

FACULTY OF ENGINEERING

Savitribai Phule Pune University

Syllabus for the

M.E (Electronics–Digital Systems)

(2017 Course)

(w.e.f . June 2017)

SAVITRIBAI PHULE PUNE UNIVERSITY

M.E. (Electronics- Digital Systems)

2017 Pattern

Syllabus Structure

First Year – Semester I

Code	Subject	LP	Examination scheme					Credits
			Paper		TW	OR	Total	
			ISA	ESA				
504101	Analog & Digital CMOS Design	4	50	50	-	-	100	4
504102	Multirate Signal Processing	4	50	50	-	-	100	4
504103	Embedded System Design	4	50	50	-	-	100	4
504104	Research Methodology	4	50	50	-	-	100	4
504105	Elective-I	5	50	50	-	-	100	5
504106	Lab Practice –I	4	-	-	50	50	100	4
	Total	25	250	250	50	50	600	25

Elective-I :

1. Wireless mobile technologies
2. Mathematics for Digital Systems
3. Artificial Neural Networks and Fuzzy Systems
4. Semiconductor device modelling

Software Tools*

First Year -Semester-II

Code	Subject	LP	Examination scheme					Credits
			Paper		TW	OR	Total	
			ISA	ESA				
504107	Advanced DSP Processors	4	50	50	-	-	100	4
504108	PLD’s and ASIC Design	4	50	50	-	-	100	4
504109	Image Processing and Computer Vision	4	50	50	-	-	100	4
504110	Elective-II	5	50	50	-	-	100	4
504111	Lab Practice –II	4	50	50	-	-	100	5
504112	Seminar-I	4	-	-	50	50	100	4
	Total	25	250	250	50	50	600	25

Elective–II :

1. Speech and Audio Processing
2. Fault Tolerant System Design
3. Reconfigurable computing
4. Business Analytics

Software Tools*

Second Year -Semester-I

Code	Subject	LP	Examination scheme					Credits
			Paper		TW	OR	Total	
			ISA	ESA				
604101	System on Chip Design	4	50	50	-	-	100	4
604102	Wireless Sensor Network for IOT	4	50	50	-	-	100	4
604103	Elective-III	5	50	50	-	-	100	5
604104	Seminar-II	4	-	-	50	50	100	4
604105	Project Stage-I	8	-	-	50	50	100	8
	Total	25	150	150	100	100	500	25

Elective-III :

For 3 credits

1. Value Education, Human rights and Legislative procedures
2. Environmental studies
3. Renewable Energy Studies
4. Disaster Management
5. Knowledge Management
6. Foreign Language
7. Economics for engineers
8. Engineering risk – Benefit and analysis

For 2 Credits

1. Optimization techniques
2. Fuzzy Mathematics
3. Design and Analysis of algorithms
4. CUDA

Second Year – Semester II

Code	Subject	LP	Examination scheme					Credits
			Paper		TW	OR	Total	
			ISA	ESA				
604106	Seminar-III	5	-	-	50	50	100	5
604107	Project Stage-II	20	-	-	150	50	200	20
	Total	25	-	-	200	100	300	25

504104

Research Methodology

Credits:4

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (End Semester)

Course Outcomes:

On completion of the course, student will be able to

1. learn research problem & its scope, objectives, and errors.
2. the basic instrumentation schemes & data collection methods.
3. study the various statistical techniques.
4. study modeling and predict the performance of experimental system.
5. The student will learn to develop the research proposals.

Module I :

(8 Hrs.)

Definition, Research Characteristics, Research Need, Objectives and types of research: Motivation and objectives – Research methods vs. Methodology, Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical.

Module II :

(8 Hrs.)

Research Formulation – Defining and formulating the research problem -Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis. Summarizing a Technical Paper - Summary Template Online tools - Google, CiteSeer, ACM Digital Library, IEEE, The on-line Computer Science Bibliography, Searching patents

Module III :

(8 Hrs.)

Research design, sampling design and scaling techniques – Research design – Basic Principles Need of research design — Features of good design – Important concepts relating to research design, basic principles of experimental designs, implications of sample design, steps in sample design, criteria for selecting sampling procedure, characteristics of good sampling design, different types of sample design. Scaling techniques: measurement scales, sources of error, the technique of developing measurement tool, important scaling techniques, scale construction techniques.

Data Collection and Analysis:- Observation and Collection of primary and secondary data - Methods of data collection, processing operations, types of analysis, statistics in research, measures of central tendency, measures of dispersion, measures of asymmetry, measures of relationships, simple regression analysis, multiple correlation and regression, partial correlation.

Module IV:**(8 Hrs.)**

Reporting and thesis writing – Structure and components of scientific reports - Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, Structure and Language of typical reports – Illustrations and tables - Bibliography, referencing and footnotes - Oral presentation – Planning – Preparation –Practice – Making presentation – Use of visual aids - Importance of effective communication - Documentation and presentation tools: LATEX

Types of technical papers - Journal papers, Conference papers, Survey Papers, Poster papers, Review papers Comparison, Structure of a survey, conference and journal paper, Organization and flow of Thesis/ Project Report, Research proposal: preparation, budgeting, presentation, funding agencies for engineering research, Intellectual property rights and patent law – Trade Related Aspects of Intellectual Property Rights

References

1. Kothari, C.R., Research Methodology: Methods and Techniques. New Age International
2. Garg, B.L., Kapadia, R., Agarwal, F. and Agarwal, U.K., An Introduction to Research Methodology, RBSA Publishers
3. Suresh Sinha, Anil K Dhiman, Research Methodology, ESS Publications, Volumes 2
4. Day R.A., How to Write and Publish a Scientific Paper, Cambridge University Press
5. Wadehra, B.L. Law relating to Patents, Trade Marks, Copyright designs and geographical indications. Universal Law Publishing

Laboratory Assignments/Experiments:

1. Design a typical research problem using scientific method
2. Design a data collection system using digital computer system.
3. Study the various analysis techniques.
4. Design and develop a computing model to predict the performance of experimental system.
5. LaTeX /Document Structure, Document classes, Packages, The document environment, Book structure

504105

Wireless Mobile Technologies (Elective-I)

Credits:4

Teaching Scheme:

Lectures: 4Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (End Semester)

Course Outcomes:

On completion of the course, student will be able to

1. understand the types of fading in wireless communication
2. Understand the different multiple access techniques.
3. understand TCP protocol
4. understand MAC protocol.

Module I :

(8 Hrs.)

Wireless Transmission, multipath propagation, two ray model, path loss, different path loss models, Doppler shift, frequency selective fading, flat fading, fast fading and slow fading, Rayleigh fading, diversity-space, time and frequency, basics of mobile communication, cellular model, frequency reuse, hand off strategies, selection of energy threshold for hand offs, static channel allocation, dynamic channel allocation schemes, coverage area for the cell etc.

Module II :

(8 Hrs.)

Medium access control, hidden and exposed terminals, near and far terminals, fixed TDMA, Aloha, Slotted Aloha, CSMA, demand assigned multiple access, PRMA Packet Reservation Multiple Access, Reservation TDMA, Multiple access with collision avoidance, polling, inhibit sense multiple access, CDMA, Spread aloha multiple access

Module III :

(8 Hrs.)

Mobile Network Layer, Mobile IP – IP packet delivery, Agent advertisement and discovery, Registration, tunneling and encapsulation, optimizations, dynamic host configuration protocol, Ad-hoc networks – destination sequence distance vector, dynamic source routing, Hierarchical algorithms, etc. Mobile Transport Layer – traditional TCP, indirect TCP, snooping TCP, Mobile TCP, Fast transmit / fast recovery, selective retransmission, transmission oriented TCP

Module IV:

(8 Hrs.)

GSM Architecture, protocols, localization and calling, handover, security, IEEE 802.11 system, architecture, protocol, physical layer, MAC layer, MAC management, HIPERLAN protocol architecture, physical layer, channel access control and sub layer, MAC sub layer, Introduction to evolving standards

References

1. Schillar, “Mobile Communications” – Pearson Education
2. Rappaport, “Wireless Communications” Principles and Practice, Pearson Education
3. Lee, “Mobile Cellular Communication” McGraw Hill

Laboratory Assignments / Experiments

1. Write a Computer Program for implementing CSMA medium access protocol
2. Write a Computer Program for implementing Reservation TDMA
3. Write a Computer Program for implementing of Dynamic Source Routing protocol
Write a program for implementation of Dynamic Channel Allocation

504105

Mathematics for Digital Systems(Elective-I)

Credits:4

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (End Semester)

Course Outcomes:

On completion of the course, student will be able to

1. exhibit the knowledge of Probability based mathematical aspects.
2. Apply fundamentals of optimization techniques
3. apply Numerical methods

Module I :

(8 Hrs.)

Statistics Measures of central tendency, Dispersion, Moments, Skewness, Kurtosis, Regression and Correlation, Multiple linear regression.

Module II : Probability

(8 Hrs.)

Probability, Conditional probability, Baye's Theorem, Random variables, Probability distribution function, Joint distribution, Joint density function, probability distributions (Binomial, Hypergeometric, Poisson, Uniform, Exponential and Normal), Expectation, Random Processes, Markov processes, Stationary processes, Ergodicity, Autocorrelation, Cross-correlation, Power spectral density.

Module III : Optimization Techniques

(8 Hrs.)

Linear programming, Introduction and formulation of models, Convexity, Simplex method to solve linear programming problems, Big-M method, Unbounded solutions, Duality, Sensitivity analysis, Search Methods : One dimensional optimization, sequential search.

Module IV: Numerical Methods

(8 Hrs.)

Solution of a system of linear equations, Implementation of Gaussian elimination and Gauss-Seidel methods, Numerical solution of ordinary differential equations, Euler and Runge-Kutta methods.

References

1. "Introduction to probability and statistics for engineers and scientists", Sheldon M. Ross, Academic Press.
2. "Probability and random processes with applications to signal processing", Henry Stark, John W. Woods, Pearson Education.
3. "Miller and Freund's Probability and statistics for engineers", Richard A Johnson, PHI.
4. "Operation research – an introduction", H. A. Taha, PHI.
5. "Numerical methods for engineers", Steven C. Chapra, Raymond P. Canale, McGraw Hill.
6. "Advanced engineering mathematics", Erwin Kreyszig, John Wiley.

Laboratory Experiments/assignments:

1. Record a speech signal in your own voice. Take 4096 samples of voiced speech and draw histogram for a signal. Try to fit a standard distribution for the signal.
2. Write a computer program for generating a Gaussian random variable using central limit theorem.
3. Consider a uniform random variable between 2 to 7. Find mean, variance and constant value of pdf.

504105 Artificial Neural Networks and Fuzzy Systems(Elective-I)
Credits: 4

Teaching Scheme:

Lectures: 4Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (End Semester)

Course Outcomes:

On completion of the course, student will be able to

1. to develop the various neural network algorithms
2. apply the suitable neural network algorithms for real time application
3. to exhibit the knowledge of optimization
4. determine and apply different methods of defuzzification

Module I :

(8 Hrs.)

Introduction to Neural Network, Human Brain, Biological Neuron, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Artificial Intelligence and Neural Networks, Learning Processes, Simple Neuron Networks for Pattern Classification: Hebb Network, Perceptron & its learning rule, Perceptron convergence theorem, Adaline, Delta rule.

Module II :

(8 Hrs.)

Single layer Perceptrons, MultiLayer Perceptrons, Back Propagation Algorithm, Hessian matrix, Generalization, Cross Validation, Virtues and Limitations of Back Propagation Learning, Performance Optimization: Steepest Descent method, Newton's method, Conjugate gradient, Radial Basis Function Network, Cover's Theorem on the Separability of patterns, Interpolation problem.

Module III :

(8 Hrs.)

Generalized Radial Basis Function Networks, Estimation of Regularization Parameter, Approximation Properties of RBF Networks, Comparison of RBF Networks and Multilayer Perceptron, Kernel Regression and its relation to RBF Networks, Competitive Learning, Self-organizing Feature Maps, Kohonen's Self Organisation Map, Support Vector Machine

Module IV:

(8 Hrs.)

Fuzzy set Theory, Fuzzy Relations, Fuzzy If-Then Rule, Fuzzification, Membership functions, Defuzzification, Fuzzy Implications, Fuzzy Inference Systems, Fuzzy Logic Controller

References

1. Fundamentals of Neural Networks: Architectures, Algorithms And Applications, Laurene Fausett, Pearson Education
2. Neural networks A comprehensive foundations, Simon Haykin, PHI edition
3. Neuro- Fuzzy and Soft Computing, J.S. Jang, C.T. Sun, E. Mizutani, PHI Learning Private Limited
4. Soft Computing Using MATLAB, Sivanndam, Deepa, TMH publication

5. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House .
6. Fuzzy Logic With Engineering Applications, Thomas, Timothy Ross, John Wiley & Sons
7. Machine learning in action, Peter Harrington, Manning Publications
8. Introduction to Fuzzy Logic using MATLAB: Sivanandam, S.N.Deepa, Sumathi

Laboratory Assignments/Experiments:

Note: Any suitable software (MATLAB/Python/any other open source language) can be used for performing experiment

1. Study and generation of different activation functions
2. Study of Multilayer Feed forward neural network for pattern recognition application
3. Study of back propagation algorithm
4. Study of Radial Basis function network
5. Study of Fuzzy logic controller

504105

Semiconductor device modelling(Elective-I)

Credits:4

Teaching Scheme:

Lectures: 4Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (End Semester)

Course Outcomes:

On completion of the course, student will be able to

1. demonstrate the development of semiconductor devices.
2. understand the device physics of the devices used in foundry.
3. use the device models in VLSI tools.

Module I:

(8 Hrs.)

Solid State Device Physics, material Properties, Crystal structure, Energy band model, Equilibrium carrier concentrations, Drift and Diffusion mechanism, Recombination and generation of carriers, continuity equations, minority carrier diffusion equations, diffusion length quasi Fermi level concepts.

Module II:

(8 Hrs.)

Semiconductor Junctions, p-n junctions: Poisson's equations, qualitative and quantitative analysis of pn junction diode, fabrication of p-n junctions, equilibrium conditions, forward and reverse biased junctions, reverse bias breakdown and transient response of p-n junction diode. Metal semiconductor junctions: Schottky barriers, qualitative and quantitative analysis, built in potential, current-voltage relationships, rectifying and non-rectifying contacts, ohmic contacts, tunneling barrier, MOS Junctions: MOS structure, Energy band diagrams, flat band voltage, threshold voltage, Charge distributions, C-V characteristics, fixed oxide and interface charge effects

Module III:

(8 Hrs.)

Bipolar Junction Transistors, BJT Fundamentals, Fabrication, Electrostatics, Operational considerations, Minority carrier distribution, non-ideal effects, Equivalent circuit models, Frequency limitations, switching characteristics, Advanced NJT structures, Power BJT. Field Effect Transistors- JFET: structure, qualitative and quantitative analysis, current-voltage characteristics, effect in real devices, high frequency and high speed issues MESFET: structure, qualitative and quantitative analysis, current-voltage characteristics

Module IV :

(8 Hrs.)

MOSFET : basic operation and fabrication ; ideal MOS capacitor; effects of real surfaces; threshold voltages; output and transfer characteristics of MOSFET, effective mobility, charge sheet model, non ideal effects, oxide charges, threshold voltage considerations, short-channel effects, hot-carrier effects, advanced MOSFET structures, SPICE Models, Analytical and physical modeling, empirical and semiempirical models, MOSFET Level 1, Level 2, Level 3 and BSIM Model, Model parameters and equations, SPICE models of p-n diode, Spice BJT model, Use of MATLAB in device modelling, AIMSPICE

References

1. B.G. Streetman and S. Banerjee, Solid State Electronic Devices, 5th edition, Prentice Hall of India
2. Y.Taur, and T.H.Ning , Fundamentals of Modern VLSI devices , Cambridge University press
3. R. S. Muller, T. I. Kamins, —Device Electronics for Integrated Circuits, John Wiley & Sons
4. YannisTsividis, —Operation and Modeling of the MOS Transistor, Oxford University Press
5. C. G. Montoro, M. C. Schneider, —MOSFET Modeling for Circuit Analysis And Design, World Scientific,

Laboratory Assignments/Experiments:

1. Develop a MOSFET model and write a MATLAB code for verifying the I-V Characteristics of this device.
2. Develop a MOS capacitance model and write a MATLAB code for verifying the C-V Characteristics of this junction.
3. Develop a pn junction model and write a MATLAB code for verifying the I-V Characteristics of this junction

504105

Software Tools*

Credits:1

Teaching Scheme:

Lectures: 2Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (End Semester)

Introduction to software tools such as Octave, MATLAB, SCILAB, LAB VIEW, RTLinux, VxWorks, μ COS-II, Tiny OS, ANDROID, Xilinx, Microwind, Tanner, TCAD Tools, NS-II, NS-III, OMNET++, OPNET, AWR Microwave office, CAD Feko, IE-3D, Python, OpenCV.

*For each Subject under Elective I the student Shall study open source/evaluation versions of at least three software tools mentioned above and should present term paper.

504110

Speech and Audio Processing (Elective-II)

Credits:4

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (End Semester)

Course Outcomes:

On completion of the course, student will be able to

1. use theory of speech production system to find pitch and formants for speech.
2. show skills of drawing a cepstrum of speech signal.
3. exhibit the knowledge of coding techniques to efficiently code speech signal.
4. exhibit the knowledge of music processing for recognition of musical instrument.

Module I :

(8 Hrs.)

Digital models for the speech signal - mechanism of speech production - acoustic theory - lossless tube models - digital models - linear prediction of speech - auto correlation - formulation of LPC equation - solution of LPC equations - Levinson Durbin algorithm - Levinson recursion - Schur algorithm - lattice formulations and solutions - PARCOR coefficients - Spectral analysis of speech - Short Time Fourier analysis - filter bank design. Auditory Perception: Psychoacoustics - Frequency Analysis and Critical Bands – Masking properties of human ear

Module II :

(8 Hrs.)

Speech coding -subband coding of speech - transform coding - channel vocoder - formant vocoder – cepstral vocoder, vector quantizer coder- Linear predictive Coder. Speech synthesis - pitch extraction algorithms - gold rabiner pitch trackers - autocorrelation pitch trackers - voice/unvoiced detection - homomorphic speech processing - homomorphic systems for convolution - complex cepstrums - pitch extraction using homomorphic speech processing. Sound Mixtures and Separation - CASA, ICA & Model based separation.

Module III :

(8 Hrs.)

Speech Transformations - Time Scale Modification - Voice Morphing. Automatic speech recognition systems - isolated word recognition - connected word recognition – large vocabulary word recognition systems - pattern classification - DTW, HMM - speaker recognition systems - speaker verification systems – speaker identification Systems.

Module IV :

(8 Hrs.)

Audio Processing: Non speech and Music Signals - Modeling - Differential transform and subband coding of audio signals & standards - High Quality Audio coding using Psychoacoustic models - MPEG Audio coding standard. Music Production - sequence of steps in a bowed string instrument - Frequency response measurement of violin, guitar, Audio Data bases and applications - Content based retrieval, raga identification, musical instrument classification

References

1. Rabiner L.R. & Schafer R.W., "Digital Processing of Speech Signals", Prentice Hall Inc.
2. O'Shaughnessy, D. "Speech Communication, Human and Machine". Addison -Wesley.
3. Deller, J., J. Proakis, and J. Hansen. "Discrete-Time Processing of Speech Signals." Macmillan.
4. Ben Gold & Nelson Morgan, "Speech and Audio Signal Processing", John Wiley & Sons, Inc.
5. Papamichalis P.E., "Practical Approaches to Speech Coding", Texas Instruments, Prentice Hall
6. Rabiner L.R. & Gold, "Theory and Applications of Digital Signal Processing", Prentice Hall of India

Laboratory Assignments/Experiments :

1. Record a speech file in your own voice. Use AMDF to find pitch period for a voiced part of the segment. Write a MATLAB program for tracking pitch contour using AMDF method.
2. Write a program to find the impulse response coefficients for a vocal tract. Execute it and interpret your results. Use cepstral domain processing.
3. Write a program to track unvoiced part of utterance and use the program for Levinson Durbin recursion to find LPC for unvoiced signal.
4. Record 5 different words in your voice by uttering each word 10 times. Find LPC for each pitch synchronous segment and track 2nd LPC contour for all utterances. Use dynamic time warping for template matching. Find recognition rate.
5. Use NOIZEUS speech database. Use babble noise and try to eliminate it using modification of real part of DFT of each segment. Draw spectrogram to check if the noise is removed.

504110

Fault Tolerant System Design(Elective-II)

Credits:4

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Course Outcomes:

On completion of the course, student will be able to

1. use theory of logical fault models for testing single stuck fault.
2. show skills for fault simulation for statistical fault analysis.
3. exhibit the knowledge of self-checking for design of self-checking combinational circuits.

Module I :

(8 Hrs.)

Modelling and Logic Simulation Level of modeling. Modelling at logic and register level. Type of simulations, Unknown logic value Compiled simulation and Event driven simulation. Delay models, Hazard Detection.

Module II :

(8 Hrs.)

Fault Modelling and Fault Simulation

Logical Fault models, Fault detection & Redundancy, Faulty equivalence and Fault Location, Fault Dominance Single stuck and Multiple stuck fault models, Testing for single stuck fault for combination and sequential circuit, Testing for Bridging Fault and Introduction to ATG(Automatic Test Generation) & RTG (Random Test Generation). Fault Simulation Techniques and its comparison, Fault Simulation for combinational circuits, Fault sampling and Statistical fault analysis.

Module III :

(8 Hrs.)

Compression Techniques and Self Checking System

Need of compression, Aspects of compression techniques, Compression techniques: Signature analysis, Ones count, Transition count, Parity check and syndrome testing. Need and basics of Self checking systems, Self checking codes, theory of Self checking combinational and sequential circuits.

Module IV :

(8 Hrs.)

Testability

Testability, Ad Hoc design for testability, Built-In Self Test: Test pattern generation, types of architectures and factors for choosing specific architectures, Memory Testing, Scan Based design for determining the complexity of test generation. Introduction to PLA test methodologies. Boundary Scan testing JTAG.

References

1. M. Abramovici, M. A. Breuer, and A. D. Friedman, Digital Systems Testing and Testable Design.

2. Michael L. Bushnell, Vishwani D. Agrawal, Essentials of Electronic Testing for Digital, Memory and Mixed-signal VLSI Circuits
3. Diraj K. Pradhan, Fault Tolerant Computer System Design

Laboratory Experiments

1. To write a program in MATLAB/SILAB to simulate the operation of Self checking system using error control hamming code.
2. Simulate to understand different fault models using EDA tools.
3. Write a program in VHDL for generation of compact output response using signature compression analysis method.
4. Write a program to measure and compare delay of compiled and event driven simulation model.

504110

Reconfigurable computing (Elective-II)

Credits:4

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Course Outcomes:

On completion of the course, student will be able to

1. understand concept of static and dynamic reconfiguration.
2. use the basics of the PLDs for designing reconfigurable circuits.
3. understand the reconfigurable system design using HDL

Module I :

(8 Hrs.)

General Purpose Computing, Domain-Specific Processors, Application – Specific Processors, Reconfigurable Computing, Fields of Application, Reconfigurable Device Characteristics, Configurable, Programmable and Fixed -Function Devices.

Module II :

(8 Hrs.)

General-Purpose Computing, General-Purpose Computing Issues; Metrics: Density, Diversity and Capacity; Interconnects, Requirements, Delays in VLSI Structures; Partitioning and Placement, Routing, Computing Elements, LUT's, LUT Mapping, ALU and CLB's, Configuration Architectures: Relocation and Defragmentation, Pipeline Reconfigurable, Block Reconfigurable, Parallel Processing on Reconfigurable Computers: Instruction Level Parallelism and Task Level Parallelism.

Module III :

(8 Hrs.)

Retiming, Fine-grained & Coarse-grained structures; Multi-context; Different architectures for fast computing viz. PDSPs, RALU, VLIW, Vector Processors, Memories, CPLDs, FPGAs, Multicontext FPGA, Partial Reconfigurable Devices, Structure and Composition of Reconfigurable Computing Devices: Interconnect, Instructions, Contexts, Context switching, RP space model;

Module IV :

(8 Hrs.)

Reconfigurable devices for Rapid prototyping , Non –frequently reconfigurable systems, frequently reconfigurable systems, Compile-time reconfiguration, Run-time reconfiguration, Architectures for Reconfigurable computing: TSFPGA, DPGA, Matrix; Applications of reconfigurable computing: Various hardware implementations of Pattern Matching such as the Sliding Windows Approach, Automaton-Based Text Searching, Video Streaming.

References

1. Andre Dehon, "Reconfigurable Architectures for General Purpose Computing".
2. Christophe Bobda, "Introduction to Reconfigurable Computing", Springer Publication.
3. Maya Gokhale, Paul Ghaham, "Reconfigurable Computing", Springer Publication.

4. IEEE Journal papers on Reconfigurable Architectures.
5. “High Performance Computing Architectures” (HPCA) Society Papers.

Laboratory Assignments/Experiments:

1. To Design and implement 2:1 Multiplexer using Transmission Gate.
2. To Design and implement a Full adder using 4:1 Multiplexer.
3. To Design and implement Multi-context (4) 4-LUT and implement using HDL and download on FPGA.
4. To Design and implement 4 bit ALU.
5. To Design and implement the simple Distributed Arithmetic system using HDL.

504110

Business Analytics (Elective-II)

Credits:4

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I :Concepts with Mathematical treatment (8 Hrs.)

Introduction to data, Information and knowledge, Decision Support System, Theory of Operational data and informational data, Introduction to Business Intelligence, Designing BI Cycle, BI Environment and Architecture, Identify BI opportunities, Benefits of BI. Role of Mathematical model in BI, Factors Responsible for successful BI Project, Obstacle to Business Intelligence in an Organization Concepts of Decision Making, Techniques of Decision Support System (DSS), Development of Decision Support System (DSS), Applications of DSS, Role of Business Intelligence in DSS.

Module II :Data-Warehouse and Pre-Processing

(8 Hrs.)

Introduction: Data warehouse Modeling, data warehouse design, data-warehouse technology, Distributed data warehouse, and materialized view Data Analytics life cycle, Discovery, Data preparation, Preprocessing requirements, data cleaning, data integration, data reduction, data transformation, Data discretization and concept hierarchy generation, Model Planning, Model building, Communicating Results & Findings, Operationalizing,

Module III : Designing and managing BI systems

(8 Hrs.)

Introduction to OLAP. Real-world Applications, types of outliers, outlier challenges, Outlier detection methods, Proximity-Based Outlier analysis, Clustering Based Determining infrastructure requirements, planning for scalability and availability, managing and maintenance of BI systems, managing BI operations for business continuity

Module IV: BI and Data Mining Applications (8 Hrs.)

Data analytics, business analytics, ERP and Business Intelligence, BI Applications in CRM, BI Applications in Marketing, BI Applications in Logistics and Production, Role of BI in Finance, BI Applications in Banking, BI Applications in Telecommunications, BI Applications in Fraud Detection, BI Applications in Retail Industry.

References :

1. R. Sharda, D. Delen, & E. Turban, Business Intelligence and Analytics. Systems for Decision Support, 10th Edition. Pearson/Prentice Hall, 2015.
2. Business Process Automation, Sanjay Mohapatra, PHI.
3. Introduction to business Intelligence and data warehousing, IBM, PHI.
4. Data mining concepts and techniques, Jawai Han, Micheline Kamber, Jiran Pie,
5. Morgan Kaufmann Publishers 3rd edition.
6. Building the data Warehouse, William H Inmon, Wiley Publication 4th edition.
7. Data Mining for Business Intelligence, WILEY
8. Soumendra Mohanty, Analytics in Practice, Tata McGraw Hill Education, 2011,

ELECTIVE-III

Select one subjects from Group-I, and one subject from Group-II from the following list as Elective-III.

Group	Electives	Credit
I	<ol style="list-style-type: none">1. Value Education, Human rights and Legislative procedures2. Environmental studies3. Renewable Energy Studies4. Disaster Management5. Knowledge Management6. Foreign Language7. Economics for engineers8. Engineering risk – Benefit and analysis	3
II	<ol style="list-style-type: none">1. Optimization techniques2. Fuzzy Mathematics3. Design and Analysis of algorithms4. CUDA	2

604103 A Value Education, Human rights and Legislative procedures
Elective-III A Credits:3

Teaching Scheme:

Lectures: 3 Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I :

(8 Hrs.)

Values and Self Development-Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non moral valuation, Standards and principles, Value judgments. Importance of cultivation of values, Sense of duty, Devotion, Self reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.

Module II :

(8 Hrs.)

Personality and Behavior Development- Soul and scientific attitude, God and scientific attitude, Positive thinking, Integrity and discipline, Punctuality, Love and kindness, Avoiding fault finding, Free from anger, Dignity of labor, Universal brotherhood and religious tolerance, True friendship, Happiness vs. suffering love for truth, Aware of self destructive habits, Association and cooperation, Doing best, Saving nature. Module

Module III :

(8 Hrs.)

Human Rights- Jurisprudence of human rights nature and definition, Universal protection of human rights, Regional protection of human rights, National level protection of human rights, Human rights and vulnerable groups. Legislative Procedures- Indian constitution, Philosophy, fundamental rights and duties, Legislature, Executive and Judiciary, Constitution and function of parliament, Composition of council of states and house of people, Speaker, Passing of bills, Vigilance, Lokpal and functionaries References

References

1. Chakraborty, S.K., Values and Ethics for Organizations Theory and Practice, Oxford University Press, New Delhi, 2001.
2. Kapoor, S.K., Human rights under International Law and Indian Law, Prentice Hall of India, New Delhi, 2002.
3. Basu, D.D., Indian Constitution, Oxford University Press, New Delhi, 2002.
4. Frankena, W.K., Ethics, Prentice Hall of India, New Delhi, 1990.
5. Meron Theodor, Human Rights and International Law Legal Policy Issues, Vol. 1 and 2, Oxford University Press, New Delhi, 2000.

604103 A

Environmental studies

Elective-III A Credits:3

Teaching Scheme:

Lectures: 3Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I :

(8 Hrs.)

Introduction and Natural Resources: Multidisciplinary nature and public awareness, Renewable and nonrenewal resources and associated problems, Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources, Conservation of natural resources and human role. Ecosystems: Concept, Structure and function, Producers composers and decomposers, Energy flow, Ecological succession, Food chains webs and ecological pyramids, Characteristics structures and functions of ecosystems such as Forest, Grassland, Desert, Aquatic ecosystems.

Module II :

(8 Hrs.)

Environmental Pollution- Definition, Causes, effects and control of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, nuclear hazards, human role in prevention of pollution, Solid waste management, Disaster management, floods, earthquake, cyclone and landslides.

Module III :

(8 Hrs.)

Social issues and Environment- Unsustainable to sustainable development, Urban problems related to energy, Water conservation and watershed management, Resettlement and re-habitation, Ethics, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accidents, holocaust, Waste land reclamation, Consumerism and waste products, Environment protection act, Wildlife protection act, Forest conservation act, Environmental issues in legislation, population explosion and family welfare program, Environment and human health, HIV, Women and child welfare, Role of information technology in environment and human health.

References

1. Agarwal, K.C., Environmental Biology, Nidi Publication Ltd., Bikaner, 2001.
2. Bharucha Erach, Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmadabad, 2002.
3. Bukhootsow, B., Energy Policy and Planning, Prentice Hall of India, New Delhi, 2003.
4. Cunningham, W.P., et al. , Environmental Encyclopedia, Jaico Publishing House, Mumbai, 2003.

604103A

Renewable Energy Studies
Elective-III A

Credits:3

Teaching Scheme:

Lectures:3Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I : Solar Energy :

(8 Hrs.)

Photovoltaic Systems: Introduction to the Major Photovoltaic System Types, Current–Voltage Curves for Loads, Grid-Connected Systems: Interfacing with the Utility, DC and AC Rated Power, The “Peak-Hours” Approach to Estimating PV Performance, Capacity Factors for PV Grid Connected Systems, PV Powered Water Pumping, PV systems – off grid systems and scope for inclusive growth of rural India.

Module II :Wind Energy :

(8 Hrs.)

Wind Energy: wind speed and power relation, power extracted from wind, wind distribution and wind speed predictions. Wind power systems: system components, Types of Turbine, Choice of generators, electrical load matching, power control, Effect of wind speed variations, tower height and its effect, Variable speed operation, maximum power operation, control systems, Design consideration of wind farms and control

Module III :Other Energy Sources :

(8 Hrs.)

Biomass – various resources, energy contents, technological advancements, conversion of biomass in other form of energy – solid, liquid and gases. Gasifiers, Biomass fired boilers, Co-firing, Generation from municipal solid waste, Issues in harnessing these sources. Mini and micro hydel plants scheme layout economics. Tidal and wave energy, Geothermal and Ocean-thermal energy conversion (OTEC) systems – schemes, feasibility and viability. Fuel cell- types and operating characteristics, efficiency, energy output of fuel cell

References

1. Renewable energy technologies - R. Ramesh, Narosa Publication.
2. Energy Technology – S. Rao, Parulkar
3. Non-conventional Energy Systems – Mittal, Wheelers Publication.
4. Clark W. Gellings, “The Smart Grid: Enabling Energy Efficiency and Demand Response”,CRC Press
5. Renewable Energy Technologies – Chetan Singh Solanki, PHI Learning Pvt. Ltd.

604103A

**Disaster Management
Elective-III A**

Credits:3

Teaching Scheme:

Lectures: 3 Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I :

(8 Hrs.)

Introduction :Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation). Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility

Module II :

(8 Hrs.)

Disaster Impacts :Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate-change and urban disasters.

Module III :

(8 Hrs.)

Disaster Risk Reduction (DRR) : Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

References

1. <http://ndma.gov.in/> (Home page of National Disaster Management Authority).
2. <http://www.ndmindia.nic.in/> (National Disaster management in India, Ministry of Home Affairs).
3. PradeepSahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management ,APH Publishing Corporation.

604103A

Knowledge Management

Elective-III A Credits:3

Teaching Scheme:

Lectures:3Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I :

(8 Hrs.)

Introduction: Definition, evolution, need, drivers, scope, approaches in Organizations, strategies in organizations, components and functions, understanding knowledge; Learning organization: five components of learning organization, knowledge sources, and documentation. Essentials of Knowledge Management; knowledge creation process, knowledge management techniques, systems and tools.

Module II :

(8 Hrs.)

Organizational knowledge management; architecture and implementation strategies, building the knowledge corporation and implementing knowledge management in organization. Knowledge management system life cycle, managing knowledge workers, knowledge audit, and knowledge management practices in organizations, few case studies

Module III :

(8 Hrs.)

Futuristic KM: Knowledge Engineering, Theory of Computation, Data Structure.

References

1. Knowledge Management – a resource book – A Thohothathri Raman, Excel, 2004.
2. Knowledge Management- Elias M. AwadHasan M. Ghazri, Pearson Education
3. The KM Toolkit – Orchestrating IT, Strategy & Knowledge Platforms, AmritTiwana, Pearson, PHI, II Edn.
4. The Fifth Discipline Field Book – Strategies & Tools For Building A learning organizationPeterSenge et al. Nicholas Brealey 1994
5. Knowledge Management – Sudhir Warier, Vikas publications
6. Leading with Knowledge, MadanmohanRao, TataMc-Graw Hill.

604103 A

Foreign Language

Elective-III A Credits:3

Teaching Scheme:

Lectures:3Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I:

(8 Hrs.)

Pronunciation guidelines; Single vowels, Accentuated vowels, Vowels and consonants combinations, Consonants; Numbers 1-10 Articles and Genders; Gender in French, Plural articles, Some usual expressions. Pronouns and Verbs; The verb groups, The pronouns, Present tense, Some color Adjectives and Plural ; Adjectives, Some adjectives, Our first sentences, More Numbers.

Module II :

(8 Hrs.)

Sentences Structures; Some Prepositions, Normal Sentences, Negative Sentences, Interrogative Sentences, Exercises The Family; Vocabulary ,Conversation, Notes on Pronunciation, Notes on Vocabulary, Grammar, Liaisons Guideline. D'oùviens-tu (Where do you come from); Vocabulary, Conversation, Notes on Vocabulary, Liaisons Guidelines . Comparer (Comparing); Vocabulary, Conversation, Notes on Vocabulary, Grammar Liaisons Guidelines, Ordinal Numbers

Module III :

(8 Hrs.)

Le temps (Time); Vocabulary, Grammar, Time on the clock Additional French Vocabulary; Vocabulary related to - The Family, Vocabulary related to - Where do you come from? French Expressions and Idioms; Day-to-day Life, At Work, The car, Sports, Special Events Other French Flavours; Nos cousins d'Amérique - Québec et Acadie, Au pays de la bière et des frites, Mettez-vous à l'heure Suisse, Véz, peuchère, le français bien de chez nous

References

<http://www.jump-gate.com/languages/french/index.html>

604103 A

Economics for Engineers

Elective-III A Credits:3

Teaching Scheme:

Lectures: 3Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I :

(8 Hrs.)

Introduction to the subject: Micro and Macro Economics, Relationship between Science, Engineering, Technology and Economic Development. Production Possibility Curve, Nature of Economic Law, Time Value of Money: concepts and application. Capital budgeting; Traditional and modern methods, Payback period method, IRR, ARR, NPV, PI (with the help of case studies)

Module II :

(8 Hrs.)

Meaning of Production and factors of production, Law of variable proportions and returns to scale. Internal and external economies and diseconomies of scale. Concepts of cost of production, different types of costs; accounting cost, sunk cost, marginal cost, Opportunity cost. Break even analysis, Make or Buy decision (case study). Relevance of Depreciation towards industry. Meaning of market, types of market, perfect competition, Monopoly, Monopolistic, Oligopoly. (Main features). Supply and law of supply, Role of demand and supply in price determination.

Module III :

(8 Hrs.)

Indian Economy, nature and characteristics. Basic concepts; fiscal and monetary policy, LPG, Inflation, Sensex, GATT, WTO and IMF. Difference between Central bank and Commercial banks

References

1. Jain T.R., Economics for Engineers, VK Publication
2. Singh Seema, Economics for Engineers, IK International
3. Chopra P. N., Principle of Economics, Kalyani Publishers
4. Dewett K. K., Modern economic theory, S. Chand
5. H. L. Ahuja., Modern economic theory, S. Chand

604103A

Engineering risk – Benefit and analysis

Elective-III A Credits:3

Teaching Scheme:

Lectures: 3 Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I :

(8 Hrs.)

Introduction- Knowledge and Ignorance, Information Uncertainty in Engineering Systems, Introduction and overview of class; definition of Engineering risk; overview of Engineering risk analysis. Risk Methods: Risk Terminology, Risk Assessment, Risk Management and Control, Risk Acceptance, Risk Communication, Identifying and structuring the Engineering risk problem; developing a deterministic or parametric model System Definition and Structure: System Definition Models, Hierarchical Definitions of Systems, and System Complexity.

Module II :

(8 Hrs.)

Reliability Assessment: Analytical Reliability Assessment, Empirical Reliability Analysis Using Life Data, Reliability Analysis of Systems

Module III :

(8 Hrs.)

Reliability and probabilistic risk assessment (RPRA), decision analysis (DA), and cost-benefit analysis (CBA). All of these pertain to decision making in the presence of significant uncertainty. In ERBA, the issues of interest are: The risks associated with large engineering projects such as nuclear power reactors, the International Space Station, and critical infrastructures; the development of new products; the design of processes and operations with environmental externalities; and infrastructure renewal projects

References

1. Risk Analysis in Engineering and Economics, B. M. Ayyub, Chapman-Hall/CRC Press, 2003.
2. Hoyland, Arnljot, and Rausand, Marvin. System Reliability Theory. Hoboken, NJ: WileyInterscience, 1994. ISBN: 9780471471332.
3. Clemen, Robert, — Making Hard Decisions: An Introduction to Decision Analysis (Business Statistics) — PHI publications

604103 B

Optimization Techniques

Elective-III B

Credits:2

Teaching Scheme:

Lectures: 2Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I :

(8 Hrs.)

First and second order conditions for local interior optima (concavity and uniqueness), Sufficient conditions for unique global optima; Constrained optimization with Lagrange multipliers; Sufficient conditions for optima with equality and inequality constraints;

Module II :

(8 Hrs.)

Recognizing and solving convex optimization problems. Convex sets, functions, and optimization problems. Least-squares, linear, and quadratic optimization. Geometric and semidefinite programming. Vector optimization. Duality theory. Convex relaxations. Approximation, fitting, and statistical estimation. Geometric problems. Control and trajectory planning

Books:

1. Stephen Boyd and Lieven Vandenberghe, Convex Optimization, Cambridge University Press.
2. A. Ben-Tal, A. Nemirovski, Lectures on Modern Convex Optimization: Analysis, Algorithms, and Engineering Applications, SIAM.
3. D. P. Bertsekas, A. Nedic, A. E. Ozdaglar, Convex Analysis and Optimization, Athena Scientific.
4. D. P. Bertsekas, Nonlinear Programming, Athena Scientific.
5. Y. Nesterov, Introductory Lectures on Convex Optimization: A Basic Course, Springer.
6. J. Borwein and A. S. Lewis, Convex Analysis and Nonlinear Optimization: Theory and Examples, Springer.

604103 B

Fuzzy Mathematics

Elective-III B

Credits:2

Teaching Scheme:

Lectures: 2 Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I :

(8 Hrs.)

Definition of a Fuzzy set; Elements of Fuzzy logic. Relations including, Operations, reflexivity, symmetry and transitivity; Pattern Classification based on fuzzy relations

Module II :

(8 Hrs.)

Fuzzy Models: Mamdani , Sugeno, Tsukamoto

Books:

1. Neuro-Fuzzy and Soft Computing by S.R.Jung, Sun, Mizutani,

604103B

Design and Analysis of Algorithm

Elective-III B

Credits:2

Teaching Scheme:

Lectures: 2 Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I :

(8 Hrs.)

Introduction- Fundamental characteristics of an algorithm. Basic algorithm analysis – Asymptotic analysis of complexity bounds– best, average and worst-case behaviour, standard notations for expressing algorithmic complexity. Empirical measurements of performance, time and space trade-offs in algorithms.

Module II :

(8 Hrs.)

Properties of big-Oh notation – Recurrence equations – Solving recurrence equations – Analysis of linear search. Divide and Conquer: General Method – Binary Search – Finding Maximum and Minimum – Merge Sort – Greedy Algorithms: General Method – Container Loading – Knapsack

Books:

Algorithm Design – Jon Kleinberg and Eva Tardos Introduction to Algorithms – T.H. Corman et. Al

604103B

CUDA
Elective-III B

Credits:2

Teaching Scheme:

Lectures: 2 Hrs/Week

Examination Scheme:

Theory: 50 Marks (In Semester)

50 Marks (In Semester)

Module I :

(8 Hrs.)

History of GPUs leading to their use and design for HPC- The Age of Parallel Processing, The Rise of GPU Computing ,CUDA, Applications of CUDA, Development Environment, Introduction to CUDA C, Kernel call, Passing Parameters, Querying Devices, Using Device Properties

Module II :

(8 Hrs.)

Parallel Programming in CUDA C - CUDA Parallel Programming, Splitting Parallel Blocks, Shared Memory and Synchronization, Constant Memory, Texture Memory, CUDA events, Measuring Performance with Events.

Books:

1. Programming Massively Parallel Processors: A Hands-on Approach –second edition by David B. Kirk, Wen-mei W. Hwu.
2. CUDA by Example - An Introduction to General-Purpose GPU Programming by Jason Sanders ,Edward Kandrot- Addison Wesley
3. GPU Computing Gems Emerald Edition -Applications of GPU Computing Series by Wen-mei, W. Hwu
4. CUDA Programming: A Developer's Guide to Parallel Computing with GPUs by shane cook