, "The Art of Designing Embedded Systems", Newnes, 1999.
2. David Simon, "An Embedded Software Primer", Addison Wesley, 2000.
3. RTS: Real-Time Systems, by C.M. Krishna and Kang G. Shin, McGraw-Hill, 1997, ISBN 0-07-057043.
4. J. A. Stankovic and K. Ramamritham, Advances in Hard Real-Time Systems, IEEE Computer Society Press, Washington DC, September 1993, 777 pages.Selected papers and references
5. C. Mead and L. Conway.Introduction to VLSI Systems, Addison Wesley, 1980.
6. N. Weste and K. Eshraghian.Principles of CMOS VLSI Design, A Systems Perspective, Addison Wesley, 1988.
7. S. Y. Kung.VLSI Array Processors, Prentice Hall, 1991.
8. K. Hwang and F. A. Briggs.Computer Architecture and Parallel Processing, Mc Graw Hill, 1985.

Paper III

Problem Solving With Soft Computing

Unit-1: Pulsed Neuron Models: The New Generation

Introduction pulsed neuron model, Spiking Neuron Model, Integrate-and-Fire Neurons, Conductance Based Models, Computing with Spiking Neurons.

Unit-2: Fuzzy Sets, Fuzzy Systems and Application

Need For Numeric And Linguistic Processing, Fuzzy Uncertainty And The Linguistic Variable, Membership Function, Geometry Of Fuzzy Sets, Simple Operation Of Fuzzy Sets, Fuzzy Rules For Approximate Reasoning, Rule Composition And Defuzification.

Unit-3: Genetic Algorithm

What Are GA? Why Are GA, Mechanics Of Biological Evolution, Artificial Evolution: Taxonomy And Search Optimization-Enumerative, Calculus-Based And Guided Random Search Techniques, Evolutionary Algorithms

Unit4: Neural Networks and the Soft Computing Paradigm

Soft Computing-Neural-Fuzzy-Evolutionary, Genetic Algorithms, Neural Networks and Fuzzy Logic, Neuro-Fuzzy-Genetic Integration, application of soft computing in industrial control , Expert system ,industrial optimization problems, industrial fault diagnosis and analysis.

Reference Books

1. S.Kumar, Neural networks-A Classroom approach, The McGraw-Hill Companies(New Delhi),2008
2. A. M. Ibrahim, Introduction to Applied Fuzzy Electronics, Prentice Hall, Upper Saddle River, NJ, 1997.
3. Ahmad M. Ibrahim, Fuzzy Logic for Embedded Systems Applications, Elsevier Science (USA) 2004
4. J. Yen and R. Langari, Fuzzy Logic Intelligence control and information, Pearson, 2009.
5. S.N Sivanandam and S.N. Deepa, Principles of Soft Computing, Wiley India, 2008.