

Choice Based Credit System Syllabus (w.e.f.2015-16)



**SOLAPUR UNIVERSITY, SOLAPUR**  
**FACULTY OF ENGINEERING & TECHNOLOGY**

**STRUCTURE OF M.E. (ELECTRONICS ENGINEERING)**

Choice Based Credit System Syllabus (w.e.f.2015-16)

**Four Semester Course**

**Semester-I**

Sr. No.	Subject	Teaching Scheme				Credits			
		L	T	P	Total	Credits (L)	Credits (T)	Credits (P)	Total Credits
1	CMOS VLSI Design	3	-	2	5	3.0	-	1.0	4.0
2	Advanced Digital Signal Processing	3	-	2	5	3.0	-	1.0	4.0
3	Advanced Network Engineering	3	1	-	4	3.0	1.0	-	4.0
4	Random Signals & Processes	3	-	2	5	3.0	-	1.0	4.0
5	Elective I	3	1	-	4	3.0	1.0	-	4.0
6	Seminar- I	-	-	2	2	-	-	2.0	2.0
<b>Total</b>		<b>15</b>	<b>2</b>	<b>8</b>	<b>25</b>	<b>15.0</b>	<b>2.0</b>	<b>5.0</b>	<b>22.0</b>

**Note –**

- Seminar I shall be delivered on a topic related to student's broad area of interest for dissertation work selected in consultation with the advisor after compiling the information from the latest literature. Student shall deliver seminar using modern presentation tools. A hard copy of the report (as per format specified by the department) shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.

## Semester-II

Sr.	Subject	Teaching Scheme				Credits			
		L	T	P	Total	Credits (L)	Credits (T)	Credits (P)	Total Credits
1	Research Methodology	3	1	-	4	3.0	1.0	-	4.0
2	Embedded System Design	3	-	2	5	3.0	-	1.0	4.0
3	Peripheral System Design & Interfacing	3	-	2	5	3.0	-	1.0	4.0
4	Advanced Control Systems	3	-	2	5	3.0	-	1.0	4.0
5	Elective – II	3	1	-	4	3.0	1.0	-	4.0
6	Seminar – II	-	-	2	2	-	-	2.0	2.0
<b>Total</b>		<b>15</b>	<b>2</b>	<b>8</b>	<b>25</b>	<b>15.0</b>	<b>2.0</b>	<b>5.0</b>	<b>22.0</b>

### Note –

- Seminar II shall be delivered on a topic related to student's particular area of interest for dissertation work selected in consultation with the advisor after compiling the information from the latest literature. Student shall deliver seminar using modern presentation tools. A hard copy of the report (as per format specified by the department) shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.

### List of elective subjects for semester I and II -

Sr.	Specialization	Elective - I	Elective - II
1	Telecommunication Engineering	Design of Wireless System OR Wireless Sensor Networks	Mobile Technology
2	VLSI & Embedded	Advanced Digital System Design	Real Time Systems
3	Signal Processing	Image and Video Processing	VLSI in Signal Processing
4	Control Systems	Neural Networks & Fuzzy Control Systems	PLC, SCADA and Distributed Control System

### Note –

- Student must select any one of the four specializations available.
- Student must opt for Elective I and Elective II from selected specialization only.
- Subjects may be added in the list of Elective I and II as per requirement.



**Solapur University, Solapur**  
**M.E. (Electronics) Semester-I**  
**CMOS VLSI DESIGN**

**Teaching Scheme**

**Lectures – 3 Hrs. /Week**

**Practical – 2 Hrs. /Week**

**Examination Scheme**

**Theory Credits – 3.0**

**Practical Credit- 1.0**

**SECTION-I**

**Unit 1: MOS transistor theory:**

**(06 Hrs.)**

Physical structure of MOS transistor, accumulation, depletion & inversion modes, MOS device design equations, second order effects, Technology scaling

**Unit 2: CMOS inverter:**

**(06 Hrs.)**

Static and dynamic behavior of CMOS inverter, power and energy delay, impact of technology scaling on inverter

**Unit 3: Combinational logic design in CMOS:**

**(08 Hrs.)**

Static CMOS design- complementary CMOS, Ratioed logic and pass transistor logic; dynamic CMOS design- dynamic logic basic principle, speed and power dissipation, issues in dynamic design, cascading dynamic gates, comparison of static and dynamic designs in CMOS

**SECTION-II**

**Unit 4: Sequential logic designs in CMOS:**

**(06 Hrs.)**

Static latches and registers- the bistability principle, multiplexer based latches, Master-slave edge triggered register, low voltage static latches, static SR flip flops, dynamic latches and registers- dynamic transmission-gate edge triggered registers, C2MOS- A clock- skew insensitive approach, true single-phase clocked register (TSPCR)

**Unit 5: Timing issues in digital circuits:**

**(07 Hrs.)**

Timing classification: synchronous interconnect, mesochronous interconnect, plesiochronous interconnect, asynchronous interconnect, synchronous design- clock skew, jitter, clock distribution, latch based clocking, synchronizers and arbiters, using PLL for clock synchronization

**Unit 6: Designing arithmetic and memory building blocks:**

**(07 Hrs.)**

Designing fast adders, designing fast multipliers, designing other arithmetic building blocks, designing ROMs, DRAMs & SRAMs

**Term work:**

- *Term work shall consist of minimum eight experiments based on above syllabus using any EDA software tool*

**Reference books:**

1. Digital Integrated Circuits, Rabey, Chandrakasan, Nikolic, Pearson Education
2. Principles of CMOS VLSI Design, Neil Weste, Kamran Eshraghian, Addison Wesley/Pearson Education
3. CMOS digital integrated circuits, Analysis and Design, Sung-Mo Kang, Yusuf Leblebici, TATA McGRAW Hill
4. CMOS VLSI design, Neil H. E. Weste, David Harris, Ayan Banerjee, Pearson Education





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-I**

**ADVANCED DIGITAL SIGNAL PROCESSING**

**Teaching Scheme**

**Lectures – 3 Hrs. /Week**

**Practical – 2 Hrs. /Week**

**Examination Scheme**

**Theory Credits – 3.0**

**Practical Credit- 1.0**

**SECTION- I**

**Unit 1: Linear prediction and optimal linear filters:**

**(07 Hrs.)**

Forward and backward linear prediction; the optimum reflection for the forward and backward predictors; relationship of an AR process to linear prediction; the Levinson Durbin algorithm; the Schur algorithm; properties of the linear prediction –error filters

**Unit 2: Power spectrum estimation:**

**(07 Hrs.)**

Estimation of spectra from finite duration observation of signals; computation of energy density function; estimation of auto-correlation and power spectrum of random signals; the periodogram; the use of DFT in power spectrum estimation; parametric methods for power spectrum estimation; AR model parameters for power spectrum estimation

**Unit 3: Design of digital filters:**

**(06 Hrs.)**

Symmetric and anti-symmetric FIR filters, design of linear phase FIR filters by using frequency sampling method and windows design of optimum equi-ripple linear phase FIR filters; design of FIR differentiator design of Hilbert transformers, comparison of design methods

**SECTION- II**

**Unit 4: IIR filters:**

**(06 Hrs.)**

Design of IIR filter using BLT method, design of digital filters based on least squares methods: Padé approximation method; least squares design methods; frequency transformation

**Unit 5: Multirate DSP:**

**(07 Hrs.)**

Decimation by a factor of D; interpolation by a factor of I; sampling rate conversion by a rational factor I/D; filter design & implementation for sampling rate conversion, direct form FIR filter structure; application of multirate DSP

**Unit 6: Wavelet transforms:**

**(07 Hrs.)**

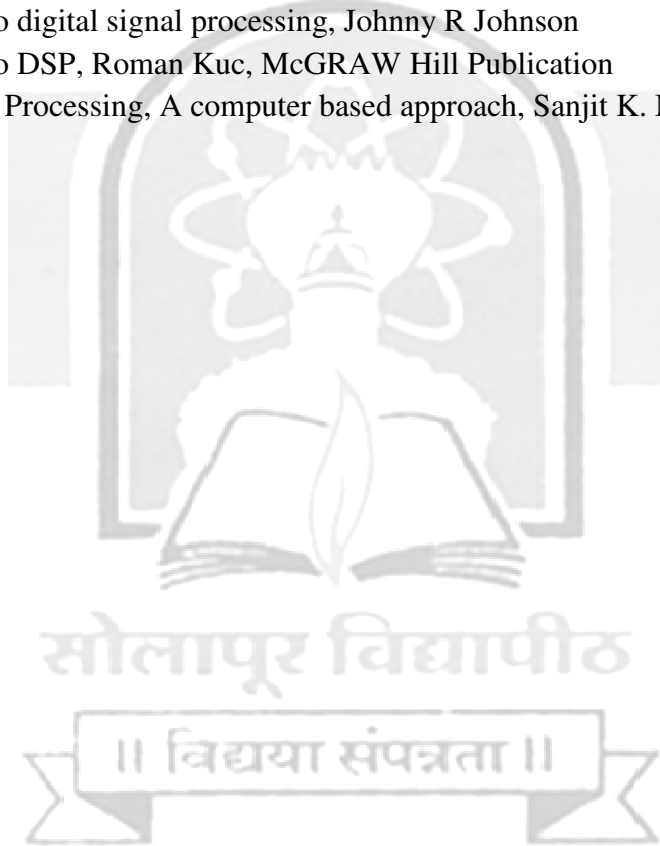
Introduction to wavelets, wavelets and wavelet expansion systems, discrete wavelet transform multi resolution formulation of wavelet systems, Haar wavelet and other wavelet representations, scaling function, wavelet functions, Parseval's theorem

**Term work:**

- *Term work shall consist of minimum eight experiments based upon above syllabus*

**Reference books:**

1. Digital signal processing- Principles, algorithms and applications, John. G Proakis, PHI Publication
2. Advanced DSP, Proakis, Rade, Ling, Mcmillan Publication
3. Discrete time signal processing, A.V. Oppenheim, R.W. Schafer
4. Theory and application of digital signal processing, I.R. Rabiner, Gold
5. Introduction to digital signal processing, Johnny R Johnson
6. Introduction to DSP, Roman Kuc, McGRAW Hill Publication
7. Digital Signal Processing, A computer based approach, Sanjit K. Mitra





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-I**  
**ADVANCED NETWORK ENGINEERING**

**Teaching Scheme**  
**Lectures – 3 Hrs. /Week**  
**Tutorial – 1 Hr. /Week**

**Examination Scheme**  
**Theory Credits– 3.0**  
**Tutorial Credit – 1.0**

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**SECTION- I**

**Unit 1: Internet technology:**

**(07 Hrs)**

Network hardware components, ARP, RARP, performance issues in IP, Internet addresses, limitations of IPv4, IPv6, ICMP, TCP performance- TCP finite state diagram, congestion & its controlling, timers in TCP & its management, Kern's algorithm, UDP

**Unit 2: Internet management:**

**(04 Hrs.)**

The level of management protocols, architectural model, protocol architecture, examples of MIB variables, the structure of Management information, format definitions DSN 1; structure and representation of MIB object names, simple network management protocol, SNMP message format

**Unit 3: Internet security and firewall design:**

**(09 Hrs.)**

Protection resources, the need for an information policy, communication, cooperation, and mutual mistrust, mechanisms for internet security, cryptography, block ciphers, public key cryptography; firewalls and Internet access, multiple connections and weakest links, firewall implementation and high-speed hardware, packet-level filters, security and packet filter specifications, the consequence of restricted access for clients; accessing services through a firewall, the details of firewall architecture, types of fire walls, stub network, an alternative firewall implementation, monitoring and logging.

**SECTION- II**

**Unit 4: Multimedia communications:**

**(04 Hrs.)**

Multimedia information representation, multimedia networks, multimedia applications, network QoS and application QoS

**Unit 5: Detailed study of MPEG 4:**

**(06 Hrs.)**

Coding of audiovisual objects, MPEG 4 systems, MPEG 4 audio and video, profiles and levels; MPEG 7 standardization process of multimedia content description, MPEG 21 multimedia framework, significant features of JPEG 2000, MPEG 4 transport across the Internet

**Unit 6: Multimedia communication across networks:**

**(10 Hrs.)**

Layered video coding, error resilient video coding techniques, multimedia transport across IP networks and relevant protocols such as RSVP, RTP, RTCP, DVMRP, multimedia in mobile networks, multimedia in broadcast networks



**Term work:**

- *Term work shall consist of minimum six assignments based upon above syllabus*

**Reference books:**

1. Internetworking with TCP/IP, D.E.Comer Vol. I (4th Edition), Vol-II, Vol- III, PHI
2. UNIX Network Programming, Richard Steven, PHI, 3<sup>rd</sup> Edition
3. Data communications and networking, Behrmz Foruzan, TMH
4. Multimedia Communication Systems, K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, Pearson Education
5. Multimedia Communications, Fred Halsall, Pearson Education, 2001
6. Multimedia-Computing, Communications and Applications, Raif steinmetz, Klara Nahrstedt, Pearson Education





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-I**  
**RANDOM SIGNALS AND PROCESSES**

**Teaching Scheme**

**Lectures – 3 Hrs. /Week**

**Practical – 2 Hr. /Week**

**Examination Scheme**

**Theory Credits– 3.0**

**Practical Credit- 1.0**

**SECTION- I**

**Unit 1: Introduction to probability:**

**(04 Hrs.)**

Sample spaces, conditional probability, total probability and Bayes' theorem, independence of events, Bernoulli trials

**Unit 2: Random variables:**

**(08 Hrs.)**

Cumulative distribution function, probability density function, statistical properties, moments, some special distributions- uniform, Gaussian and Rayleigh distributions; Binomial, and Poisson distributions, moment generating functions and characteristic functions, transformation of a random variable, conditional probability density

**Unit 3: Multiple random variables:**

**(08 Hrs.)**

Joint cumulative distribution function, joint probability density function statistical properties, jointly distributed Gaussian random variables, conditional probability density, PDF of sum of random variables, almost sure (a.s.) convergence and strong law of large numbers, central limit theorem, estimation of population mean, expected value and variance and covariance, bounds and approximations- Chebysev inequality and Chernoff bound

**SECTION- II**

**Unit 4: Random processes:**

**(06 Hrs.)**

Basic definitions, properties, auto correlation and cross correlation function, estimate of auto correlation function

**Unit 5: Spectral density:**

**(06 Hrs.)**

Definition, properties, white noise, estimation of auto-correlation function using frequency domain technique, estimate of spectral density, cross spectral density and its estimation, coherence

**Unit 6: Linear system:**

**(04 Hrs.)**

Properties, random inputs, estimate of response using frequency domain techniques, matched filter

**Unit 7: Examples of random processes:**

**(04 Hrs.)**

White noise process and white noise sequence; Gaussian process; Poisson process, Markov process

**Term work:**

- *Term work shall consist of minimum eight experiments based upon above syllabus*

**Reference Books:**

1. Introduction to Probability and Random Processes, Jorge I. Aunin, V. Chandrashekar
2. Probability and Random Processes with Applications to Signal Processing, H.Stark, J. Woods (Indian Edition is available), Pearson Education, 3<sup>rd</sup> Edition
3. Introduction to Probability Theory with Stochastic Processes, K. L. Chung, Springer International student Edition.
4. Probability and Statistics and Queuing Theory, P. Kandasamy, Dr. K. Gunvanthi





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-I**

**ELECTIVE I - DESIGN OF WIRELESS SYSTEM**

**Teaching Scheme**

**Lectures – 3 Hrs. /Week**

**Tutorial – 1 Hr./Week**

**Examination Scheme**

**Theory Credits– 3.0**

**Tutorial Credit- 1.0**

**SECTION- I**

**Unit 1: Design of amplifiers and oscillators: (10 Hrs)**

Components at radio frequency, S parameters, digital modulation issues, designing with modulation/ demodulation ICs, distortion and noise products, wideband amplifiers design, parallel amplifiers design, audio amplifiers design, VGA amplifiers design, oscillator design issues, LC, crystal, VCO oscillator design and testing

**Unit 2: Design of frequency synthesis: (05 Hrs.)**

Review of PLL synthesis, PLL synthesis design; direct digital synthesis

**Unit 3: Filter design: (05 Hrs.)**

Review of lumped filter design, distributed filter design, diplexer filter design, crystal and SAW filter design, tunable filter design, filter issues

**SECTION- II**

**Unit 4: Mixer design: (05 Hrs.)**

Passive mixer design, active mixer design, image reject and harmonic mixers

**Unit 5: Support circuit design: (05 Hrs.)**

Design of frequency multipliers, RF switches, automatic gain control, splitters and combiners, antenna design

**Unit 6: Comprehensive system design: (05 Hrs.)**

Receiver as a system, transmitter as a system complete communication system, RF propagation considerations

**Unit 7: Wireless systems simulation: (05 Hrs.)**

Issues, discrete event simulation, simulation models, random number and variate generator, overview of design simulation software, case studies

**Term work:**

- *Term work shall consist of minimum six assignments based upon above syllabus*

**Reference books:**

1. Complete Wireless Design, Coter W. Sayre, McGraw Hill, 2<sup>nd</sup> Edition
2. RF Circuit Design-Theory and Applications, Reinhold Ludwig, Pavel Bretchko, Pearson Education
3. Wireless Networks, P. Nicopolitidis, M.S. Obaidat, G.I. Papadimitriou, A.S. Pomportsis, Wiley India Edition





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-I**

**ELECTIVE I- WIRELESS SENSOR NETWORKS**

**Teaching Scheme**  
**Lectures – 3 Hrs. /Week**  
**Tutorial – 1 Hr./Week**

**Examination Scheme**  
**Theory Credits– 3.0**  
**Tutorial Credit- 1.0**

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**SECTION-I**

- Unit 1: Introduction to Wireless Sensor Networks (WSN):** (06 Hrs.)  
Motivation, overview, network architecture, protocol stack, design objectives, challenges & constraints, technologies, hardware & software platforms, standards, applications
- Unit 2: Medium Access Control (MAC):** (06 Hrs.)  
Overview of MAC, MAC for WSN- network characteristics, objectives, energy efficiency, contention MAC, contention free MAC, hybrid MAC
- Unit 3: Routing & Clustering:** (08 Hrs)  
Overview, challenges, metrics, data centric routing, proactive routing, on demand routing, hierarchical routing, location based routing, QoS based routing, introduction to clustering

**SECTION-II**

- Unit 4: Node Architecture:** (04 Hrs.)  
Architecture, sensing, processing, communication interface, prototypes, software subsystems
- Unit 5: Power Management:** (06 Hrs.)  
Need, classification, passive power conservation mechanism, active power conservation mechanism, power control at different protocol layer
- Unit 6: Time Synchronization:** (04 Hrs.)  
Clocks and synchronization problems, basics of time synchronization, time synchronization protocols
- Unit 7: Localization:** (04 Hrs.)  
Ranging techniques, range based localization, range free localization, event driven localization
- Unit 8: Standards** (04 Hrs)  
IEEE 802.15- Overview, MAC layer, Zigbee- network layer, application layer

**Term work:**

- *Term work shall consist of minimum eight tutorials based on above syllabus*

**Reference books:**

1. Wireless Sensor Networks – A Networking Perspective, Jun Zheng, Abbas Jamalipour, Wiley- IEEE
2. Fundamentals of Wireless Sensor Networks- Theory and Practice, Walteneus Dargie, Chrstian Poellabauer, Wiley
3. Networking Wireless Sensors, Bhaskar Krishnamachari, Cambridge University Press
4. Wireless Sensor Networks- Technology, Protocols and Applications, Kazem Sohraby, Daniel Minoli, Taieb Znati, Wiley India
5. Wireless Sensor Network Designs, Anna Hac, John Wiley and Sons





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-I**

**ELECTIVE I - ADVANCED DIGITAL SYSTEM DESIGN**

**Teaching Scheme**

**Lectures – 3 Hrs. /Week**

**Tutorial – 1 Hr./Week**

**Examination Scheme**

**Theory Credits – 3.0**

**Tutorial Credit- 1.0**

**SECTION- I**

**Unit 1: Analysis and design using state machines: (08 Hrs.)**

Clocked synchronous state machine analysis (state machine structure, output logic, characteristics equations of latch and flip-flops, analysis of state machines with D flip-flops) clocked synchronous state machine design with examples, designing state machines using state diagrams, state machine synthesis using transition lists

**Unit 2: Timing and hazards: (05 Hrs.)**

Static hazards, finding static hazards using maps, dynamic hazards, designing hazard free circuits, sequential circuit timing

**Unit 3: Designing with FPGAs: (07 Hrs.)**

Implementing functions in FPGAs, implementing functions using Shannon's decomposition, carry chains in FPGAs, cascade chains in FPGAs, Xilinx configurable logic block, the Altera logic element, dedicated memory in FPGAs, dedicated multipliers in FPGAs, cost of programmability, FPGA capacity, design translation (Synthesis)

**SECTION II**

**Unit 4: Floating point- Arithmetic: (07 Hrs.)**

Representation of floating point numbers (floating point formats- 2's complement, IEEE754), floating point multiplication, floating- point addition, floating- point subtraction, floating- point division

**Unit 5: Design of Processor: (07 Hrs.)**

Control and data path units of processor, design of serial multiplier, central processing unit - simple data path, controlling simple data path, control unit implementations -hard wired control unit, memory and I/O interface, contemporary microprocessors architectures: instruction pipelining, parallel hardware units, memory hierarchy, CISC, RISC

**Unit 6: Hardware Testing and Design for Testability: (06 Hrs.)**

Testing combinational logic, testing sequential logic, scan testing, boundary scan, built-in self-test



**Term work:**

- *Term work shall consist of minimum six assignments based upon above syllabus*

**Reference books:**

1. Digital Design principles and practices, John F. Wakerly, Pearson education, 3<sup>rd</sup> Edition
2. Digital systems design using VHDL, Charles H. Roth, Lizy Kurian John, Cengage Learning, 2<sup>nd</sup> Edition
3. Digital Logic Design Principles, Norman Balabanian, Bradley Carlson, Wiley Publication.
4. Fundamentals of digital logic with VHDL Design, Stephen Brown, Zvonko Vranesic, Tata McGraw-Hill Publication





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-I**

**ELECTIVE I – IMAGE AND VIDEO PROCESSING**

**Teaching Scheme**

**Lectures – 3 Hrs. /Week**

**Tutorial – 1 Hr. /Week**

**Examination Scheme**

**Theory Credits– 3.0**

**Tutorial Credit – 1.0**

**SECTION I**

- Unit 1: Image sampling and quantization: (04 Hrs.)**  
Introduction, 2D sampling theory, limitations in sampling & reconstruction, quantization, optimal quantizer, compander, visual quantization
- Unit 2: Image transforms: (06 Hrs.)**  
Introduction, 2D orthogonal & unitary transforms, properties of unitary transforms, DFT, DCT, DST, Hadamard, Haar, slant, KLT, SVD transform.
- Unit 3: Image enhancement: (06 Hrs.)**  
Point operations, histogram modeling, spatial operations, transform operations, multi-spectral image enhancement, false color and pseudocolor, color image enhancement
- Unit 4: Image filtering & restoration: (06 Hrs.)**  
Image observation models, inverse & Wiener filtering, Fourier domain filters, smoothing splines and interpolation, least squares filters, generalized inverse, SVD and iterative methods, maximum entropy restoration, Bayesian methods, coordinate transformation & geometric correction, blind de-convolution

**Section– II**

- Unit 5: Image analysis & computer vision: (06 Hrs.)**  
Spatial feature extraction, transform features, edge detection, boundary extraction, boundary representation, region representation, moment representation, structure, shape features, texture, scene matching & detection, image segmentation, classification techniques.
- Unit 6: Image data compression: (06 Hrs.)**  
Introduction, pixel coding, predictive techniques, transform coding, inter-frame coding, coding of two tone images, image compression standards
- Unit 7: Video processing: (06 Hrs.)**  
Fundamental concepts in video – types of video signals, analog video, digital video, color models in video, video compression techniques – motion compensation, search for motion vectors, H.261, H.263, MPEG I, MPEG 2, MPEG 4, MPEG 7, content based video indexing

**Term work:**

- *Term work shall consist of minimum six assignments based upon above syllabus*

**Reference books:**

1. Fundamentals of Digital Image Processing, K. Jain, Pearson education (Asia) Pte. Ltd. / Prentice Hall of India, 2004
2. Handbook of Image & Video Processing, Al Bovik, Elsevier Academic Press, 2<sup>nd</sup> Edition
3. Fundamentals of Multimedia, Z. Li, M.S. Drew, Pearson education (Asia) Pte. Ltd., 2004
4. Digital Image Processing, R. C. Gonzalez, R. E. Woods, Pearson education (Asia) Pte. Ltd. /Prentice Hall of India, 2004, 2<sup>nd</sup> Edition
5. Digital Video Processing, M. Tekalp, Prentice Hall, USA, 1995





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-I**  
**ELECTIVE I-NEURAL NETWORKS AND**  
**FUZZY CONTROL SYSTEMS**

**Teaching Scheme**

**Lectures**– 3 Hrs. /Week

**Tutorial** – 1 Hr. /Week

**Examination Scheme**

**Theory Credits** – 3.0

**Tutorial credit** – 1.0

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**SECTION- I**

**Unit 1: Artificial neural system-preliminaries:**

**(04 Hrs)**

Neural computations, models of artificial neural networks (ANN), neural processing, learning and adaptation, learning rules, applications of ANN

**Unit 2: Feed-forward ANN and supervised learning:**

**(07 Hrs.)**

Single layer perception classifiers- continuous, discrete, multi category, multilayer feed-forward, error back propagation, learning factors, variants of back propagation, ANN as a statistical recognizer

**Unit 3: Recurrent neuro-dynamical systems:**

**(05 Hrs.)**

Discrete time Hopfield ANN, gradient type Hopfield ANN, content addressable memory, simulated annealing, Boltzman machine, bidirectional associative memory

**Unit 4: Identification, control and estimation using ANN:**

**(04 Hrs.)**

Linear system identification, autoregressive model, ARMA model, nonlinear system modeling, identification of control of nonlinear dynamical systems, independent component analysis, spectrum estimation, case studies

**SECTION- II**

**Unit 5: Fuzzy control-preliminaries:**

**(07 Hrs.)**

Fuzzy sets, fuzzy relations, approximate reasoning, representing a set of rules, membership functions, fuzzy controller from industrial perspective, knowledge based system for process control, knowledge representation, applications of fuzzy logic

**Unit 6: Fuzzy controller design:**

**(07 Hrs.)**

Structure of fuzzy controller, rule base, data base, inference engine, fuzzification and defuzzification, nonlinear fuzzy control, PID like fuzzy controller

**Unit 7: Fuzzy nonlinear simulation:**

**(06 Hrs.)**

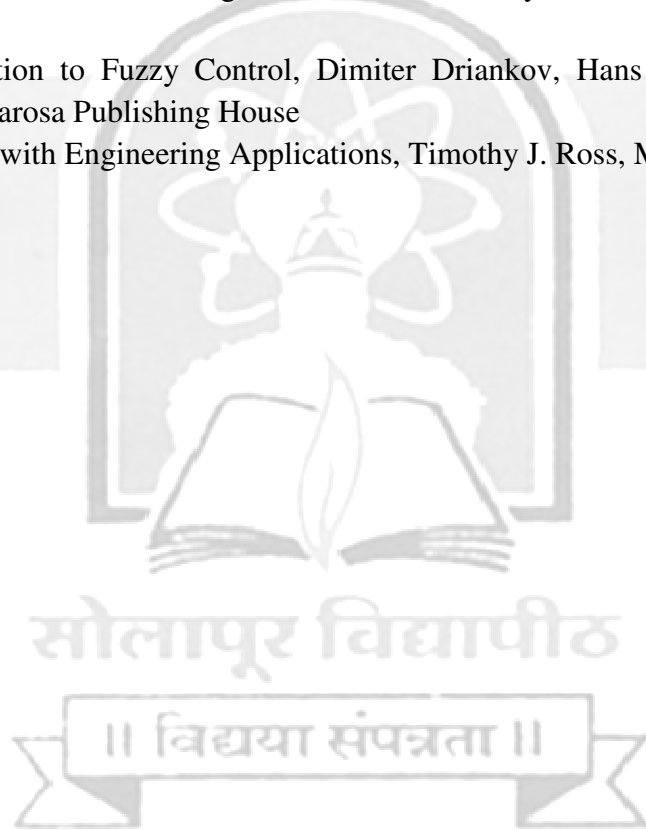
Relational equations, partitioning, non linear simulation using fuzzy rule based systems, fuzzy associative memories

**Term work:**

- *Term work shall consist of minimum six assignments based upon above syllabus*

**Reference Books:**

1. Neural Networks- Classroom Approach, Satish Kumar, Tata McGraw-Hill Publishing Company Ltd.
2. Introduction to Artificial Neural Systems, Jacek M Zurada, Jaico Publishing House
3. Principles of Neurocomputing for Science and Engineering, Fredric M Ham, Ivica Kostanic, Tata McGraw-Hill Edition
4. Neural Networks and Learning Machines, Simon Haykin, Prentice Hall of India Pvt. Ltd.
5. An Introduction to Fuzzy Control, Dimiter Driankov, Hans Hellendoorn, Michael Reinfrank, Narosa Publishing House
6. Fuzzy Logic with Engineering Applications, Timothy J. Ross, McGraw Hill, Inc.





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-II**  
**RESEARCH METHODOLOGY**

**Teaching Scheme**

**Lectures – 3 Hrs. /Week**

**Tutorial – 1 Hr. /Week**

**Examination Scheme**

**Theory Credits – 3.0**

**Tutorial Credit- 1.0**

**SECTION- I**

**Unit 1: Research fundamentals:**

**(06 Hrs.)**

Definition, objectives, motivation, types of research and approaches, research- descriptive, conceptual, theoretical, applied and experimental

**Unit 2: The initial research process:**

**(06 Hrs.)**

Literature review, research design, assortment of the problem, identification of problem, defining a problem, objective, sub objective and scope, assumptions, validation criteria, research proposal(synopsis)

**Unit 3: Mathematical modeling and simulation:**

**(08 Hrs.)**

Mathematical modeling – need, techniques and classification, system models –types, static, dynamic, system simulation – why to simulate, technique of simulation, Monte Carlo simulation, types, continuous modeling, discrete model

**SECTION II**

**Unit 4: Probability and statistics in simulation:**

**(06 Hrs.)**

Role of probability and statistics in simulation, statistical distributions, inference about the difference in means, statistical output analysis

**Unit 5: Design of experiment:**

**(06 Hrs.)**

Strategy of experimentation, types, basic principle, guidelines, need of precision, types of errors

**Unit 6: Report writing and presentation of results:**

**(05 Hrs.)**

Need, report structure, formulation, sections, protocols, graphs, tables, IEEE format, evaluation of report, writing abstract, writing technical paper

**Unit 7: Information communication technology:**

**(03 Hrs.)**

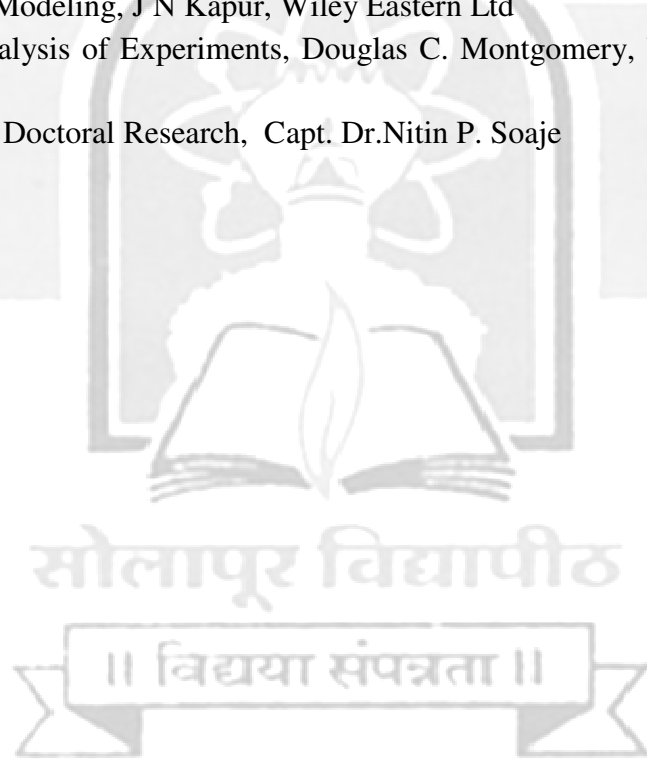
Introduction, e-research, indices, patents, virtual lab, digital lab, ethical issues in research

**Term work:**

- *Term work shall consist of minimum six assignments based upon above syllabus*

**Reference books:**

1. Fundamental of Research Methodology and Statistics, Yogesh Kumar Sing, New Age International Publishers
2. Research Methodology: Methods and Techniques, C.R. Kothari, New Age International Publishers, 2<sup>nd</sup> revised Edition
3. Research Methodology, Concepts and Cases, Deepak Chawla, Neena Sondhi, Vikas Publishing House Pvt. Ltd
4. Simulation Modeling and Simnet, Hamdy A. Taha, Prentice Hall International Edition
5. System Simulation, Geoffrey Gorden, Prentice Hall of India Pvt. Ltd.
6. Mathematical Modeling, J N Kapur, Wiley Eastern Ltd
7. Design and analysis of Experiments, Douglas C. Montgomery, Wiley Student Edition, 7<sup>th</sup> Edition
8. Role of ICT in Doctoral Research, Capt. Dr.Nitin P. Soaje





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-II**  
**EMBEDDED SYSTEM DESIGN**

**Teaching Scheme**

**Lectures**– 3 Hrs. /Week

**Practical** – 2 Hrs. /Week

**Examination Scheme**

**Theory Credits**– 3.0

**Practical Credit** – 1.0

**SECTION- I**

**Unit 1: Embedded architecture:**

**(03 Hrs)**

Embedded computers, characteristics of embedded computing applications, challenges in embedded computing system design, embedded memories, embedded system design process, designing hardware and software components

**Unit 2: Embedded processor:**

**(09 Hrs.)**

ARM 9 architecture, instructions and data handling; interfacing with memory; interrupts, timers, ARM bus, I/O devices, I/O controllers, simple & autonomous I/O controllers, parallel, multiplexed, tristate, and open-drain buses, bus protocols, serial transmission techniques & standards, wireless protocol, CAN & advanced buses

**Unit 3: Interfacing:**

**(08 Hrs.)**

Sensors and interfacing techniques, analog interfacing and data acquisition, timing generation and measurements, interfacing of serial bus protocols like I2C, RS485, CAN and USB, wireless protocols and interfacing of IRDA and SMART card

**SECTION- II**

**Unit 4: Embedded system software:**

**(04 Hrs.)**

Software architectures, software developments tools, programming concepts, embedded programming in C and C++, queues, stacks, optimization of memory needs, program modeling concepts, software development process life cycle and its model, software analysis, design and maintenance

**Unit 5: Real time operating systems:**

**(10 Hrs.)**

Operating system concepts, processes, deadlocks, memory management, input /output, files, security, the shell, recycling of concepts; operating system structure monolithic systems-layered systems, virtual machines, exo-kernels, client-server model; real time operating systems ( $\mu$ C/OS)- real-time software concepts, kernel structure, task management, time management, inter task communication & synchronization, memory management, and porting  $\mu$ Cos-II; Linux/RT Linux- features of Linux, Linux commands, file manipulations, directory, pipes and filters, file protections, shell programming, system programming, RT Linux modules, POSIX Threads, mutex management, semaphore management



**Unit 6: System design:****(06 Hrs.)**

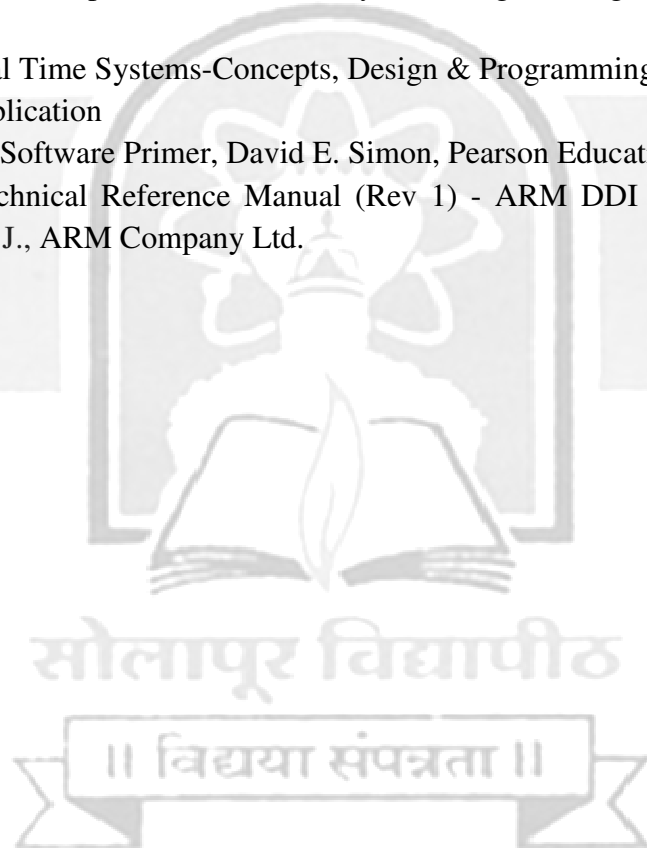
Design methodologies- requirement analysis, specification, system analysis and architecture design; modeling techniques- testing and debugging; quality assurance, design example- data base applications (smart cards), robotics (wireless), CCD camera (data compression)

**Term work:**

- *Term work shall consist of minimum eight experiments based upon above syllabus*

**Reference books:**

1. Introduction to Embedded Systems, Jonathan W. Valvano , Cengage 2009
2. ARM System Developer's Guide, Sloss, Symes, Wright, Morgan, Kaufmann, 2004, 1st Edition
3. Embedded Real Time Systems-Concepts, Design & Programming, Dr. K.V.K.K. Prasad, Dreamtech Publication
4. An Embedded Software Primer, David E. Simon, Pearson Education Publication.
5. ARM920T Technical Reference Manual (Rev 1) - ARM DDI 0151C, Data books of ARM7/ARM9 J., ARM Company Ltd.





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-II**

**PERIPHERAL SYSTEM DESIGN AND INTERFACING**

**Teaching Scheme**

**Lectures – 3 Hrs. /Week**

**Practical – 2 Hrs./Week**

**Examination Scheme**

**Theory Credits– 3.0**

**Practical Credit- 1.0**

**SECTION- I**

**Unit 1: Bus system:**

**(06 Hrs.)**

Bus systems in microcomputers ST 100 bus, Multi bus, EISA, PCI Bus, HP IB/GPIB bus & their applications

**Unit 2: Interface:**

**(06 Hrs.)**

Standard I/O interfaces RS-232 C, RS-232 D centronics interface, current loop interface, RS-485 and USB communication interface

**Unit 3: Design criterion with PCs:**

**(08 Hrs.)**

Application of PC buses (ISA, EISA, PCI, and VESA-VL) and associated signals, handshakes, I/O and interrupt map, programming methodology for input/output application, GPIB signals and GPIB programming techniques operating system calls

**SECTION- II**

**Unit 4: Peripherals:**

**(05 Hrs.)**

Communication controllers, DMA controller, programmable keyboard/display interfaces and associated circuitries.

**Unit 5: Controllers:**

**(07 Hrs.)**

PID controllers, Programmable logic controllers, PC based data acquisition system.

**Unit 6: Process network communication methods:**

**(08 Hrs.)**

HART communication, PROFIBUS, device-Net & Control-Net, industrial Ethernet

**Term work:**

- *Term work shall consist of minimum eight experiments based upon –*
  1. Serial communication between PC and controller
  2. Implementation of RS-485 communication
  3. Design and simulation of PID controller for Temperature process station.
  4. To study on the interface of PLC with PC for data acquisition applications.
  5. Implementation of Digital PID Controller.
  6. To auto tune a PID controller using a relay switch method for process control systems
  7. Experimental Study of DCS and SCADA in a process control system.
  8. To study the action of ON/OFF, P, PI, PID control for pressure process station.
  9. Stability analysis of process control systems.
  10. Process network communication using MODBUS, Profibus

**Reference books:**

1. Intelligent Instrumentation by George C. Barney- PHI.
2. Microprocessors with applications in process control by Ahson, S.I. - Tata McGraw-Hill Publishing Company Limited, New Delhi.
3. PC-based Instrumentation-Concepts & Practice by N. Mathivanan-PHI
4. Industrial Instrumentation and Control by S. K. Singh- TATA McGraw-Hill
5. Instrumentation for Engg. Measurement by James W. dally, William F. Riley, John Wilay and Sons
6. Interfacing A Laboratory Approach by Deonzo, PHI





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-II**  
**ADVANCED CONTROL SYSTEM**

**Teaching Scheme**

**Lectures**– 3 Hrs. /Week

**Practical** – 2 Hrs./ week

**Examination Scheme**

**Theory Credits** – 3.0

**Practical Credits** – 1.0

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**SECTION- I**

**Unit 1: State space analysis:**

**(07 Hrs.)**

State space representation, state transition matrix, response of LTI system, controllability & observability, state representation of discrete system, transfer function of z-domain

**Unit 2: Digital control system:**

**(06 Hrs.)**

Sampling and quantization effects, zero order hold-block, frequency domain consideration, difference domain representation, analysis in Z domain, transfer function, & complete response

**Unit 3: Stability analysis:**

**(07 Hrs.)**

Mapping between S-plane & Z-plane, justify stability criteria, steady state error and error constant, root locus, bode and analytical methods of design, Lyapunov stability

**SECTION- II**

**Unit 4: Pole placement and observer design:**

**(06 Hrs.)**

State feedback gain, design via pole placement, state observers, observer design, servo systems, design of state & output regulations

**Unit 5: MIMO control:**

**(07 Hrs.)**

Models for multivariable systems, basic MIMO control loop, closed loop stability, pairing of inputs and outputs, converting MIMO problems to SISO problems

**Unit 6: Robust control system:**

**(07 Hrs.)**

Introduction, system sensitivity, analysis of robustness, system with uncertain parameter, design of robust control system, design examples, robust internal model control system

**Term work:**

- *Term work shall consist of minimum eight experiments based upon above syllabus*

**Reference books:**

1. Adaptive and Robust Control, Karl Astrom, Wittenmark, Pearson Education, 1995.
2. Robust Control, Patros Ionnav, Jing Sun, Prentice Hall of India Pvt. Ltd., 1996.
3. Discrete Time Control System, K.Ogata, Tata McGraw Hill, Publication, 2001.
4. Control System Design, G.C.Goodwin, Graebe , Salgado Prantice Hall of India Pvt. Ltd.2002.





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-II**  
**ELECTIVE II- MOBILE TECHNOLOGY**

**Teaching Scheme**

**Lectures – 3 Hrs. /Week**

**Tutorial – 1 Hr. /Week**

**Examination Scheme**

**Theory Credits– 3.0**

**Tutorial Credit – 1.0**

**SECTION- I**

- Unit 1: GSM system overview: (08 Hrs)**  
GSM architecture, location tracking and call set up, security, data services, network signaling, MAP protocol and dialogue, mobility management, databases, failure restoration, overflow control, SMS protocol, international roaming, operations, administration and maintenance
- Unit 2: General Packet Radio Services (GPRS): (06 Hrs.)**  
Functional groups, architecture, network nodes, interfaces, procedures, billing, mobility management, applications, EDGE
- Unit 3: Wireless Application Protocol (WAP): (06 Hrs.)**  
Model, gateway, protocol, user agent profile and caching, wireless bearers, development toolkit, network and application environments, wireless markup language, telephony applications, MMS, other applications

**SECTION II**

- Unit 4: Universal Mobile Telecommunication Services (UMTS): (07 Hrs.)**  
Migration path, air interfaces, UTRAN architecture, speech call, packet data, handover, core network evaluation
- Unit 5: CDMA 2000: (07 Hrs.)**  
Evaluation, network architecture and structure, radio network, 1xEVDO, 1xRTT
- Unit 6: Security Issues in Mobile Technology: (06 Hrs.)**  
Information security, attacks, components of information security, security techniques and algorithms, security protocols, security models and frameworks

**Term work:**

- *Term work shall consist of minimum six assignments based upon above syllabus*

**Reference Books:**

1. Mobile Computing, Technology, applications and Service Creation, Asoke K. Talukder, Hasan Ahmed, Rupa R. Yavagal, Tata McGraw Hill Education Pvt. Ltd., 2<sup>nd</sup> Edition
2. 3G Wireless Networks, Clint Smith, Daniel Collins, Tata McGraw Hill Publishing Company Ltd., 2<sup>nd</sup> Edition
3. Wireless and Mobile Network Architecture, Yi-Bing Lin, Imrich Chlamtac, Wiley India





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-II**  
**ELECTIVE II- REAL TIME SYSTEMS**

**Teaching Scheme**

**Lectures – 3 Hrs. /Week**

**Tutorial – 1 Hr. /Week**

**Examination Scheme**

**Theory Credits– 3.0**

**Tutorial Credit – 1.0**

**SECTION- I**

**Unit 1: Introduction:**

**(08 Hrs)**

Introduction – issues in real time computing, structure of a real time system, task classes, performance measures for real time systems, estimating program run times, task assignment and scheduling, classical uniprocessor scheduling algorithms, uniprocessor scheduling of IRIS tasks, task assignment, mode changes and fault tolerant scheduling

**Unit 2: Programming languages and tools-I:**

**(06 Hrs.)**

Programming languages and tools - desired language characteristics, data typing, control structures, facilitating hierarchical decomposition, packages

**Unit 3: Programming languages and tools-II:**

**(06 Hrs.)**

Run time (exception) error handling, overloading and generics, multitasking, low level programming, task scheduling, timing specifications, programming environments, run – time support

**SECTION II**

**Unit 4: Real time databases:**

**(07 Hrs.)**

Real time databases - basic definition, real time Vs general purpose databases, main memory databases, transaction priorities, transaction aborts, concurrency control issues, disk scheduling algorithms, two – phase approach to improve predictability – maintaining serialization consistency – databases for hard real time systems

**Unit 5: Communication:**

**(07 Hrs.)**

Real – time communication – communications media, network topologies protocols, fault tolerant routing; fault tolerance techniques, fault types – fault detection; fault error containment redundancy, data diversity, reversal checks, integrated failure handling

**Unit 6: Evaluation techniques:**

**(06 Hrs.)**

Reliability evaluation techniques – obtaining parameter values, reliability models for hardware redundancy, software error models; clock synchronization, clock, a non fault – tolerant synchronization algorithm, impact of faults, fault tolerant, synchronization in hardware, fault tolerant synchronization in software

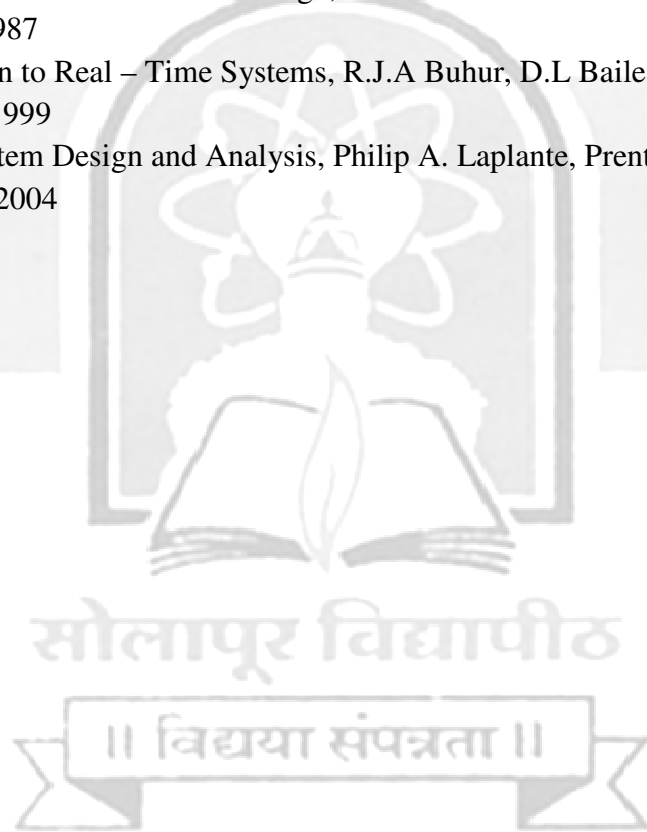


**Term work:**

- *Term work shall consist of minimum six assignments based upon above syllabus*

**Reference Books:**

1. Real – Time Systems, C.M. Krishna, Kang G. Shin, McGraw – Hill International Edition, 1997
2. Real-time systems- theory and practice, Rajib Mall, Pearson Education, 2007
3. Real Time Micro Computer System Design – An Introduction, Peter D. Lawrence, McGraw Hill, 1988
4. Introduction to real time software design, S.T. Allworth and R. N. Zobel, Macmillan, 2nd Edition, 1987
5. An Introduction to Real – Time Systems, R.J.A Buhur, D.L Bailey, Prentice – Hall International, 1999
6. Real Time System Design and Analysis, Philip A. Laplante, Prentice Hall of India, 3<sup>rd</sup> Edition, April 2004





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-II**

**ELECTIVE II-VLSI IN DIGITAL SIGNAL PROCESSING**

**Teaching Scheme**

**Lectures – 3 Hrs. /Week**

**Tutorial – 1 Hr. /Week**

**Examination Scheme**

**Theory Credits– 3.0**

**Tutorial Credit – 1.0**

**SECTION- I**

**Unit 1: DFG representation and iteration bound:**

**(06 Hrs)**

Representations of DSP algorithms, data flow graph representations, critical path, loop bound, iteration bound, algorithms for computing iteration bound

**Unit 2: Pipelining and parallel processing:**

**(06 Hrs.)**

Pipelining approach to reduce critical path, parallel processing to handle higher sample rates, power reduction computations, combined pipelining and parallel processing

**Unit 3: Retiming:**

**(08 Hrs.)**

Introduction to retiming, definitions and properties, solving system of inequalities, cut set retiming and pipelining, retiming for clock period minimization, retiming for register minimization

**SECTION II**

**Unit 4: Unfolding:**

**(06 Hrs.)**

Introduction to unfolding, algorithm for unfolding, properties of unfolding, applications of unfolding

**Unit 5: Folding:**

**(05 Hrs.)**

Introduction to folding, folding transformation, lifetime analysis for register minimization in folded architecture

**Unit 6: Systolic array design:**

**(05 Hrs.)**

Methodologies, family of systolic arrays (FIR filter) using linear mapping techniques, matrix – matrix multiplication

**Unit 7: Bit level arithmetic architectures:**

**(04 Hrs.)**

Parallel multiplication with sign extension, parallel carry ripple array multipliers, parallel carry save array multipliers, parallel multipliers with modified booth recording

**Term work:**

- *Term work shall consist of minimum six assignments based upon above syllabus*

**Reference Books:**

1. VLSI Digital Signal Processing Systems- Design and Implementation, Keshav K. Parhi, Wiley (India)
2. Architecture for Digital Signal Processing, Peter Pirsch, Wiley India
3. Digital Signal Processing in VLSI, Richard J. Higgins
4. VLSI Synthesis of DSP Kernels-Algorithmic and Architectural Transformations, Mahesh Mehendale, Sunil D. Sherlekar





**Solapur University, Solapur**  
**M.E. (Electronics) Semester-II**

**ELECTIVE II- PLC, SCADA AND DISTRIBUTED CONTROL SYSTEMS**

**Teaching Scheme**

**Lectures – 3 Hrs. /Week**

**Tutorial – 1 Hr. /Week**

**Examination Scheme**

**Theory Credits– 3.0**

**Tutorial Credit- 1.0**

**SECTION- I**

**Unit 1: Introduction to programmable logic controllers: (07 Hrs)**

Building blocks of automation, controllers- PLC, role of PLC in FA, architecture of PLC, advantages, types, programming of PLC, simple process control programming using relay ladder logic & Boolean logic methods, PLC- arithmetic functions.

**Unit 2: PLC networking: (06 Hrs.)**

PLC networking standards, vertical integrator of Ind-automation, field bus & Ethernet, HMI system, text display, operator panel, touch panel – panel PCS, integrated display – PLC & HMI.

**Unit 3: Supervisory control and data acquisition: (07 Hrs.)**

Supervisory control & DAS- overview, developer & runtime packages, architecture, tools, internal & external graphics, alarm logging, tag log structured tags, report generation, VB & C scripts for SCADA application.

**SECTION- II**

**Unit 4: Communication protocols: (07 Hrs.)**

Communication protocols of SCADA– Proprietary & open protocols – OLE / OPC, DDE-server/client configuration, messaging, user administration, interfaces of SCADA with PLC, driver & field devices.

**Unit 5: Distributed control system: (07 Hrs.)**

Difference between SCADA & DCS, architecture, local control unit, programmer languages, communication facilities, operator interface, engineering interface

**Unit 6: Application of SCADA & DCS: (06 Hrs.)**

Case studies of process plants using SCADA & DCS, advanced features/ option in SCADA & DCS, role of PLC in DCS & SCADA, comparison – field devices, sensors, drives etc in DCS & SCADA.

**Term work:**

- *Term work shall consist of minimum six assignments based upon above syllabus*

**Reference Books:**

1. Computer Control of Manufacturing Systems, Yoram Koren, Tata Mc-Graw Hill Publication, 1988, 1st Edition
2. Programmable Logic Controllers, Prentice Hall of India Publications, 2005, 5th Edition
3. Distributed Control Systems, Michael lucas, Van Nostrand Reinhold Company
4. Cimlicity SCADA Packages Manuals, Fanuc India ltd., 2004.





# **SOLAPUR UNIVERSITY, SOLAPUR**

**FACULTY OF ENGINEERING & TECHNOLOGY**

**ELECTRONICS ENGINEERING**

**Syllabus for**

**M.E. (Electronics Engineering) Semester III and IV**

Choice Based Credit System Syllabus  
(w.e.f.2015-16)

**॥ विद्यया संपन्नता ॥**



**SOLAPUR UNIVERSITY, SOLAPUR  
FACULTY OF ENGINEERING & TECHNOLOGY**

**STRUCTURE OF M.E. (ELECTRONICS ENGINEERING)**

Choice Based Credit System Syllabus (w.e.f.2015-16)

**Four Semester Course**

**Semester-III**

Sr. No.	Subject	Teaching Scheme				Credits			
		L	T	P	Total	Credits (L)	Credits (T)	Credits (P)	Total Credits
1	Self Learning Subject	\$	-	-	-	3.0	-	-	3.0
2	Lab Practice	-	-	2	2	-	-	1.0	1.0
3	Dissertation Phase I : Synopsis Submission Seminar* (ISE)	-	-	4@	4@	-	-	3.0	3.0
4	Dissertation Phase II : Term Work*(ISE)	-	-	-	-	-	-	3.0	3.0
5	Dissertation Phase II Progress Seminar* (ESE)	-	-	-	-	-	-	6.0	6.0
<b>Total</b>		-	-	<b>6</b>	<b>6</b>	<b>3.0</b>	-	<b>13.0</b>	<b>16.0</b>

**Note –**

- \$- Being a Self Learning Subject, student shall prepare for examination as per specified syllabus
- \*- For all activities related to dissertation Phase I (synopsis submission seminar and progress seminar) student must interact regularly every week with the advisor.
- Synopsis submission seminar shall cover detailed synopsis of the proposed work. Student shall submit synopsis of the dissertation work only after delivering this seminar.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.

### Note (Continued)

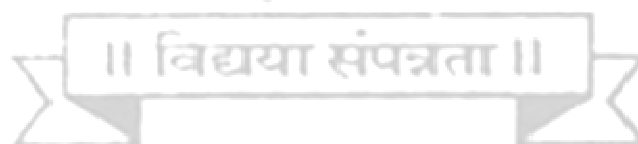
- Lab Practice shall include any of the below activities related to dissertation work and recommended by advisor. Student shall submit a report after completion of the activity to advisor–  
Software assignments, learning new software, hardware realization, literature survey, filed work, industrial training etc.
- @ Indicates contact hours of students for interaction with advisor.
- Details of modes of assessment of seminar and dissertation shall be as specified in 7(III) of PG Engineering Ordinance of Solapur University, Solapur

### • List Self Learning Subjects -

<i>Sr.</i>	<i>Specialization</i>	<i>Self Learning Subjects</i>
1	Telecommunication Engineering	Network and Internet Security
2	VLSI & Embedded	Programmable System on Chip (PSoC)
3	Signal Processing	Advanced Signal and Image Processing
4	Control Systems	Advanced Process Control

### Note –

- Student must select Self Learning Subject as per their specialization already selected in Semester I and II
- New Self Learning Subjects may be added as and when required







**SOLAPUR UNIVERSITY, SOLAPUR**  
**FACULTY OF ENGINEERING & TECHNOLOGY**

**STRUCTURE OF M.E. (ELECTRONICS ENGINEERING)**

Choice Based Credit System Syllabus (w.e.f.2015-16)

**Four Semester Course**

**Semester-IV**

Sr. No.	Subject	Teaching Scheme				Credits			
		L	T	P	Total	Credits (L)	Credits (T)	Credits (P)	Total Credits
1	Dissertation Phase III : Progress Seminar# (ISE)	-	-	6@	6@	-	-	4.0	4.0
2	Dissertation Phase IV: Term Work #(ISE)	-	-	-	-	-	-	6.0	6.0
3	Final Submission of the Dissertation and Viva –Voce (ESE)	-	-	-	-	-	-	6.0	6.0
<b>Total</b>		-	-	<b>6</b>	<b>6</b>	-	-	<b>16.0</b>	<b>16.0</b>

**Note –**

- #- For all activities related to dissertation Phase II student must interact regularly every week with the advisor.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.
- Student must submit a hard copy of project report to the department
- @ Indicates contact hours of students for interaction with advisor.
- Details of modes of assessment of seminar and dissertation shall be as specified in 7(III) of PG Engineering Ordinance of Solapur University, Solapur



**Solapur University, Solapur**  
**M.E. (Electronics)**  
**Self Learning Subject**  
**NETWORK AND INTERNET SECURITY**

**Examination Scheme**  
**Theory Credits – 3.0**

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**SECTION-I**

**Unit 1: Introduction:**

Overview of ISO's OSI model and TCP/IP model, key management, public-key infrastructure (PKI), remote user authentication using symmetric key encryption, Kerberos, remote user authentication using asymmetric key encryption, federated identity management, biometrics

**Unit 2: Wireless network security:**

IEEE 802.11 wireless LAN overview: IEEE 802.11 network components, architectural model, IEEE 802.11 services; IEEE 802.11i wireless LAN security: IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, authentication phase, key management phase & protected data transfer phase, IEEE 802.11i pseudorandom function

**Unit 3: WAP security:**

Wireless application protocol (WAP): WAP architecture, wireless application environment, WAP protocol architecture; wireless transport layer security (WTLS): WTLS sessions and connections, WTLS protocol architecture, cryptographic algorithms, WAP end-to-end security

**SECTION II**

**Unit 4: Electronic mail security:**

Pretty good privacy (PGP): notation, operational description, cryptographic keys and key rings, public-key management, S/MIME: RFC 5322, multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, domain keys identified mail: internet mail architecture, e-mail threats, DKIM strategy, DKIM functional flow

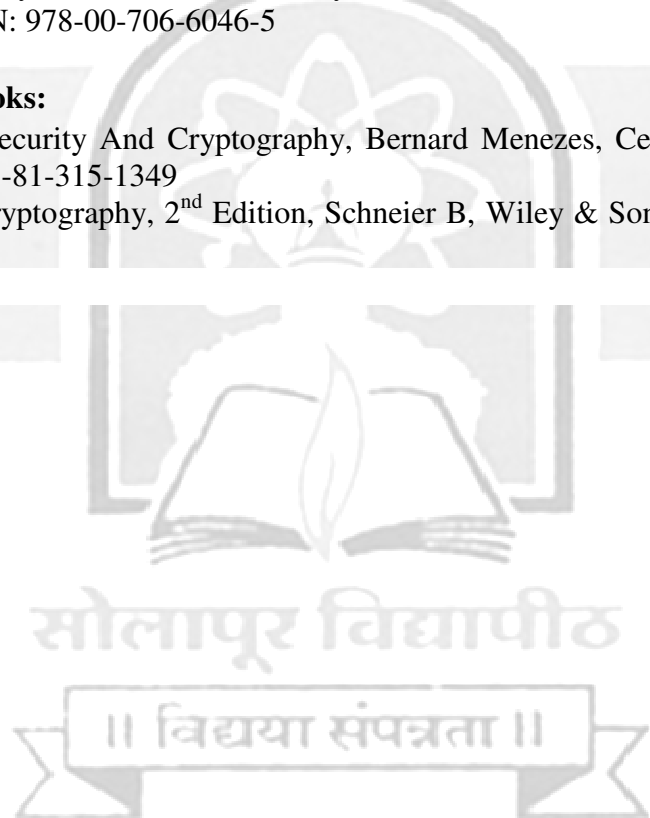
**Unit 5: Web and IP security:**

Web security: web security requirements, secure sockets layer (SSL), transport layer security (TLS), and secure electronic transaction (SET), HTTPS, secure shell (SSH), IP security: IP security overview, architecture, authentication, encapsulating security payload, combining security associations, key management

**Unit 6: System security:**

Intruders, intrusion detection; password management, malicious software, viruses and related threats, virus countermeasures, distributed denial of service attacks, firewalls: firewall design, principles, trusted systems

- *Student must complete at least one assignment based on each unit and submit it to department for assessment.*
  
- **Text Books:**
  1. Cryptography and Network Security: Principles and Practice, 5<sup>th</sup> Edition, William Stallings, Pearson Education, ISBN: 978-81-317-6166-3
  2. Cryptography and Network Security, Behrouz A. Forouzan, Tata McGraw-Hill. 2007, ISBN: 978-00-706-6046-5
  
- **Reference Books:**
  1. Network Security And Cryptography, Bernard Menezes, Cengage Learning, 2010, ISBN : 978-81-315-1349
  2. Applied Cryptography, 2<sup>nd</sup> Edition, Schneier B, Wiley & Sons. 2002, ISBN: 0-471-11709-9





**Solapur University, Solapur**  
**M.E. (Electronics)**  
**Self Learning Subject**  
**PROGRAMMABLE SYSTEM ON CHIP (PSoC)**

**Examination Scheme**  
**Theory Credits – 3.0**

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**SECTION-I**

**Unit 1: Introduction to PSoC:**

PSoC technology, programmable routing and interconnect, configurable analog and digital blocks, cpu sub system, families of PSoC (PSoC 1, PSoC 3, PSoC 5), difference between PSoC and conventional MCU.

**Unit 2: Introduction to PSoC 3/5:**

PSoC 3/5, architecture – block diagram, system wide resources, I/O interfaces, CPU sub system, memory organization, digital sub systems, analog sub systems

**Unit 3: PSoC design modules:**

Why cypress PSoC, structure of PSoC, PSoC designer suit, limitations of PSoC, improvements of the PSoC, PSoC sub system design, PSoC memory management.

**SECTION-II**

**Unit 4: Mixed-signal embedded design:**

Overview of mixed-signal embedded system designs, hardware and software subsystems of mixed-signal architecture, PSoC hardware components, PSoC software components, PSoC interrupt sub system, introduction to PSoC express, system design using PSoC express.

**Unit 5: PSoC components:**

Universal digital blocks (UDB), UDB arrays and digital system interconnect (DSI), timer, counter and PWM, digital filter blocks (DFB),  $\Delta\Sigma$  ADC topologies and circuits, programmable gain amplifiers, switched capacitor / continuous time, analog routing, flash temperature sensors, DTMF dialers, sleep timers, UART, I2 C, SPI, USB, CAN buses.

**Unit 6: System design using PSoC:**

Interfacing of temperature sensors and tachometers, SPI and UART based task communications, lower noise continuous time signal processing with PSoC, data acquisition and control system with PSoC, ultra wide-based RADAR, serial bit receiver with hardware Manchester decoder, DTMF detector, ultrasonic vehicle parking assistant, universal wide-range signal generator.

- *Student must complete at least one assignment based on each unit and submit it to department for assessment.*
- **Text Books:**
  1. PSoC 3, PSoC 5 Architecture technical reference manual, Cypress website
  2. My First Five PSoC 3 design (e-book), Robert Ashby, Cypress website
- **Reference Books:**
  1. Designer Guide to the Cypress PSoC, Robert Ashby, Elsevier Publications
  2. Introduction to Mixed Signal Embedded Design, Alex Dobioli, Springer
  3. The Beginners Guide to Using PSoC Express: Mixed-Signal Microcontroller Development without Code, Oliver H. Bailey, Timelines Industries Incorporated, 2007
  4. PSoC Mikrocontroller by Fredi Kruger Franzis, 2006
- **Web References:**
  1. [www.cypress.com/go/psoc](http://www.cypress.com/go/psoc)
  2. [www.cypress.com/go/training](http://www.cypress.com/go/training)
  3. [www.cypress.com/go/support](http://www.cypress.com/go/support)
  4. [www.psocdeveloper.com](http://www.psocdeveloper.com)





**Solapur University, Solapur**  
**M.E. (Electronics)**  
**Self Learning Subject**  
**ADVANCED SIGNAL AND IMAGE PROCESSING**

**Examination Scheme**  
**Theory Credits – 3.0**

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**SECTION-I**

**Unit 1: Biometric technologies:**

Biometric systems, biometric functionalities, biometric system errors, design cycle of biometric systems, application of biometric systems, security and privacy issues, case study: design of iris recognition system

**Unit 2: Applications of fuzzy logic:**

Fuzzy logic in power plants, fuzzy logic in data mining, fuzzy logic in image processing, fuzzy logic in biomedicine, fuzzy logic in industrial and control applications

**Unit 3: Medical image processing:**

Biomedical image processing, noise reduction filters for medical images, feature extraction and statistical measurements, medical image restoration, bio-medical image segmentation

**SECTION-II**

**Unit 4: Low power design:**

Scaling versus power consumption, power analysis, power reduction techniques, power estimation approaches

**Unit 5: Programmable digital signal processors:**

Evolution of programmable digital signal processors, important features of dsp processors, dsp processors for mobile and wireless communications, processors for multimedia signal processing.

**Unit 6: Optimization techniques:**

Scheduling and allocation techniques, Euclidean GCD algorithm, orthonormality of Schur polynomials, fast binary adders and multipliers

- *Student must complete at least one assignment based on each unit and submit it to department for assessment.*

- **Reference Books:**

1. Introduction to Biometrics, A.K.Jain, Springer Publication
2. Introduction to Fuzzy Logic using MATLAB, S.N. Sivanandam, S. Sumathi, S. N. Deepa, Springer Publication
3. Medical Image Processing Concepts and Applications, Sinha, G.R., Patel, Bhagwati
4. VLSI Digital Signal Processing Systems- Design and Implementation, Keshav K. Parhi, Wiley (India)
5. Architecture for Digital Signal Processing, Peter Pirsch, Wiley India





**Solapur University, Solapur**  
**M.E. (Electronics)**  
**Self Learning Subject**  
**ADVANCED PROCESS CONTROL**

**Examination Scheme**  
**Theory Credits – 3.0**

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**SECTION-I**

**Unit 1: Process dynamics and mathematical modeling:**

Modeling procedure, linearization, numerical solutions of ordinary differential equations, input-output models and transfer functions, dynamic behavior of typical process systems, serial & parallel structures of simple systems, multiple input-multiple output systems

**Unit 2: Empirical model identification:**

An empirical model building procedure, process reaction curve methods, statistical model identification.

**Unit 3: Conventional feedback control system:**

Desired features of a PID controller, PID controller tuning for dynamic performance, stability analysis of control systems, controller tuning based on stability: Ziegler – Nichols closed loop method, digital implementation of process control, effects of digital control on stability, tuning and performance, performance of feedback control systems

**Unit 4: Cascade & feed forward control:**

Cascade control: design criterion, cascade performance, controller algorithm & tuning, implementation issues; feed forward control: design criterion, feed forward performance, controller algorithm and tuning, implementation issues; analyzing a nonlinear process with linear feedback control, different issues in improving nonlinear process performance

**SECTION-II**

**Unit 5: Model based control:**

The structure of model based control, modeling approaches, internal model control (IMC), the Smith predictor, model predictive control (MPC), process model based control (PMBC), implementation guidelines.

**Unit 6: Nonlinear adaptive control:**

Adaptation of feedback parameters, programmed adaptation, switching controller gains and self-tuning controllers: model based methods, model reference adaptive control, pattern recognition controllers.



**Unit 7: Multivariable control:**

Multi-loop control, effects of interaction, performance analysis, multivariable predictive control and dynamic matrix control (DMC) approach for signal variable and multivariable, implementation issues in DMC.

**Unit 8: Statistical process control:**

Shewhart chart, interpretation of chart, distinction between automatic process control (APC) & statistical process control (SPC), implementing SPC concepts.

- *Student must complete at least one assignment based on each unit and submit it to department for assessment.*
- **Reference Books:**
  1. Process Control: Designing Processes & Control Systems for Dynamic Performance, Thomas E.Marlin, McGRAW Hill International Edition.
  2. Process Control: Instrument Engineers Handbook, Editor, Bela G. Liptak, Butterworth - Heinemann Publishers.
  3. Process Dynamics: Modeling, Analysis & Simulation, B. Wayne Bequette, Prentice Hall International Edition.
  4. Process Modeling, Simulation and Control for Chemical Engineers, William Luben, McGraw Hill International Edition.
  5. Process control systems: Application, Design and Turning, F.G. Sinskey, McGraw Hill Publication
  6. Applied Process Control by M. Chidambaram, Allied Publishers Ltd

