



Estd. 1962  
NAAC 'A' Grade

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दुरध्वनी (ईपीएबीएक्स) २६०९००० (अभ्यास मंडळे विभाग— २६०९०९४)  
फॅक्स : ००९१-०२३१-२६९१५३३ व २६९२३३३.e-mail:bos@unishivaji.ac.in

SU/BOS/Sci. & Tech /

No 00158

Date :

05 FEB 2021

To,

The Principals, All Affiliated Colleges/Institutions, Shivaji University, Kolhapur	The Head, Electronics Department, Shivaji University, Kolhapur
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Ref: - SU/BOS/Sci. & Tech /1423Date: 30/06/2020

Subject: - Regarding revised syllabus of M.Phil/Ph.D Course Work, Electronics Paper No.II under the Faculty of Science & Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the University authorities have accepted and granted approval revised syllabus of M.Phil/Ph.D Course Work, Electronics Paper No.II under the Faculty of Science & Technology.

This syllabus shall be implemented from the academic year 2020-2021 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website [www.unishivaji.ac.in](http://www.unishivaji.ac.in) Students(Online Syllabus).

The question papers on the pre-revised syllabi of above mentioned course will be set for two examinations only. Two chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dy.Registrar

Copy to :-

- |   |                                 |
|---|---------------------------------|
| 1 The Dean, Faculty of Science & Technology | 8 Appointment Section           |
| 2 The Chairman, Respective, BOS             | 9 Centre for Distance Education |
| 3 B.Sc.Exam Section                         | 10 Computer Centre              |
| 4 Eligibility Section                       | 11 Affiliation Section (U.G.)   |
| 5 O.E. I Section                            | 12 Affiliation Section (P.G.)   |
| 6 O.E. II Section                           | 13 P.G.Admission Section        |
| 7 O.E. III Section                          | 14 P.G.BUTR/Seminar Section     |

# **SHIVAJI UNIVERSITY, KOLHAPUR.**



**Accredited By NAAC with 'A' Grade  
Revised Syllabus For**

**M. Phil./ Ph. D. Course Work**

**Electronics**

**Syllabus to be implemented from  
June, 2020 onwards.**

## **M. Phil/ Pre Ph.D.**

### **Paper I: Research Methodology**

#### **Unit –I Introduction to Research Methodology**

Research Methodology: An Introduction Objectives of Research, Types of Research, Research Methods and Methodology, Defining a Research Problem, Techniques involved in Defining a Problem Research Design Need for Research Design, Features of Good Design, Different Research Designs, Basic Principles of Experimental Designs, Sampling Design, Steps in Sampling Design, Types of Sampling Design, Sampling Fundamentals, Estimation, Sample size Determination, Random sampling [15 Hrs]

#### **Unit –II Research Tools**

Measurement and Scaling Techniques Measurement in Research, Measurement Scales, Sources in Error, Techniques of Developing Measurement Tools, Scaling, Meaning of Scale, Scale Construction Techniques [15 Hrs]

#### **Unit –III Hypothesis and Research Methodology**

Methods of Data Collection and Analysis Collection of Primary and Secondary Data, Selection of appropriate method Data Processing Operations, Elements of Analysis, Statistics in Research, Measures of Dispersion, Measures of Skewness, Regression Analysis, Correlation Techniques of Hypotheses, Parametric or Standard Tests Basic concepts, Tests for Hypotheses I and II, Important parameters limitations of the tests of Hypotheses, Chi-square Test, Comparing Variance, As a non-parametric Test, Conversion of Chi to Phi, Caution in using Chi-square test [ 15Hrs]

#### **Unit –IV Research Output Techniques**

Analysis of Variance and Co-variance ANOVA, One way ANOVA, Two Way ANOVA, ANOCOVA Assumptions in ANOCOVA, Multivariate Analysis Technique Classification of Multivariate Analysis, factor Analysis, R-type Q Type factor Analysis, Path Analysis [15 Hrs]

#### **Reference Books:**

1. “Research Methodology”, C.R. Kothari, Wiley Eastern.
2. “Formulation of Hypothesis”, Willkinson K.P, L Bhandarkar, Hymalaya Publication, Bombay.
3. “Research in Education”, John W Best and V. Kahn, PHI Publication.
4. “Research Methodology- A step by step guide for beginners”, Ranjit Kumar, Pearson Education
5. “Management Research Methodology-Integration of principles, methods and Techniques”, K.N. Krishna swami and others, Pearson Education

## **M.Phil. / Pre Ph.D. Paper II**

### **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 tools, 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, 4<sup>th</sup> 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

## **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 designs, 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

### Advances in Power Electronics

1. UNIT 1 (15)  
**Power Semiconductor devices** Ideal switch, diode, transistor, power MOSFET, IGBT, Diac, MCT MOSFET, Snubber circuit, power factor and converter  
**DC-DC line regulation** – line regulator topology, parameter of line regulator, Analysis of regulators, Basic DC-DC converter (Boost, BUCK, Buck-Boost) practical issues.
2. UNIT 2 (15)  
**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.
3. UNIT 3 (15)  
**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.
4. UNIT 4 (15)  
**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**

#### **Digital Filter Design and Analysis**

- Unit1 : Digital Signal** (15)  
Periodic signals, Discrete-time signals, Fourier transform, Discrete Fourier Transform (DFT), Short Time Fourier Transform (STFT)
- Unit2 : Digital Filter Design** (15)  
Linear time-invariant filters, Convolution, Impulse response, The window method, Frequency sampling, Filter specifications, The moving average filter, IIR design, FIR design, Fractional delay and Hilbert filter
- Unit3 : Adaptive Signal Processing** (15)  
Random Variables, Stochastic Processes, Power Spectral Density, Filtering Random Processes, Optimal Least Squares, LMS Filter, Echo Cancellation
- Unit4 : Audio Signal Processing** (15)  
Periodogram, Spectrogram, analyzing a sound, Noise removing, Analysis of Sounds - Measurement Times, Averaging, Octave Bands, 1/3 Octave Bands.

#### **References**

1. Mller, m. (2016). Fundamentals of music processing: audio, analysis, algorithms, applications. Place of publication not identified: springer.
2. Winder, S. (2007). Analog and digital filter design. Amsterdam: Newnes.
3. Sheno, B. A. (2006). Introduction to digital signal processing and filter design. Hoboken, NJ: Wiley-Interscience.
4. Unpingco, J. (2014). Python for Signal Processing Featuring IPython Notebooks. Cham: Springer International Publishing.
5. Cohen, M. X. (n.d.). Fundamentals of Time-Frequency Analyses in Matlab/Octave. Kindle Edition.
6. Watson, R., & Downey, O. (2013). The little red book of acoustics: A practical guide. Sheffield: Blue Tree Arts.
7. Idris, I. (2016). Python data analysis cookbook. Place of publication not identified: Packt Publishing Limited.
8. Spectrograms. (2016, June 02). Retrieved July 08, 2020, from <http://www.opentextbooks.org.hk/ditatopic/9759>



### **Paper III**

#### **Internet of Things and Applications**

- UNIT-I:** [15]  
Introduction- The IOT Today & Progression to Tomorrow – Success Factors –Strategic Research & Innovation Directions.
- UNIT-II:** [15]  
IOT and Related Issues - IOT & Related Future Internet Technologies – Networks & Communication – Processes & Data Management - Security, Privacy & Trust - Protocol Convergence
- UNIT-III:** [15]  
M2M To IOT -M2M Vs IOT – A vision from M2M to IOT – Case Study.
- UNIT-IV:** [15]  
An Architectural Overview, Reference Model and IOT Architecture - Architecture Reference Model – IOT Reference Architecture , IOT Smart Applications, Cloud Service Management and IOT - Connecting IOT to cloud – Cloud Storage for Iot – Data Analytics for IoT – Software & Management Tools for IOT.

#### **TEXT BOOKS:**

1. Ovidiu Vermesan, Peter Friess, “Internet of Things – From Research & Innovation to Market Deployment”, River Publishers, 2014
2. Jan Holler ,VlasiosTsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, Elsevier Ltd, 2014

#### **REFERENCE BOOKS:**

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.
2. Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, 2014. 3. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014

## 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, 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)

#### **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 szczecin, Poland, Sept 2002.)

Antenna under test (Control engineer point of view), performance criteria and design goals, PI controller, LQG controller,  $H_\infty$  controller, Hardware restriction.

### Paper III

(Ref. Wodek Gawronski, "Antenna Control System: From PI to  $H_\infty$ ," 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, backlash, 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", 8<sup>th</sup> IEEE international conference on methods and model in automation and robotics szczecin, Poland, sept 2002
6. Wodek Gawronski, Antenna control system: from PI to  $H_\infty$ ", 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

### Microstrip Antennas

**Unit 1 : Probe-Fed Microstrip Antennas (15)**

Full-wave Analysis of Multilayer Multipatch Microstrip Antennas, Spectral Domain Full-Wave Analysis of Probe-Fed Rectangular Microstrip Antennas, Representative Numerical and Experimental results, Rectangular Patch with Ushaped slot  
Aperture-Coupled Multilayer Microstrip Antennas  
Green's Function Formulation, Galerkin's Method, Illustrative Results, Infinite Arrays of Aperture-Coupled Multilayer Microstrip Antennas

**Unit 2 : Microstrip Arrays ; Analysis, Design and Applications (15)**

Analysis techniques for Microstrip Arrays, Design Methodology, Applications  
Dual and Circularly polarized Microstrip Antennas  
Polarization in Antenna Systems, Generation of orthogonal Polarizations, Circularly Polarized Patches, Dual polarized Patches, Microstrip Spirals, Special substrates and Active Antennas, Dual and Circularly Polarized Arrays

**Unit 3 : Computer-Aided Design of Rectangular Microstrip Antennas (15)**

CAD Model for Rectangular Patch Antenna, CAD Formulas for Resonance Frequency, CAD Formulas for the Q Factors, CAD Formula for Bandwidth, CAD Formula for Bandwidth, CAD Formula for Radiation Efficiency, CAD Formula for Input Resistance, CAD Formula for Probe Reactance, Results for Input Impedance, Radiation Patterns, CAD Formula for Directivity

**Unit 4 : Efficient Modeling of Microstrip Antennas Using Finite-Difference Time-Domain Method (15)**

Comparison of Various CAD approaches, Basic FDTD Algorithm, Efficient FDTD Modeling of Microstrip Antennas, Single Patch Modeling, Analysis of Two-Layer Stacked Patch Antenna, Design of Compact Broadband Antenna

### References

1. Kai Fong Lee and Wei Chen Ed., Advances in Microstrip and Printed Antennas, A Wiley-Interscience Publication John Wiley and Sons, Inc. New York 1997

## Paper III

### Small Antennas

- Unit 1 Definition, Properties, Fundamental Limitations, Subjects related with small antennas (15)  
Definition, significance, performance of small antennas, importance of impedance matching, problems of environmental effect, fundamental limitations, brief review of typical work, major subjects and topics, practical design problems, general topics
- Unit 2 Principles and techniques for making antennas small (15)  
Techniques and methods for producing ESA, Techniques and methods for producing FSA, Techniques and methods for producing PCSA, Techniques and methods for producing PSA, optimization techniques
- Unit 3 Design and practice of ESA (15)  
Lowering the resonance frequency, full use of volume/space, uniform current distribution, increase of excitations mode, applications of metamaterials, active circuit applications to impedance matching
- Unit 4 Design and practice of FSA, PCSA, PSA and evaluation of small antenna performance (15)  
FSA-integration technique, integration of functions into antenna,  
PCSA- low profile structure, application of HIS, EBG, DGS, DBE structure,  
PSA-small antennas for radio watch/clock systems, small antennas for RFID  
Performance evaluation- practical method of measurement, practice of measurement

### References

1. Kyohei Fujimoto and Hisashi Morishita, *Modern Small Antennas*. Cambridge : Cambridge University Press, 2013 New York

## Paper III

### Paper III : Wireless Sensor Networks

#### Unit 1: Overview of Wireless Sensor Networks

(15)

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

(15)

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, Gateway concepts.

#### Unit 3 : Networking

(15)

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

(15)

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming, NS2/NS3, 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, Nandan Parameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye, Wiley.

## Paper III

### Problem Solving With Soft Computing

#### Unit I: 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 II: 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 Defuzzification.

#### Unit III: 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

#### Unit IV: 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.