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**

SEMESTER-I

504101 Analog & Digital CMOS Design

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. The student will understand the fundamentals of CMOS Technology in analog and Digital Domain.
2. The student will show the skills of designing CMOS analog and Digital circuits.
3. The student will demonstrate the ability for using backend tools in analog IC technology.

Module I : (8Hrs.)

MOSFET equivalent circuits and analysis, CMOS Technologies, Layout Design Rules: Design Rules Background, Scribe Line and Other Structures, MOSIS Scalable CMOS Design Rules, Micron Design Rules. CMOS Process Enhancements: Transistors, Interconnect, Circuit Elements, Beyond Conventional CMOS, CMOS Fabrication and layout: Inverter Cross-section , Fabrication Process, Stick Diagrams.

Module II :(8Hrs.)

Static, dynamic and short circuit power dissipations; Propagation delay; Power delay product, Fan in, fan out and dependencies. Delay Estimation: RC Delay Models, Linear Delay Model, Logical Effort, Parasitic Delay. Logical Effort and Transistor Sizing: Delay in a Logic Gate, Delay in Multistage Logic Networks, Interconnect: Resistance, Capacitance, Delay, Crosstalk, Design Margin.

Module III : (8Hrs.)

Small-Signal Model for MOS Transistor, Analog CMOS Subcircuits : MOS Switch, MOS Diode, Current Sinks and Sources, Current mirrors, Current and Voltage Reference, CMOS Amplifiers : CMOS Inverter as an Amplifier, Differential Amplifiers , Cascode Amplifiers , Operational amplifier, Digital to Analog Converters, Switched Capacitors, Analog to Digital Converters, RF Circuits

Module IV: (8Hrs.)

CMOS Logic: Inverter, NAND Gate, Combinational Logic, NOR Gate, Compound Gates,Pass Transistors and Transmission Gates, Tristates, Multiplexers, Latches and Flip-Flops, Design calculations for combinational logic and active area on chip; Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Differential Circuits, Sense Amplifier Circuits, BiCMOS Circuits, Low Power Logic Design, Comparison of Circuit Families.

References

1. Neil Weste and Kamaran, "Principles of CMOS VLSI Design", Education Asia.
2. J. M. Rabaey, A. Chandrakasan and B. Nikolic, Digital Integrated Circuits : A Design Perspective, Pearson (Low Price Edition)
3. S-M. Kang and Y. Leblebici, CMOS Digital Integrated Circuits : Analysis and Design, Third Edition, McGraw-Hill
4. P. E. Allen and D. R. Holberg, CMOS Analog Circuit Design, Second Edition, Oxford University Press
5. B. Razavi, Design of Analog CMOS Integrated Circuits, McGraw-Hill
6. P. Gray, P. J. Hurst, S. H. Lewis and R. Meyer, Analysis and Design of Analog Integrated Circuits, Fourth Edition,Wiley, 2001. (Low Price Edition)

Laboratory Assignments/Experiments:

1. To implement three input NAND gate using static CMOS logic and draw the Layout for the same.
2. To implement the CMOS inverter using Static CMOS logic and find the impact of W/L on propagation delay and Power Dissipation.
3. Design and Implement Differential amplifier by using AIMSPICE. Analyze the circuit using DC Analysis and Transient analysis.
4. Design and Implement Cascade amplifier by using AIMSPICE. Adjust the W/L ratio and Plot the effect of W/L ratio on Output voltage.

504102 Multirate Signal Processing

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. The student will use theory of multirate processing for design of QMFs and sub band coding.
2. The student will show skills for design of adaptive filter for equalizer or echo canceller.
3. The student will exhibit the knowledge of wavelet transformation.

Module I :Fundamentals of Multirate Systems:(8 Hrs.)
Need for multirate DSP, Decimation and interpolation, Sampling rate conversion by (I/D), spectral diagrams, design of filters, efficient implementation of decimator and interpolator, Poly phase interpolator, time variant filter structures, multistage filter design.

Module II :Applications of Multirate Systems:(8 Hrs.)

Oversampling ADC/DAC, design of DFT filter bank, design of phase shifter, Two channel filter bank, Perfect reconstruction and alias cancelation conditions, design of QMFs, sub band coding of speech, applications of multirate DSP for image resizing and sampling rate conversion of speech signal.

Module III : (8 Hrs.)

Adaptive filtering: Adaptive FIR filtering, Newton steepest descent algorithm, Least Mean Square algorithm, applications of adaptive filters such as adaptive noise cancellation, adaptive echo cancellers, Adaptive IIR filters, Pade approximation technique and least squares techniques, Prony's method and Shank's method.

Module IV: (8 Hrs.)

The Wavelet Transform and its Relation to Multirate Filter Bank: DCT,Short-time Fourier transform, Multi-resolution analysis, Haar wavelet, Wavelet basis, Mother wavelet, Standard wavelets, Calculation of a wavelet transform, Wavelet packets, Applications of wavelet transform and DCT for speech and image processing like coding, compression, filtering etc., wavelet filter bank.

References

1. P.P. Vaidyanathan, "Multirate System and Filter Banks", Pearson.
2. Shaila D Apte, "Advanced Digital Signal Processing", 2nd Edition, Wiley India.
3. J G Proakis, D G Manolokis, "Digital Signal Processing Principles, Algorithms, Applications", PHI.
4. Emmanuel C Ifeacher, Barrie. W. Jervis, "DSP- A Practical Approach", Pearson Education.
5. K.P.Soman, K.I.Ramchandran, N.G. Resmi, "Insight into Wavelets from theory to practice", Third edition PHI

Laboratory Experiment and Assignments:

1. Design an FIR filter using FS method with Kaiser window to meet the following specifications. Cut-off frequency of 1000 Hz with sampling frequency of 10,000 Hz. Minimum stop band attenuation is 40 dB, $\omega p = 0.15\pi$, $\omega s = 0.25\pi$.
2. Design 9 coefficient FIR LPF using frequency sampling method with cut off frequency 2fs/9 where fsis sampling frequency. Plot the magnitude response of the resulting filter
3. Record a speech file in your own voice with a sampling frequency of 8 KHz and use the sampling rate converter program to convert the sampling frequency to 24 KHz.

504103 Embedded System Design

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. The student will study ARM Processor based Embedded System design
2. The student will be able to do programming in Embedded programming in C, C++
3. The student will understand Linux operating system and device driver
4. The student will demonstrate the knowledge of android operating system

Module I :Introduction to Embedded systems and ARM CORTEX Processors (8 Hrs.)

Definition and characteristics of embedded systems, Introduction to Embedded system design Life-Cycle Models, Design Metrics. Embedded System Development tools, Introduction to ARM, Power aware design, Introduction to Development Platform Trends (only introduce IDE, board Details and Application) Arduino, Beaglebone, Rasberry PI, Intel Galileo Gen 2

ARM CORTEX series features, Improvement over classical series, CORTEX A, R, M processors series, Features and applications, Survey of CORTEX based controllers from various manufacturers, ARM-M3 Based Microcontroller LPC1768: Features, Architecture (Block Diagram & Its Description), System Control, Clock & Power Control, Pin Connect Block. CMSIS Standard, Bus Protocols Ethernet, CAN, USB, Bluetooth

Module II :Embedded Operating Systems (8 Hrs.)

Fundamentals of RTOS, Different kernel services of RTOS, Implementation of RTOS for VxWorks and MicroC/OS-II:

Task Creation and Management, Task Scheduling, Task Synchronization, Interrupt Handling, Watchdog for task execution Monitoring, Timing and Reference, The VxWorks and MicroC/OS-II development environment. Introduction to Android technology, Structure of Android applications, Development of Android application

Module III :Embedded Linux and Device Driver (8 Hrs.)

Introduction to Embedded Linux, Linux kernel: construction, Kernel Build system, kernel configuration, obtaining custom Linux kernel, Kernel initialization, Porting Linux on ARM, Device driver: Concepts, Module utilities, Driver methods, Device driver for LED, Keyboard, LCD

Module IV: Embedded System Design Case Studies (8 Hrs.)

Design Case Studies like Automated Meter Reading Systems (AMR), Digital Camera, Certification and documentation: Mechanical Packaging, Testing, reliability and failure analysis, Certification (EMI / RFI) and Documentation. Study of any two real life embedded products in detail.

References

1. Embedded Systems Architecture, Programming and Design Rajkamal
2. Embedded Linux Primer: A Practical Real-World Approach (Prentice Hall) Christopher Hallinan
3. Introduction to Embedded systems: Shibu, TMH
4. www.nxp.com/documents/user_manual/UM10360.pdf

Laboratory Assignments/Experiments:

1. To design any one embedded product to solve any real life problem/s. Test the hardware designed using suitable tool.
2. Study of RTOS: Micro C OS-II or Vx-Works or Android.
3. Interfacing USB & CAN of LPC 1768.
4. StudyofLinuxKernel. Write adevicedriverforLCD
5. One experiment based on any one of development Platform: Arduino, Beaglebon, Rasberry PI, Intel Galileo Gen 2

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 wil 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 day 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.)

StatisticsMeasures 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**,**MultiLayerPerceptrons, 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 Oragnisation 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, LaureneFausett, 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, µCOS-II, Tiny OS, ANDROID, Xilinx, Microwind, Tanner, TCAD Tools, NS-II, NS-III, OMNET++, OPNET, AWR Microwave office, CAD Feko, IE-3D, Phython, 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.

504106 Lab Practice I

Credits:4

Teaching Scheme:
Lectures: 4 Hrs/Week

Examination Scheme:
Theory: 50 Marks (TW)
50 Marks (OR)

Lab Practice I: The laboratory work will be based on completion of minimum two assignments/experiments confined to the courses of the semester.

Semester-II

504107 Advanced DSP Processors

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. Understand the architecture of TMS320C6713
2. To program TMS320C6713 using CCS studio
3. Study basic Embbeded processor

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

Digital Signal Processor Architectures, hardware units as MAC unit, Barrel shifter, Address generators, pipelining, circular buffering, memory configurations, peripherals and input/output, Fixed point and floating point formats and digital signal processors, Concept of Real Time Processing.

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

Architecture of TMS320C54XX and TMS320C6713 , features, instruction sets , memory considerations, data types , addressing modes , various fields of application of the two processors.

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

Embbeded processor: Micro Signal Architecture, Real time embedded signal processing, overview of Blackfin Processor, Hardware processing units and register files, Bus Architecture and memory, Basic peripherals, Introduction to VisualDSP++, Software development flow and tools, linker files, debugging features.

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

Selection criteria of Digital Signal Processor, sampling and quantization, coder-decoder, overview of C compiler, Assembler, linker, simulator, emulator. Code composer studio, creating, building of project, viewing memory and graphics, use of breakpoints.

References

1. Digital Signal Processor: SenM.Kuo, Woon-SengS.Gan, Pearson
2. Digital Signal Processor: B.Venkataraman, M.Bhaskar, McgrawHill
3. Embedded Signal Processing with the Micro Signal Architecture: Woon-SengGan, Sen M. Kuo, Wiley publication

List of Laboratory Assignments:

1.Write a program in C for Finite impulse response LPF or HPF or BPF filter and

implement on TMS 320C XXX processor.

2. Write a program in C for infinite impulse response LPF or HPF or BPF filter and implement on TMS 320C XXX processor.

3. Write a program in C for Adaptive filter and implement on TMS 320C XXX processor.

4. to implement coder-decoder using MATLAB Simulink.

504108 PLD's and ASIC Design

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. show the skills of designing analog and digital VLSI ICs..
2. the basics of the PLDs for designing IP Cores.
3. understand the reconfigurable system design

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

System Design Basics, Combinational Circuits, Sequential Circuits, Timing, Power Dissipation, SoC, IP Design, Design methodology, System Modeling, Hardware-Software Co-design, Application Domains, Top down Approach to Design, Data Path, Control Path, Controller behavior and Design, Pipelining, Resource sharing, FSM issues: Starring state, Power on Reset, State diagram optimization, State Assignment, Asynchronous Inputs, Output Races, fault Tolerance.

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

VHDL for System Design, Introduction to HDL, Behavioral, Data flow, Structural Models, Simulation Cycles, Process, Concurrent Statements, Sequential Statements, Loops, Delay Models, Sequential Circuits, FSM Coding, Library, Packages, Functions, Procedures, Operator Inference, Test bench. Complex Programmable Logic Devices**,** Review of PLDs, Design Flow, Programmable Interconnections, Complex PLD's (XC 9500, MAX - 7000, APEX), Architecture, Resources, Applications, Cool Runner CPLD.

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

Field Programmable Gate Arrays, Introduction to FPGA, Logic Block Architecture, Routing Architecture, Programmable Interconnections, Design Flow, Xilinx Spartan-II architecture, Xilinx Virtex-II Architecture, Altera, Actel FPGA Architectures, Boundary Scan, Programming FPGA's, Constraint Editor, Static Timing Analysis, One hot encoding, Case Study: Xilinx Virtex II Pro, Embedded System on Programmable Chip, Hardware-software co-simulation, Bus function models, BFM Simulation, Debugging FPGA Design, Chipscope Pro

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

Types of ASICs, Custom IC Design Flow, ASIC Cell Libraries, ASIC Library Design, Programming Technologies, RTL to GDS-II flow, Introduction to ASIC design EDA Tools: Cadence, Mentor and Synopsis. Design and development of serial/ parallel converter, Introduction to IP cores.

References

1. Jon F Wakerly, Digital Design: Principles and Practices, Prentice Hall.
2. Kevin Skahil, VHDL for programmable logic, Addison Wesley.
3. ZainalabedinNavabi, VHDL, analysis and modeling of digital systems, McGraw-Hill.
4. Ian Grout, Digital Systems Design with FPGAs and CPLDs, Elsevier
5. Michael John Sebastian Smith, Application-Specific Integrated Circuits, Addison Wesley

Laboratory Assignments/Experiments:

1. Interface a 4×4 matrix keypad with the CPLD and display the pressed key on the Liquid Crystal display interfaced with the same CPLD.
2. Design and implement the Analog to digital converter custom IC by using the RTL to GDS-II flow.
3. Design and implement the serial/parallel converters using VHDL.
4. To implement decade counter on any FPGA experimental Kit and verify the output on seven segment LED display.

504109 Image Processing and Computer Vision

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. To apply different techniques used for enhancement and segmentation
2. To process color images in different color spaces
3. Understand different image registration techniques
4. Understand basic of stenography.

Module I :Basic of image processing (8 Hrs.)

Formation of image model, histogram equalization, application of spatial filters for enhancement and segmentation– average, weighted average, first order and second order, Hough transform, Thresholding.

Binary image processing: Erosion, Dilation, Opening and closing, Hit or miss transform

Image transforms- DCT, Haar, Hadamard, PCA

Module II :Colour Image processing: (8 Hrs.)

Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations , Formulation ,Color Complements , Color Slicing , Tone and Color Corrections, Histogram Processing , Smoothing and Sharpening , Color Image Smoothing , Color Image Sharpening , Image Segmentation Based on Color , Segmentation in HSI Color Space , Segmentation in RGB Vector Space , Color Edge Detection , Noise in Color Images , Color Image Compression

Module III :Image registration: (8 Hrs.)

Operational goal of registration, Classification of registration methods - Geometrical transformations, Rigid transformations, Nonrigid transformations, Rectification, Point-based methods, Points in rigid transformations, Points in scaling transformations, Points in perspective projections, Points in curved transformations, Surface-based methods, Disparity functions, Head and hat algorithm, Distance definitions, Distance transform approach, Iterative closest point algorithm, Weighted geometrical feature algorithm, Intensity-based methods, Similarity measures,

Module IV: Stereo correspondence: (8 Hrs.)

Epipolar geometry --Rectification, Plane sweep, Sparse correspondence, 3D curves and profiles,. Dense correspondence, Similarity measures, Local methods, Sub-pixel estimation and uncertainty, Application: Stereo-based head tracking , Multi-view stereo, Volumetric and 3D surface reconstruction

3D reconstruction :

Shape from X, Shape from shading and photometric stereo, Shape from texture, Shape from focus, Active range finding , Range data merging , Application: Digital heritage

Surface representations, Surface interpolation, Surface simplification, Geometry images, Point-based representations, Volumetric representations, Model-based reconstruction , Application: Facial animation, Recovering texture maps and albedos , Application: 3D photography

References

1. Digital Image processing by Gonzalez.
2. Computer Vision: Algorithms and Applications" by Richard Szeliski, published by Springer (available online)
3. Computer Vision: A Modern Approach" by David Forsyth and Jean Ponce
4. "Computer and Robot Vision" by Haralick&Shapiro,

List of experiments/Assignments

Students can use any open source platform or MATLAB for coding

1. Design a system for edge detection using Sobel and Prewitt edge operator.
2. Write a generalized program to take the 3*3 mask from the user and convolve the given image with the mask.
3. Write a program to implement any 3 gray scale transformations on the image.
4. Use any image of size 512*512 and high pass filter it in WT domain.
5. Write as code for finding disparity for stereo images using SSD algorithm..

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 – cepstralvocoder, 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 HallInc.
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, PrenticeHall
6. Rabiner L.R. & Gold, “Theory and Applications of Digital Signal Processing”, Prentice Hallof 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, Dening BI Cycle, BI Environment and Architecture, Identify BI opportunities, Benets 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-ware-house 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, MichellineKamber, 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. SoumendraMohanty, Analytics in Practice,Tata McGraw Hill Education, 2011,

504110 Software Tools*

Credits:1

Teaching Scheme:
Lectures: 2 Hrs/Week

Examination Scheme:
Theory: 50 Marks (In Semester)
50 Marks (In Semester)

Introduction to software tools such as Octave, MATLAB, SCILAB, LAB VIEW, RTLinux, VxWorks, µCOS-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 II the student Shall study open source/evaluation versions of at least three software tools mentioned above (not covered during semester –I) and should present term paper.

504111 Lab Practice II

Credits:4

Teaching Scheme:
Lectures: 4 Hrs/Week

Examination Scheme:
Theory: 50 Marks (TW)
50 Marks (OR)

Lab Practice II: The laboratory work will be based on completion of minimum two assignments/experiments confined to the courses of the semester.

Seminar I

Credits:4

Teaching Scheme:
Lectures: 4 Hrs/Week

Examination Scheme:
Term Work : 50 Marks
Oral/ Presentation: 50 Marks

Seminar II: shall be on the topic relevant to latest trends in the field of concerned branch, preferably on the topic of specialization based on the electives selected by him/her approved by authority. The student shall submit the seminar report in standard format, duly certified for satisfactory completion of the work by the concerned guide and head of the Department/Institute.

604101 System on Chip

Credits:4

Teaching Scheme:
Lectures 4 Hrs/ Week

Examination Scheme:
Theory: 50 Marks (In Semester)
50 Marks (End Semester)

Course Outcomes:

1. The student will learn to design flow graphs and flow modeling.
2. The student will study SOC modeling and interfacing.
3. The student will learn SOC memory system design, embedded software and energy management techniques for SOC design, SOC prototyping, verification, testing and physical design.
4. The student will able to design , implement and test SOC.

Module I

Subsystem Design and Floor-planning: An approach for SOC design, system architecture and complexity, Subsystem design principles, Combinational Shifters, Adders, ALUs, Multipliers, High Density Memory, Floor-planning Methods, Off Chip Connections **(8Hrs.)**

Module II

Interconnect, Customization and Configuration : Interconnect architectures, Bus: basic architectures, SOC standard buses, Analytic bus models, using the bus model, effects of bus transactions and contention time, SOC Customization: an overview, customizing Instruction Processor, Reconfiguration Technologies, Mapping design into reconfigurable devices. **(8Hrs.)**

Module III

RTL Intent : Simulation race, simulation-synthesis mismatch, timing analysis, timing parameters for digital logic, factors affecting delay and slew, sequential arcs, clock domain crossing ,bus synchronization , preventing data loss through FIFO, Importance of low power, causes and factors affecting power, switching activity, simulation limitation, implication on synthesis and on backend. **(8Hrs.)**

Module IV

SOC Case Studies & Research Challenges : a soc controller for digital still camera : a digital still camera SOC, chip implementation, recent development. energy management techniques for SOC design : power and energy consumptions in SOC , techniques for lowering operating voltage, techniques for reducing switching activity : DPM, soc prototyping : soc design flow, transaction level modeling, verification, testing : test access control system, test pattern application, test integration issues and solution. **(8Hrs.)**

Laboratory Assignments/Experiments:

1. Design, simulate and implement FSM for detection of either of input sequence X = … 1001..... or …1101… sequence and set output flags Y='1' or Z='1' respectively.
2. Why gated clock is not preferred in digital design? Write Verilog code for to implement CMOS layout which will generate glitch also design a RTL by Write VHDL will generate glitch and also measure it using electronic test equipment.
3. Implement temperature logging system by Interfacing FPGA & μC 8051 as follows :
   i) LM 35 interfaced with ADC
   ii) ADC interfaced with FPGA
   iii) FPGA interfaced with μC 8051

iv) μC 8051 is interfaced with LCD to display real-time room temperature. If temperature is greater than 25^0 C Bi-colour LED should change its normal Green colour to RED colour via opto-isolator by actuation of relay.

References

1. Wayne Wolf, "Modern VLSI Design Systems On Chip", Pearson Education
2. Sanjay Churiwala, SapanGarg, "Principles of VLSI RTL Design a Practical Guide", Springer
3. Micheal Flynn, Wayne Luk, "Computer System Design System-On-Chip", Wiley India Pvt. Ltd
4. Youn-Long Steve Lin, "Essential Issues in SOC Design, Designing Complex Systems-on-Chip", Springer

604102 Wireless Sensor Network for IOT

Credits:4

Teaching Scheme:
Lectures: 4 Hrs/Week

Examination Scheme:
Theory: 50 Marks (In Semester)
50 Marks (In Semester)

Course Outcomes : On completion of course students will be able to

1. study the architecture of wireless sensor network
2. study the different protocols of wireless communication
3. understandIoT architecture and protocol.

Module I : (8 Hrs.)

OVERVIEW OF WIRELESS SENSOR NETWORKS: Challenges and constraints in Wireless Sensor Networks, Classification of Wireless sensor network

ARCHITECTURES : Single-Node Architecture - Hardware Components, Energy Consumption of Sensor,Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts, Real Life Applications of WSN

Module II : (8 Hrs.)

PROTOCOLS IN SENSOR NETWORK

MEDIUM ACCESS CONTROL PROTOCOLS: Fundamentals of MAC protocols, Low duty cycle protocols and wakeup concepts, Contention based protocols, Traffic-adaptive medium access protocol, IEEE 802.15.4 MAC protocol , Bluetooth, Zigbee

Routing Challenges and Design Issues in Wireless Sensor Networks, Real Time routing Protocols , Data aggregation, Aggregation Techniques and protocols

INFRASTRUCTURE ESTABLISHMENT :

Topology Control , Clustering, Time Synchronization, Localization in Sensor network, Target detection and tracking

Module III : (8 Hrs.)

INTRODUCTION TO THE INTERNET OF THINGS

Introduction to IoT and its importance, Elements of an IoT ecosystem, Technology drivers, Business drivers, M2M vs IOT, IPv6 vs. IPv4 , 6LoWPAN

IP for Smart Objects: motivation and main challenges, Definition of Low Power and Lossy Networks (LLN); survey of current link-layer technologies for the IoT, Big Data and IOT Analytics

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

IOT ARCHITECTURE AND PROTOCOLS

IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views

IOT Protocols: Identification: EPC, UCODE,IPV6,URI; Data Protocols : HTTP, MQTT,REST, COAP,AMQP, Web-socket, SOAP

IoT Ethics, Privacy, Security, Security Protocols : Open Trust Protocol (OTrP), X.509

Applications of IOT : Real-World Design Constraints, Real Time Applications of IOT, Home Automation, Health care, Infrastructure, IoT in Energy and Environment, Building Automation.

References

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless SensorNetworks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An InformationProcessing Approach", Elsevier, 2007.
3. KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks-Technology, Protocols, And Applications", John Wiley, 2007.
4. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
5. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
6. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
7. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

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

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604103 AValue Education, Human rights and Legislative procedures

Elective-III ACredits: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, Ox ford University Press, New Delhi, 2000.

604103 A Environmental studies

Elective-III ACredits: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. BharuchaErach, 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: **Examination Scheme:**

Lectures:3Hrs/Week **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: **Examination Scheme:**

Lectures: 3 Hrs/Week **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 ACredits: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 oganizationPeterSenge 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 ACredits: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, Specia Events Other French Flavours; Nos cousins d'Amérique - Québec et Accadie, Au pays de la bière et des frites, Mettez-vous à l'heure Suisse, Vé, peuchère, le françaisbien de chez nous

References

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

604103 A Economics for Engineers

Elective-III ACredits:3

Teaching Scheme: **Examination Scheme:**

Lectures: 3Hrs/Week **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 ACredits: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: **Examination Scheme:**

Lectures: 2Hrs/Week **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 LievenVandenberghe, 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: **Examination Scheme:**

Lectures: 2 Hrs/Week **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: **Examination Scheme:**

Lectures: 2 Hrs/Week **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

604104 Seminar II

Credits:4

Teaching Scheme:
Lectures: 4 Hrs/Week

Examination Scheme:
Term Work : 50 Marks
Oral/ Presentation: 50 Marks

Seminar II : shall be on the topic relevant to latest trends in the field of concerned branch, preferably on the topic of specialization based on the electives selected by him/her approved by authority. The student shall submit the seminar report in standard format, duly certified for satisfactory completion of the work by the concerned guide and head of the Department/Institute.

604105 **Project Stage- I**

Credits:8

Teaching Scheme:
Lectures: 8 Hrs/Week

Examination Scheme:
Term Work : 50 Marks
Oral/ Presentation: 50 Marks

Project Stage – I

Project Stage – I is an integral part of the project work. In this, the student shall complete the partial work of the project which will consist of problem statement, literature review, project overview, scheme of implementation (Mathematical Model/SRS/UML/ERD/block diagram/ PERT chart, etc.) and Layout & Design of the Set-up. As a part of the progress report of Project work Stage-I, the candidate shall deliver a presentation on the advancement in Technology pertaining to the selected dissertation topic. The student shall submit the duly certified progress report of Project work Stage-I in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute.

Second Year –Semester II

604106 **Seminar III**

Credits:5

Teaching Scheme:
Lectures: 5 Hrs/Week

Examination Scheme:
Term Work : 50 Marks
Oral/ Presentation: 50 Marks

Seminar III: shall preferably an extension of seminar II. The student shall submit the duly certified seminar report in standard format, for satisfactory completion of the work by the concerned guide and head of the Department/Institute.

604107 **Project Stage- II**

Credits:20

Teaching Scheme:
Lectures: 20 Hrs/Week

Examination Scheme:
Term Work : 150 Marks
Oral/ Presentation: 50 Marks

Project Stage – II

In Project Stage – II, the student shall complete the remaining part of the project which will consist of the fabrication of set up required for the project, work station, conducting experiments and taking results, analysis & validation of results and conclusions. The student shall prepare the duly certified final report of project work in standard format for satisfactory completion of the work by the concerned guide and head of the Department/Institute.