VIDYA JYOTHI
INSTITUTE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION
(Accredited by NAAC & NBA, Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)
Aziz Nagar Gate, C.B. Post, Hyderabad-500 075

Department of Electronics and Communication Engineering
(Accredited by NBA)

Minutes of the Board of studies in ECE meeting held on 15th July 2023 at 11.00 AM at Board Room.

The following members were present in the meeting.

S.No	Name of the Member	Designation	Signature
1.	Dr. M. Rajendra Prasad, Professor & Head ECE, VJIT	Chairman	
2.	Dr. T.SatyaSavithri, Professor, JNTUH CEH	JNTUH Nominee	15/7/23
3.	Dr.S.Sathees Kumaran, Professor, Anurag University	Member	
4.	Dr. P. Chandra Sekhar, Professor, Osmania University	Member	
5.	Dr. P.Nageswara Rao,Professor, Vardhaman College of Engineering.	Member	
6.	Mr. A. Hariharan, Associate Director, PACTRA EDGE, Hyderabad.	Member	
7.	Mr. N. Venkatesh, Sr. Director, Sillicon Labs, Hyderabad.	Member	
8.	Dr. S. Thulasi Prasad, Professor, ECE, VJIT.	Member	
9.	Dr.P.Ganesan, Professor, ECE,VJIT	Member	
10.	Dr. V. G. Siva Kumar, Assoc. Professor, ECE, VJIT.	Member	
11.	Dr. M. Vadivel, Assoc. Professor, ECE, VJIT.	Member	
12.	Mrs. A. Jaya Lakshmi, Assoc. Professor, ECE, VJIT.	Member	
13.	Mr. S. Pradeep Kumar Reddy, Assoc. Professor, ECE, VJIT.	Member	

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RESOLUTIONS

1. All the previous minutes were incorporated as per the previous BOS meeting

Agenda No. 1: Approval of M.Tech. (Embedded Systems) Course Structure under R-23 regulations

The chairman of BoS presented I & II year course structure of M.Tech. (Embedded Systems) under R-23 regulations.

Resolution (1): ***After detailed discussion board members approved I & II year course structure of M.Tech. (Embedded Systems) under R-23 regulations.***

Agenda No. 2: Approval of M.Tech. (Embedded Systems) I and II Year Syllabi under R-23 regulations

The Chairman presented I & II Year syllabi of M.Tech.(Embedded Systems) under R-23 regulations.

Resolution (2): ***After detailed discussion board members approved I & II Year syllabi of M.Tech. (Embedded Systems) under R23 regulations.***

Agenda No. 3: Approval of Courses / Equivalent Subjects (for detained Students of Old Regulations) along with their syllabi of the subjects offered to students under R19 / R15 Regulations

Resolution (3): ***Kindly grant powers to the Chairman of BoS to take decision regarding Approval of Courses / Equivalent Subjects (for detained students of old regulation) along with their syllabi of the subjects offered to students under R19 / R15 Regulations***

Agenda No. 4: Approval of Panel of examiners

The Chairperson emphasized the necessity of Panel of Examiners. Their services will be utilized in the preparation of End-Semester Question paper(s) and Evaluation of End-Semester Examination Answer Scripts. They will be paid remuneration as per the recommendations of College Finance Committee.

Resolution (4): ***The committee on BoS in ECE to prepare the Panel of examiners in consultation with the senior teachers for all the M.Tech (Embedded Systems) courses under R-23 regulations. The same may be submitted to the Examination branch (Autonomous) for further processing.***

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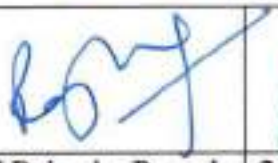
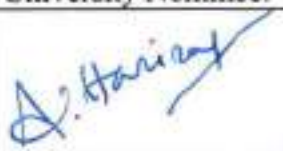
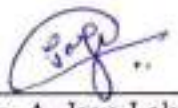
BoS Members' Signatures:

			
1.Dr. M.Rajendra Prasad, Professor, Head & Chairman of BoS,ECE,VJIT.	2.Dr.T. SatyaSavithr, Professor of ECE,JNTUH CEH, University Nominee.	3.Dr.S. Sathees Kumaran, Professor, Anurag University, External Member.	4. Dr. P. Chandra Sekhar, Professor, Dept., of ECE, OsmainaUniversity, External Member.
			
5. Dr. P.Nageswara Rao, Professor, Vardhaman College of Engineering, External Member.	6. Mr. A. Hariharan, Associate Director, PACTRA EDGE, Hyderabad, External Member.	7. Mr. N. Venkatesh, Sr. Director, Sillicon Labs, Hyderabad, External Member.	8. Dr.S. Thulasi Prasad, Professor,ECE,VJIT, Internal Member.
			
9. Dr.P. Ganesan, Professor, ECE, VJIT, Internal Member.	10. Dr. V. G. Siva Kumar, Associate Professor, ECE, VJIT, Internal Member.	11. Dr. M. Vadivel, Associate Professor, ECE, VJIT, Internal Member.	12. Mrs. A. Jaya Lakshmi, Associate Professor, ECE,VJIT, Internal Member.
		.	
13. Mr.S.Pradeep Kumar Reddy, Associate Professor, ECE,VJIT, Internal Member	.		

M.Tech

(EMBEDDED SYSTEMS)

R23
REGULATIONS

(For the Students admitted in AY: 2023-24)

COURSE STRUCTURE
&
SYLLABUS

Vidya Jyothi Institute of Technology (Autonomous)

Department of Electronics and Communication Engineering

Accredited by NAAC & NBA, Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)

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I YEAR I SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1.	Professional Core - I	Digital System Design with FPGAs	3	0	0	3
2.	Professional Core - II	System Design with Embedded Linux	3	0	0	3
3.	Professional Elective - I	1. CMOS VLSI Design 2. Pattern Recognition and Machine Learning 3. Wireless Sensor Networks	3	0	0	3
4.	Professional Elective - II	1. Communications Buses & Interfaces 2. Advanced Computer Architecture 3. CMOS Analog IC Design	3	0	0	3
5.	Lab - I	Digital system Design with FPGAs Lab	0	0	4	2
6.	Lab - II	System Design with Embedded Linux Lab	0	0	4	2
7.		Research Methodology & IPR	2	0	0	2
8.	Audit - I	1. English for Research Paper Writing 2. Disaster Management 3. Constitution of India	2	0	0	0
		Total	**16**	**0**	**8**	**18**

I YEAR II SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1.	Professional Core - III	ARM Microcontrollers	3	0	0	3
2.	Professional Core - IV	Embedded System And IoT	3	0	0	3
3.	Professional Elective - III	1. IoT Architectures and System Design 2. Design for Testability 3. SoC Design	3	0	0	3
4.	Professional Elective - IV	1. Hardware and Software Co-Design 2. Secure Networks 3. Physical Design Automation	3	0	0	3
5.	Lab - III	ARM Microcontrollers Lab	0	0	4	2
6.	Lab - IV	Embedded and IoT Sensor Lab	0	0	4	2
7.		Mini Project with Seminar	0	0	4	2
8.	Audit - II	1. Value Education 2. Pedagogy Studies 3. Stress Management by Yoga	2	0	0	0
		Total	**14**	**0**	**12**	**18**

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II YEAR I SEMESTER

S.No	Course Code	Course Title	L	T	P	Credits
1.	Professional Elective - V	1. Embedded Networks 2. CMOS Mixed Signal Design 3. Human -Machine Interface	3	0	0	3
2.	Open Elective	1. Logistics & Supply chain management 2. Maintenance and Safety Engineering 3. Operations Research 4. Business Analytics 5. Composite Materials	3	0	0	3
3.	Dissertation	Dissertation Work Review – II	0	0	12	6
		Total	**6**	**0**	**12**	**12**

II YEAR-II SEMESTER

	Course Code	Course Title	L	T	P	Credits
1.	Dissertation	Dissertation Work Review - III	0	0	12	06
2.	Dissertation	Dissertation Viva-Voce	0	0	28	14
		Total	**0**	**0**	**40**	**20**

1 2 3 4 5
6 7 8 9 10
11 12 13 14

COURSE STRUCTURE FOR M.TECH I YEAR I SEMESTER

I YEAR-I SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1.	Professional Core - I	Digital System Design with FPGAs	3	0	0	3
2.	Professional Core - II	System Design with Embedded Linux	3	0	0	3
3.	Professional Elective - I	1. CMOS VLSI Design 2. Pattern Recognition and Machine Learning 3. Wireless Sensor Networks	3	0	0	3
4.	Professional Elective - II	1. Communications Buses & Interfaces 2. Advanced Computer Architecture 3. CMOS Analog IC Design	3	0	0	3
5.	Lab - I	Digital system Design with FPGAs Lab	0	0	4	2
6.	Lab - II	System Design with Embedded Linux Lab	0	0	4	2
7.		Research Methodology & IPR	2	0	0	2
8.	Audit - I	1. English for Research Paper Writing 2. Disaster Management 3. Constitution of India	2	0	0	0
		Total	**16**	**0**	**8**	**18**

DIGITAL SYSTEM DESIGN WITH FPGAs

(PC – I)

M.Tech I Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes:

1. To exposes the design approaches using FPGAs.
2. To provide in depth understanding of Fault models.
3. To understands test pattern generation techniques for fault detection.
4. To design fault diagnosis in sequential circuits.
5. To provide understanding in the design of flow using case studies.

UNIT - I

Programmable Logic Devices: The concept of programmable Logic Devices, SPLDs, PAL devices, PLA devices, GAL devices, CPLD-Architecture, FPGAs-FPGA technology, architecture, virtex CLB and slice, FPGA Programming Technologies, Xilinx XC2000, XC3000, XC4000 Architectures, Actel ACT1, ACT2 and ACT3 Architectures. [TEXTBOOK-1]

UNIT - II

Analysis and derivation of clocked sequential circuits with state graphs and tables: A sequential parity checker, Analysis by signal tracing and timing charts-state tables and graphs-general models for sequential circuits, Design of a sequence detector, More Complex design problems, Guidelines for construction of state graphs, serial data conversion, Alphanumeric state graph notation. Need and Design stratagies for multi-clock sequential circuits.

UNIT - III

Sequential circuit Design: Design procedure for sequential circuits-design example, Code converter, Design of Iterative circuits, Design of a comparator, Controller (FSM) – Metastability, Synchronization, FSM Issues, Pipelining resources sharing, Sequential circuit design using FPGAs, Simulation and testing of Sequential circuits, Overview of computer Aided Design. [TEXTBOOK-2]

UNIT - IV

Fault Modeling and Test Pattern Generation: Logic Fault Model, Fault detection & redundancy, Fault equivalence and fault location, Fault dominance, Single stuck at fault model, multiple Stuck at Fault models, Bridging Fault model. Fault diagnosis of combinational circuits by conventional methods, [TEXTBOOK-3 & Ref.1]

UNIT - V

Fault Diagnosis in sequential circuits: Circuit Test Approach, Transition check Approach, State identification and fault detection experiment, Machine identification, Design of fault detection experiment. [Ref.3]

TEXT BOOKS

1. Digital Electronics and design with VHDL- Volnei A. Pedroni, Elsevier publications.
2. Fundamentals of Logic Design-Charles H.Roth, Jr. -5th Ed., Cengage Learning.
3. Digital Circuits and Logic Design-Samuel C. LEE, PHI, 2008.

REFERENCE BOOKS

1. Logic Design Theory-N.N. Biswas, PHI.
2. Digital System Design using programmable logic devices- Parag K. Lala, BS publications. Switching and Finite Automata Theory - Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge

SYSTEM DESIGN WITH EMBEDDED LINUX

(PC – II)

M.Tech I Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes:

1. Familiarity of the embedded Linux development model.
2. Write, debug, and profile applications and drivers in embedded Linux.
3. Create Linux BSP for a hardware platform

UNIT- I

Introduction to Real Time Operating Systems: Characteristics of RTOS, Tasks Specifications and types, Real-Time Scheduling Algorithms, Concurrency, Inter-process Communication and Synchronization mechanisms, Priority Inversion, Inheritance and Ceiling. Embedded Linux Vs Desktop Linux, Embedded Linux Distributions, System calls, Static and dynamic libraries, Cross tool chains

NIT- II

Embedded Linux Architecture, Kernel Architecture – HAL, Memory manager, Scheduler, File System, I/O and Networking subsystem, IPC, User space, Start-up sequence

UNIT- III

Board Support Package Embedded Storage: MTD, Architecture, Drivers, Embedded File System Embedded Device Drivers: Communication between user space and kernel space drivers, Character and Block Device Drivers, Interrupt handling, Kernel modules Embedded Drivers: Serial, Ethernet, I2 C, USB, Timer, Kernel Modules

UNIT- IV

Porting Applications Real-Time Linux: Linux and Real time, Programming, Hard Real-time Linux

UNIT- V

Building and Debugging: Bootloaders, Kernel, Root file system, Device Tree

TEXT BOOKS:

1. Chris Simmonds, "Mastering Embedded Linux Programming" - Second Edition, PACKT Publications Limited.
2. Karim Yaghmour, "Building Embedded Linux Systems", O'Reilly & Associates
3. P Raghvan, Amol Lad, Sriram Neelakandan, "Embedded Linux System Design and Development", Auerbach Publications

REFERENCE BOOKS:

1. Christopher Hallinan, "Embedded Linux Primer: A Practical Real-World Approach", Prentice Hall, 2nd Edition, 2010.
2. Derek Molloy, "Exploring Beagle Bone: Tools and Techniques for Building with Embedded Linux", Wiley, 1st Edition, 2014

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Department of Electronics and Communication Engineering

CMOS VLSI DESIGN

(Professional Elective - I)

M.Tech I Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: Students will be able to:

1. Design of combinational MOS logic and sequential MOS logic circuits
2. Design of different Memories using MOS transistors
3. Design a circuits based on dynamic logic
4. Use CMOS transmission gates in various applications

UNIT - I

MOS Design

Pseudo NMOS logic- Inverter, Inverter threshold voltage, output high voltage, Output lowvoltage, gain at gate threshold voltage, transient response, rise time, fall time, pseudo NMOS logic gates, transistor equivalency, CMOS inverter logic.

UNIT - II

Combinational MOS logic circuits

MOS logic circuits with NMOS loads, Primitive CMOS logic gates- NOR and NAND gates, Complex logic circuits design- realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full-adder, CMOS transmission gates, designing with transmission gates.

UNIT - III

Sequential MOS logic circuits: Behavior of bistable elements, SR Latch, Clocked Latch and Flip-flop circuits, CMOS D Latch and edge triggered flip-flop.

UNIT - IV

Dynamic Logic Circuits: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, high performance dynamic CMOS circuits.

UNIT - V

Semiconductor Memories: Types, RAM array Organization, DRAM- types, operation, leakage currents in DRAM cell and refresh operation, SRAM - operation, leakage currents in SRAM cells, Flash memory- NOR flash and NAND flash

TEXT BOOKS:

1. Digital Integrated Circuit Design- Ken Martin, Oxford University Press, 2011.
2. CMOS Digital Integrated Circuit Analysis and Design – Sung Mo Kang, YusufLeblebici, TMH, 3rd Ed., 2011.

REFERENCE BOOKS:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective- Ming Bo Lin,CRC Press, 2011.
2. Digital Integrated Circuits: A Designs Perspective -Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.

PATTERN RECOGNITION AND MACHINE LEARNING

(Professional Elective – I)

M.Tech I Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: On completion of this course student will be able to

1. Familiar the basics of pattern classes and functionality.
2. Construct the various linear models.
3. Use the different kernel methods.
4. Design the Markov and Mixed models.

UNIT-I

Introduction to Pattern recognition: Mathematical Formulation and Basic Functional Equation, Reduction of Dimensionality, Experiments in Pattern Classification, Backward Procedure for Both Feature Ordering- and Pattern Classification, Suboptimal Sequential Pattern Recognition, Nonparametric Design of Sequential Pattern Classifiers, Analysis of Optimal Performance and a Multiclass Generalization

UNIT-II

Linear Models: Linear Basis Function Models -Maximum likelihood and least squares, Geometry of least squares , Sequential learning, Regularized least squares, Multiple outputs , The Bias-Variance Decomposition, Bayesian Linear Regression -Parameter distribution, Predictive, Equivalent, Bayesian Model Comparison, Probabilistic Generative Models-Continuous inputs, Maximum likelihood solution, Discrete features, Exponential family, Probabilistic Discriminative Models -Fixed basis functions, Logistic regression, Iterative reweighted least squares, Multiclass logistic regression, Probit regression, Canonical link functions

UNIT-III

Kernel Methods: Constructing Kernels, Radial Basis Function Networks - Nadaraya-Watson model, Gaussian Processes -Linear regression revisited, Gaussian processes for regression, Learning the hyper parameters, Automatic relevance determination, Gaussian processes for classification, Laplace approximation, Connection to neural networks, Sparse Kernel Machines- Maximum Margin Classifiers, Overlapping class distributions, Relation to logistic regression, Multiclass SVMs, SVMs for regression, Computational learning theory, Relevance Vector Machines- RVM for regression, Analysis of sparsity, RVM for classification

UNIT-IV

Graphical Models: Bayesian Networks, Example: Polynomial regression, Generative models, Discrete variables, Linear-Gaussian models, Conditional Independence- Three example graphs, D-separation, Markov Random Fields -Conditional independence properties, Factorization properties, Illustration: Image de-noising, Relation to directed graphs, Inference in Graphical Models- Inference on a chain, Trees, Factor graphs, The sum-product algorithm, The max-sum algorithm, Exact inference in general graphs, Loopy belief propagation, Learning the graph structure.

UNIT-V

Mixture Models and EM algorithm: K-means Clustering-Image segmentation and compression, Mixtures of Gaussians-Maximum likelihood, EM for Gaussian mixtures, An Alternative View of EM- Gaussian mixtures revisited, Relation to K-means, Mixtures of Bernoulli distributions, EM for Bayesian linear regression, The EM Algorithm in General, Combining Models- Tree-based Models, Conditional Mixture Models- Mixtures of linear regression models, Mixtures of logistic models, Mixtures of experts.

TEXT BOOKS:

1. Sequential methods in Pattern Recognition and Machine Learning-K.S.Fu, Academic Press, volume no.52.
2. Pattern Recognition and Machine Learning- C. Bishop-Springer,2006.

REFERENCE BOOKS:

1. Pattern Classification- Richard o. Duda, Peter E. hart, David G. Stork, John Wiley& Sons, 2ndEd., 2001.
2. The elements of Statistical Learning- Trevor Hastie, Robert Tibshirani, JeromFriedman,Springer,2009.

WIRELESS SENSOR NETWORKS

(Professional Elective –I)

M.Tech I Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes:

1. Analyze and compare various architectures of Wireless Sensor Networks
2. Understand Design issues and challenges in wireless sensor networks
3. Analyze and compare various data gathering and data dissemination methods.
4. Design, Simulate and Compare the performance of various routing and MAC protocol

UNIT -I:

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

UNIT –II

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks

UNIT –III

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee

UNIT -IV

Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocol

UNIT -V

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.

TEXT BOOKS:

1. Ad-Hoc Wireless Sensor Networks- C. Siva Ram Murthy,B. S. Manoj, Pearson
2. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE

REFERENCE BOOKS:

1. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.
4. Wireless Communication and Networking – William Stallings, 2003, PHI.

COMMUNICATION BUSES AND INTERFACES

(Professional Elective - II)

M.Tech I Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes:

1. Select a particular serial bus suitable for a particular application.
2. Develop APIs for configuration, reading and writing data onto serial bus.
3. Design and develop peripherals that can be interfaced to desired serial bus.

UNIT - I

Serial Busses - Physical interface, Data and Control signals, features, limitations and applications of RS232, RS485, I2C, SPI

UNIT - II

CAN - Architecture, Data transmission, Layers, Frame formats, applications

UNIT - III

PCIe - Revisions, Configuration space, Hardware protocols, applications

UNIT - IV

USB - Transfer types, enumeration, Descriptor types and contents, Device driver

UNIT - V

Data Streaming Serial Communication Protocol - Serial Front Panel Data Port (SFPDP) using fiber optic and copper cable

TEXT BOOKS:

1. Jan Axelson, "Serial Port Complete - COM Ports, USB Virtual Com Ports, and Ports for Embedded Systems", Lakeview Research, 2nd Edition
2. Jan Axelson, "USB Complete", Penram Publications
3. Mike Jackson, Ravi Budruk, "PCI Express Technology", Mindshare Press
4. Wilfried Voss, "A Comprehensible Guide to Controller Area Network", Copperhill Media Corporation, 2nd Edition, 2005.
5. Serial Front Panel Draft Standard VITA 17.1 –200x
6. Technical references onwww.can-cia.org, http://www.pcisig.com/ www.pcisig.com, http://www.usb.org/www.usb.org

ADVANCED COMPUTER ARCHITECTURE

(Professional Elective – II)

M.Tech I Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, students will be able to:

1. Familiarize the instruction set, memory addressing of Computer
2. Handle the issues in pipelining and parallelism
3. Familiarize the practical issues in inter network

UNIT - I

Fundamentals of Computer Design: Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, measuring and reporting performance, quantitative principles of computer design, Amdahl's law. Instruction set principles and examples- Introduction, classifying instruction set- memory addressing- type and size of operands, operations in the instruction set.

UNIT - II

Pipelines: Introduction, basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe line for RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties.

Memory Hierarchy Design: Introduction, review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.

UNIT - III

Instruction Level Parallelism the Hardware Approach: Instruction-Level parallelism, Dynamic scheduling, Dynamic scheduling using Tomasulo's approach, Branch prediction, high performance instruction delivery- ILP Software Approach- Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time

UNIT - IV

Multi Processors and Thread Level Parallelism: Multi Processors and Thread level Parallelism- Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization.

UNIT - V

Inter Connection and Networks: Introduction, Interconnection network media, Practical issues in interconnecting networks, Examples of inter connection, Cluster, Designing of clusters.

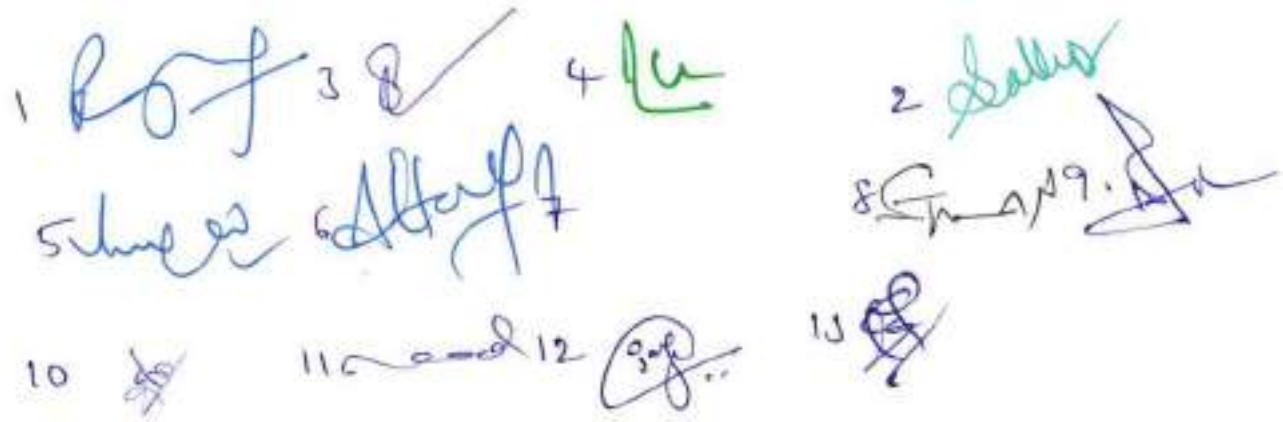
Intel Architecture: Intel IA- 64 ILP in embedded and mobile markets Fallacies and pit falls.

TEXT BOOK:

1. John L. Hennessy, David A. Patterson, "Computer Architecture: A Quantitative Approach", 3rd Edition, Elsevier.

REFERENCE BOOKS:

1. John P. Shen and Miikko H. Lipasti, "Modern Processor Design: Fundamentals of Super Scalar Processors", 2002. Beta Edition, McGraw-Hill
2. Kai Hwang, Faye A.Brigs., "Computer Architecture and Parallel Processing", McGraw Hill.
1. DezsoSima, Terence Fountain, Peter Kacsuk, "Advanced Computer Architecture - A Design Space Approach", Pearson Education.



CMOS ANALOG IC DESIGN

(Professional Elective -II)

M.Tech I Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: After studying the course, each student is expected to be able to

1. Design basic building blocks of CMOS analog ICs.
2. Carry out the design of single and two stage operational amplifiers and voltage references.
3. Determine the device dimensions of each MOSFETs involved.
4. Design various amplifiers like differential, current and operational amplifiers.

UNIT - I

MOS Devices and Modeling

The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small- Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT- II

Analog CMOS Sub-Circuits

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors- Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT – III

CMOS Amplifiers

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT – IV

CMOS Operational Amplifiers

Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT - V

Comparators

Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

TEXT BOOKS:

1. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
2. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.

REFERENCE BOOKS:

1. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013.
2. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
3. CMOS: Circuit Design, Layout and Simulation- Baker, Li and Boyce, PHI.

DIGITAL SYSTEM DESIGN WITH FPGAs LAB
(Lab – I)

M.Tech I Year I Semester

L	T	P	C
0	0	4	2

Part –I:

Programming can be done using any complier and perform simulations.

1. HDL code to realize all the logic gates
2. Design and Simulation of Full Adder, Serial Binary Adder, Multi Precession Adder, Carry Look Ahead Adder.
3. Design of Combinational circuit using Decoders.
4. Design of Combinational circuit using encoder (without and with parity).
5. Design of Combinational circuit using multiplexer.
6. Design of 4 bit binary to gray converter using MUX or Decoders.
7. Design of Multiplexer/ Demultiplexer, comparator in all 3 styles.
8. Modelling of an Edge triggered and Level triggered FFs : D, SR, JK
9. Design of 4-bit binary, BCD counters (synchronous/ asynchronous reset) or any sequence counter
10. Design of a N- bit Register of Serial- in Serial –out, Serial in parallel out, Parallel in Serial out and Parallel in Parallel Out using different FFs.
11. Design of Sequence Detector (Finite State Machine- Mealy and Moore Machines).
12. Design of 4- Bit Multiplier, Divider.
13. Design of ALU to Perform – ADD, SUB, AND-OR, 1's and 2's Compliment,

SYSTEM DESIGN WITH EMBEDDED LINUX LAB
(Lab – II)

M.Tech I Year I Semester

L	T	P	C
0	0	4	2

List of Experiments:

1. **Functional Testing Of Devices:** Flashing the OS on to the device into a stable functional state by porting desktop environment with necessary packages.
2. **Exporting Display On To Other Systems:** Making use of available laptop/desktop displays as a display for the device using SSH client & X11 display server.
3. **GPIO Programming:** Programming of available GPIO pins of the corresponding device using native programming language. Interfacing of I/O devices like LED/Switch etc., and testing the functionality.
4. **Interfacing Chronos eZ430:** Chronos device is a programmable texas instruments watch which can be used for multiple purposes like PPT control, Mouse operations etc., Exploit the features of the device by interfacing with devices.
5. **ON/OFF Control Based On Light Intensity:** Using the light sensors, monitor the surrounding light intensity & automatically turn ON/OFF the high intensity LED's by taking some pre-defined threshold light intensity value.
6. **Battery Voltage Range Indicator:** Monitor the voltage level of the battery and indicating the same using multiple LED's (for ex: for 3V battery and 3 led's, turn on 3 led's for 2-3V, 2 led's for 1-2V, 1 led for 0.1-1V & turn off all for 0V)
7. **Dice Game Simulation:** Instead of using the conventional dice, generate a random value similar to dice value and display the same using a 16X2 LCD. A possible extension could be to provide the user with option of selecting single or double dice game.
8. **Displaying RSS News Feed On Display Interface:** Displaying the RSS news feed headlines on a LCD display connected to device. This can be adapted to other websites like twitter or other information websites. Python can be used to acquire data from the internet.
9. **Porting Openwrt To the Device:** Attempt to use the device while connecting to a wifi network using a USB dongle and at the same time providing a wireless access point to the dongle.
10. **Hosting a website on Board:** Building and hosting a simple website(static/dynamic) on the device and make it accessible online. There is a need to install server (eg: Apache) and thereby host the website.
11. **Webcam Server:** Interfacing the regular usb webcam with the device and turn it into fully functional IP webcam & test the functionality.
12. **FM Transmission:** Transforming the device into a regular fm transmitter capable of transmitting audio at desired frequency (generally 88-108 Mhz)

RESEARCH METHODOLOGY AND IPR

M.Tech I Year I Semester

L	T	P	C
2	0	0	2

Course Outcomes: At the end of this course, students will be able to

1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

UNIT- I:

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem. Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT- II:

Effective literature studies approaches, analysis, Plagiarism, Research ethics.

UNIT- III:

Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT- IV:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT- V:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

REFERENCE BOOKS:

1. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall, "Industrial Design", McGraw Hill, 1992.
4. Niebel, "Product Design", McGraw Hill, 1974.
5. Asimov, "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
7. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

ENGLISH FOR RESEARCH PAPER WRITING

(Audit Course - I)

M.Tech I Year I Semester

L	T	P	C
2	0	0	0

Course Outcomes: At the end of the course, students will be able to:

1. Ability to improve writing skills and level of readability
2. Show conciseness, clarity and avoid redundancy in writing
3. Able to conclude what to write in each section
4. Describe how to develop title, write abstract and introduction
5. Understand the skills needed when writing a Title Ensure the good quality of paper at very First time submission

UNIT-I:

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT-II:

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

UNIT-III:

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT-IV:

key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT-V:

skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

TEXT BOOKS/ REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

DISASTER MANAGEMENT
(Audit Course - I)

M.Tech I Year I Semester

L	T	P	C
2	0	0	0

Course Outcomes: At the end of the course, students will be able to:

1. Ability to know the key concepts in disaster risk reduction and humanitarian response.
2. Enable the students to understand basic concepts and issues related to disaster management.
3. Understand to comprehend about causes, impact, distribution and mapping of disasters in India.
4. Students shall be well-versed with the analysing the response and mitigation of disasters.
5. Understand the strengths and weaknesses of disaster management approaches

UNIT-I:

Introduction:

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Disaster Prone Areas in India:

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT-II:

Repercussions of Disasters and Hazards:

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT-III:

Disaster Preparedness and Management:

Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT-IV:

Risk Assessment Disaster Risk:

Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

UNIT-V:

Disaster Mitigation:

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

TEXT BOOKS/ REFERENCES:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies", Deep &Deep Publication Pvt. Ltd., New Delhi.

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Department of Electronics and Communication Engineering

CONSTITUTION OF INDIA
(Audit Course – I)

M.Tech I Year I Semester

L	T	P	C
2	0	0	0

Course Outcomes: Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

UNIT-I:

History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working),

Philosophy of the Indian Constitution: Preamble, Salient Features.

UNIT-II:

Contours of Constitutional Rights & Duties: Fundamental Rights Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT-III:

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

UNIT-IV:

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT-V:

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for thewelfare of SC/ST/OBC and women.

TEXT BOOKS/ REFERENCES:

1. The Constitution of India, 1950 (Bare Act). Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

ARM MICROCONTROLLERS
(PC -III)

M.Tech I Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: After completing this course the student will be able to:

1. Explore the selection criteria of ARM processors by understanding the functional level trade off issues.
2. Explore the ARM development towards the functional capabilities.
3. Work with ASM level program using the instruction set.
4. Programming the ARM Cortex M.

UNIT –I:
ARM Architecture:
ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families.

UNIT –II:
ARM Programming Model – I:
Instruction Set: Data Processing Instructions, Addressing Modes, Branch, Load, Store instructions, PSR Instructions, Conditional Instructions.

UNIT –III:
ARM Programming Model – II:
Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions

UNIT –IV:
ARM Programming:
Simple C Programs using Function Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution and Loops.

UNIT –V:
Memory Management:
Cache Architecture, Polices, Flushing and Caches, MMU, Page Tables, Translation, Access Permissions, Context Switch.

TEXT BOOKS:

1. ARM Systems Developer's Guides- Designing & Optimizing System Software – Andrew N. Sloss, Dominic Symes, Chris Wright, 2008, Elsevier.

REFERENCE BOOKS:

1. Embedded Microcomputer Systems, Real Time Interfacing – Jonathan W. Valvano – Brookes / Cole, 1999, Thomas Learning.

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EMBEDDED SYSTEM AND IOT
(PC-IV)

I M.Tech. II Semester

UNIT I

INTRODUCTION TO EMBEDDED SYSTEM AND IOT
Architecture pf Embedded system-Embedded system Development process-Architecture of IOT-Application of Embedded system & IOT-Design methodology for IOT product.

UNIT II
EMBEDDED C PROGRAMMING
Memory And I/O Devices Interfacing – Programming Embedded Systems in C – Need For RTOS –Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies.

UNIT III
IOT AND ARDUINO PROGRAMMING
Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino– Arduino Toolchain – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators withArduino.

UNIT IV
IOT COMMUNICATION AND OPEN PLATFORMS
IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee– GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming –Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins –Connecting to the Cloud.

UNIT V
APPLICATIONS DEVELOPMENT Complete Design of Embedded Systems – Development of IoT Applications – Home automation –Smart Agriculture – Smart Cities – Smart Healthcare.

TEXT BOOKS

1. Muhammed Ali Mazidi, Janice GillispieMazidi, Rolin D. McKinlay, "The 8051Microcontroller and Embedded Systems", Pearson Education, Second Edition, 2014
2. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoTFundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017

REFERENCE BOOKS

1. Wayne Wolf, "Computers as Components: Principles of Embedded Computer SystemDesign", Elsevier, 2006.
2. K.V.K.K Prasad, "Embedded Real time System: Concept, Design and Programming", 1st Edition Dreamtech Publication,2014.
3. Michael J. Pont, "Embedded C", Pearson Education, 2007.
4. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015

IOT ARCHITECTURES AND SYSTEM DESIGN
(Professional Elective– III)

M.Tech I Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: Students will be able to:

1. Integrate the sensors and actuator depending on the applications
2. Interface the IoT and M2M with value chains
3. Write Python programming for Arduino, Raspberry Pi devices
4. Design IoT based systems such as Agricultural IoT, Vehicular IoT etc.,

UNIT - I

IoT introduction: Introduction and definition of IoT, Evolution of IoT, IoT growth, Application areas of IoT, Characteristics of IoT, IoT stack, Enabling technologies, IoT levels, IoT sensing and actuation, Sensing types, Actuator types.

UNIT - II

IoT and M2M: M2M to IoT — A Basic Perspective– Introduction, Differences and similarities between M2M and IoT, SDN and NFV for IoT.M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.

UNIT - III

IoT Hands-on: Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino. Introduction to Python programming. Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi.

UNIT - IV

IoT Architecture: IoT Architecture components, Comparing IoT architectures, A simplified IoT architecture, The core IoT functional stack, IoT data management and compute stack

UNIT - V

IoT System design: Challenges associated with IoT, Emerging pillors of IoT, Agricultural IoT, Vehicular IoT, Healthcare IoT, Smart cities, Transportation and logistics.

TEXT BOOKS:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy "Introduction to IOT", Cambridge University Press.
2. David Hanes, Gonzalo salgueiro, Patrick Grossetete, Rob barton, Jerome henry "IoT Fundamentals Networking technologies, protocols, and use cases for IoT", Cisco Press

REFERENCE BOOKS:

1. Cuno pfister, "Getting started with the internet of things", O Reilly Media, 2011
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to ConnectingEverything", 1 st Edition, Apress Publications.
3. "Internet of Things concepts and applications", Wiley
4. Arshdeep Bahga, Vijay Madisetti "Internet of Things A Hands on approach", Universities Press.

DESIGN FOR TESTABILITY
(Professional Elective – III)

M.Tech I Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: Students will be able to

1. Acquire verification knowledge and test evaluation
2. Design for testability rules and techniques.
3. Utilize the scan architectures for different digital circuits.
4. Acquire the knowledge of design of built-in-self test.

UNIT - I

Introduction to Testing: Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends affecting Testing, Types of Testing, Fault Modeling: Defects, Errors and Faults, Functional Versus Structural Testing, Levels of Fault Models, Single Stuck-at Fault.

UNIT - II

Logic and Fault Simulation: Simulation for Design Verification and Test Evaluation, Modeling Circuits for Simulation, Algorithms for True-value Simulation, Algorithms for Fault Simulation, ATPG.

UNIT - III

Testability Measures: SCOAP Controllability and Observability, High Level Testability Measures, Digital DFT and Scan Design: Ad-Hoc DFT Methods, Scan Design, Partial-Scan Design, Variations of Scan.

UNIT - IV

Built-In Self-Test: The Economic Case for BIST, Random Logic BIST: Definitions, BIST Process, Pattern Generation, Response Compaction, Built-In Logic Block Observers, Test-Per-Clock, Test-Per- Scan BIST Systems, Circular Self Test Path System, Memory BIST, Delay Fault BIST.

UNIT - V

Boundary Scan Standard: Motivation, System Configuration with Boundary Scan: TAP Controller and Port, Boundary Scan Test Instructions, Pin Constraints of the Standard, Boundary Scan Description Language: BDSL Description Components, Pin Descriptions.

TEXT BOOKS:

1. M.L. Bushnell, V. D. Agrawal, "Essential of Electronic Testing for Digital, Memory and MixedSignal VLSI Circuits", Kluwer Academic Publishers.

REFERENCE BOOKS:

1. M. Abramovici, M. A. Breuer and A.D Friedman, Digital Systems and Testable Design", JaicoPublishing House.
2. P. K. Lala, "Digital Circuits Testing and Testability", Academic Press.

SOC DESIGN

(Professional Elective – III)

M.Tech I Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, students will be able to:

1. Identify and formulate a given problem in the framework of SoC based design approaches
2. Design SoC based system for engineering applications
3. Realize impact of SoC on electronic design philosophy and Macro-electronics thereby inclinetowards entrepreneurship & skill development.

UNIT - I

ASIC: Overview of ASIC types, design strategies, CISC, RISC and NISC approaches for SOC architectural issues and its impact on SoC design methodologies, Application Specific Instruction Processor (ASIP)concepts.

UNIT - II

NISC: NISC Control Words methodology, NISC Applications and Advantages, Architecture Description Languages (ADL) for design and verification of Application Specific Instruction- set Processors (ASIP), No-Instruction-Set-computer (NISC)-design flow, modeling NISC architectures and systems, use of Generic Netlist Representation - A formal language for specification, compilation and synthesis of embedded processors.

UNIT - III

Simulation: Different simulation modes, behavioural, functional, static timing, gate level, switch level, transistor/circuit simulation, design of verification vectors, Low power FPGA, Reconfigurable systems, SoC related modeling of data path design and control logic, Minimization of interconnects impact, clock tree design issues.

UNIT - IV

Low power SoC design / Digital system Design synergy, Low power system perspective- power gating, clock gating, adaptive voltage scaling (AVS), Static voltage scaling, Dynamic clock frequency and voltage scaling (DCFS), building block optimization, building block memory, power down techniques, power consumption verification.

UNIT - V

Synthesis: Role and Concept of graph theory and its relevance to synthesizable constructs, Walks, trails paths, connectivity, components, mapping/visualization, nodal and admittance graph. Technology independent and technology dependent approaches for synthesis, optimization constraints, Synthesis report, analysis Single core and Multi core systems, dark silicon issues, HDL coding techniques for minimization of power consumption, Fault tolerant designs.

TEXT BOOKS:

1. Hubert Kaeslin, "Digital Integrated Circuit Design: From VLSI Architectures to CMOS Fabrication", Cambridge University Press, 2008.
2. B. Al Hashimi, "System on chip-Next generation electronics", The IET, 2006

REFERENCE BOOKS

1. Rochit Rajsuman, "System-on- a-chip: Design and test", Advantest America R & D Center, 2000.
2. P Mishra and N Dutt, "Processor Description Languages", Morgan Kaufmann, 2008.
3. Michael J. Flynn and Wayne Luk, "Computer System Design: System-on-Chip", Wiley, 2011.

HARDWARE AND SOFTWARE CO-DESIGN
(Professional Elective – IV)

M.Tech I Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: Students will be able to:

1. Acquire the knowledge on various models of Co-design.
2. Explore the interrelationship between Hardware and software in a embedded system
3. Acquire the knowledge of firmware development process and tools during Co-design.
4. Implement validation methods and adaptability.

UNIT - I

Co-Design Issues: Co- Design Models, Architectures, Languages, A Generic Co-design Methodology. **Co-Synthesis Algorithms:** Hardware software synthesis algorithms: hardware – software partitioningdistributed system co-synthesis.

UNIT - II

Prototyping and Emulation: Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure.

Target Architectures: Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051- Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

UNIT - III

Compilation Techniques and Tools for Embedded Processor Architectures: Modern embedded architectures, embedded software development needs, compilation technologies, practical consideration in a compiler development environment.

UNIT - IV

Design Specification and Verification: Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, and interface verification.

UNIT - V

Languages for System – Level Specification and Design-I: System – level specification, design representation for system level synthesis, system level specification languages.

Languages for System – Level Specification and Design-II: Heterogeneous Specifications and multi- language co-simulation, the cosyma system and lycos system.

TEXT BOOKS

1. Hardware / Software Co- Design Principles and Practice – Jorgen Staunstrup, Wayne Wolf –Springer, 2009.

REFERENCE BOOKS

1. Hardware / Software Co- Design - Giovanni De Micheli, Mariagiovanna Sami, Kluwer Academic Publishers, 2002.
2. A Practical Introduction to Hardware/Software Co-design -Patrick R. Schaumont, Springer, 2010

SECURE NETWORKS
(Professional Elective -IV)

M.Tech 1 Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, students will be able to:

1. Identify and utilize different forms of cryptography techniques.
2. Incorporate authentication and security in the network applications.
3. Distinguish among different types of threats to the system and handle the same.

UNIT -I:

Security: Need, security services, Attacks, OSI Security Architecture, one time passwords, Model for Network security, Classical Encryption Techniques like substitution ciphers, Transposition ciphers, Cryptanalysis of Classical Encryption Techniques.

UNIT -II

Number Theory: Introduction, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Euclidean Algorithm, Extended Euclidean Algorithm, and Modular Arithmetic.

UNIT -III

Private-Key (Symmetric) Cryptography: Block Ciphers, Stream Ciphers, RC4 Stream cipher, Data Encryption Standard (DES), Advanced Encryption Standard (AES), Triple DES, RC5, IDEA, Linear and Differential Cryptanalysis.

UNIT -IV

Public-Key (Asymmetric) Cryptography: RSA, Key Distribution and Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Message Authentication Code, hash functions, message digest algorithms: MD4 MD5, Secure Hash algorithm, RIPEMD-160, HMAC.

UNIT -V

Authentication and System Security: IP and Web Security Digital Signatures, Digital Signature Standards, Authentication Protocols, Kerberos, IP security Architecture, Encapsulating Security Payload, Key Management, Web Security Considerations, Secure Socket Layer, Secure Electronic Transaction Intruders, Intrusion Detection, Password Management, Worms, viruses, Trojans, Virus Countermeasures, Firewalls, Trusted Systems.

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security, Principles and Practices", Pearson Education, 3rd Edition.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security, PrivateCommunication in a Public World", Prentice Hall, 2nd Edition

REFERENCE BOOKS:

1. Christopher M. King, Ertem Osmanoglu, Curtis Dalton, "Security Architecture, Design Deployment and Operations", RSA Press,
2. Stephen Northcutt, Leny Zeltser, Scott Winters, Karen Kent, and Ronald W. Ritchey, "Inside Network Perimeter Security", Pearson Education, 2nd Edition
3. Richard Bejtlich, "The Practice of Network Security Monitoring: Understanding Incident Detection and Response", William Pollock Publisher, 2013.

PHYSICAL DESIGN AUTOMATION
(Professional Elective -IV)

M.Tech I Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, students will be able to:

1. Implement automation process for VLSI System design.
2. Familiarize to use various physical design CAD tools.
3. Develop and enhance the existing algorithms and computational techniques for physical design process of VLSI systems.

UNIT - I

Introduction to VLSI Physical Design Automation: Design Representation, VLSI Design Styles, and VLSI Physical Design automation.

UNIT - II

Partitioning, Floor planning, Pin Assignment, Standard cell, Performance issues in circuit layout, delay models, Layout styles.

UNIT - III

Placement: Problem formulation, classification, Simulation based placement algorithms, Partitioning based placement algorithms, Time driven and performance driven placement.

UNIT - IV

Global routing: Problem formulation, classification of global routing, Maze routing algorithms, Line- Probe algorithms, and shortest path based algorithms, Steiner Tree based algorithms, Integer programming based approach, Performance driven routing.
Detailed Routing: Problem formulation, classification, Single layer, two layer, three layer and Multi-Layer channel routing, Algorithms, Switch box routing.

UNIT - V

Over the Cell Routing - Single layer and two-layer routing: Over the cell routing, Two Layer, Three Layer and Multi-Layer OTC Routing.
Via Minimization: Constraint and Unconstrained via minimization.
Clock and Power Routing: Clocking schemes, design considerations for the clock. Problem formulation, Clock routing algorithms, Skew and Delay reduction by Pin Assignment, Multiple clock routing, Power and Ground Routing

TEXT BOOKS:

1. Algorithms for VLSI Physical Design Automation – Naveed Sherwani, 3rd Ed., 2005.
2. Algorithms for VLSI Design Automation, S.H.Gerez, 1999, WILEY Student Edition, John wiley&Sons (Asia) Pvt. Ltd.

REFERENCE BOOKS:

1. Computer Aided Logical Design with Emphasis on VLSI – Hill & Peterson, 1993, Wiley.
2. Modern VLSI Design: Systems on silicon – Wayne Wolf, 2nd ed., 1998, Pearson Education Asia

ARM MICROCONTROLLERS LAB
(Lab – III)

M.Tech I Year II Semester

L	T	P	C
0	0	4	2

Course Outcomes: At the end of the laboratory work, students will be able to:

1. Install, configure and utilize tool sets for developing applications based on ARM processorcore SoC.
2. Develop prototype codes using commonly available on and off chip peripherals on the Cortex M3 development boards.

List of Assignments:

Experiments to be carried out on Cortex-M3 development boards and using GNU tool-chain

1. Blink an LED with software delay, delay generated using the SysTicktimer.
2. System clock real time alteration using the PLL modules.
3. Control intensity of an LED using PWM implemented in software and hardware.
4. Control an LED using switch by polling method, by interrupt method and flash the LED once every five switch presses.
5. UART Echo Test.
6. Take analog readings on rotation of rotary potentiometer connected to an ADC channel.
7. Temperature indication on an RGB LED.
8. Mimic light intensity sensed by the light sensor by varying the blinking rate of an LED.
9. Evaluate the various sleep modes by putting core in sleep and deep sleep modes.
10. System reset using watchdog timer in case something goes wrong.
11. Sample sound using a microphone and display sound levels on LEDs.

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R23

I M.Tech. II Semester

EMBEDDED AND IOT SENSOR LAB
(Lab – IV)

Perform the following experiments in real time by interfacing with the related hardware.

List of Experiments:

1. Design a setup to Blink LED using Arduino uno.
2. Switch interface with Arduino uno.
3. Object Distance measurement using Arduino uno.
4. Temperature monitoring using Arduino uno.
5. Study and Configure Raspberry Pi.
6. Obstacle Detection using IR sensor with Raspberry Pi.
7. Interface between Beagle board with a Zigbee module.
8. Interfacing stepper motor and Raspberry Pi.
9. Measurement of Heartbeat and temperature using Raspberry Pi
10. Weather monitoring using suitable sensors and Raspberry Pi
11. Street light control system using Raspberry Pi

VALUE EDUCATION
(Audit Course - II)

M.Tech I Year II Semester

L	T	P	C
2	0	0	0

Course outcomes: Students will be able to

1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

UNIT-I:

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision ofhumanism.Moralandnon-moralvaluation.Standardsandprinciples.Valuejudgements

UNIT-II:

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

UNIT-III:

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness.

UNIT-IV:

Avoid fault Thinking. Free from anger, Dignity of labour.Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature

UNIT-V:

Character and Competence–Holy books vs. Blind faith. Self-management and Good health. Science of reincarnation, Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind,Self-control.Honesty,Studying effectively

TEXT BOOKS/REFERENCES:

1. Chakroborty,S.K."ValuesandEthicsfororganizationsTheoryandpractice",OxfordUnive rsityPress,NewDelhi

PEDAGOGY STUDIES
(Audit Course - II)

M.Tech I Year II Semester

L	T	P	C
2	0	0	0

Course Outcomes: Students will be able to understand:

1. What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
2. What is the evidence on the effectiveness of the sepedagogical practices in what conditions and with what population of learners?
3. How can teacher education (curriculum and practicum) and The school curriculum and guidance materials best support effective pedagogy?

UNIT-I:

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

UNIT-II:

Thematic overview: Pedagogical practices are being used by teachers informal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT-III:

Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the schocurriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT-IV:

Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT-V:

Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

TEXT BOOKS/REFERENCES:

1. AckersJ,HardmanF(2001)Classroom interaction in Kenyan primary schools,Compare,31(2):245-261.
2. AgrawalM(2004)Curricularreforminschools:Theimportanceofevaluation,JournalofCurriculum Studies,36 (3):361-379.
3. Akyeam pong K(2003)Teacher training in Ghana -does it count? Multi-site teacher education research project(MUSTER)countryreport1.London:DFID.

STRESS MANAGEMENT BY YOGA
(Audit Course - II)

M.Tech I Year II Semester

L	T	P	C
2	0	0	0

Course Outcomes: Students will be able to:
1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

UNIT-I:
Definitions of Eight parts of yog. (Ashtanga)

UNIT-II:
Yam and Niyam.

UNIT-III:
Do's and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT-IV:
Asan and Pranayam

UNIT-V:
i) Various yog poses and their benefits for mind & body
ii) Regularization of breathing techniques and its effects-Types of pranayam

TEXT BOOKS/ REFERENCES:
1. 'Yogic Asanas for Group Tarining-Part-I": Janardan Swami Yogabhyasi Mandal, Nagpur
2. 2."Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

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II YEAR I – SEMESTER

Course Code	Course Title	L	T	P	Credits
Professional Elective – V	1. Embedded Networks 2. CMOS Mixed Signal Design 3. Human -Machine Interface	3	0	0	3
Open Elective	1. Logistics & Supply chain management 2. Maintenance and Safety Engineering 3. Operations Research 4. Business Analytics 5. Composite Materials	3	0	0	3
Dissertation	Dissertation Work Review – II	0	0	12	6
	Total	**6**	**0**	**12**	**12**

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EMBEDDED NETWORKS
(Professional Elective -V)

M.Tech II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: Student will be able to

1. Acquire knowledge on communication protocols of connecting Embedded Systems.
2. Master the design level parameters of USB and CAN bus protocols.
3. Design Ethernet in Embedded networks considering different issues.
4. Acquire the knowledge of wireless protocols in Embedded domain.

UNIT –I

Embedded Communication Protocols: Embedded Networking: Introduction – Serial/Parallel Communication – Serial communication protocols -RS232 standard – RS485 – Synchronous Serial Protocols -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – PC Parallel port programming - ISA/PCI Bus protocols – Firewire.

UNIT –II

USB and CAN Bus: USB bus – Introduction – Speed Identification on the bus – USB States – USB bus communication Packets –Data flow types –Enumeration –Descriptors – PIC 18 Microcontroller USB Interface – C Programs –CAN Bus – Introduction - Frames –Bit stuffing –Types of errors –Nominal Bit Timing – PIC microcontroller CAN Interface –A simple application with CAN.

UNIT –III

Ethernet Basics: Elements of a network – Inside Ethernet – Building a Network: Hardware options – Cables, Connections and network speed – Design choices: Selecting components –Ethernet Controllers –Using the internet in local and internet communications – Inside the Internet protocol.

UNIT –IV

Embedded Ethernet: Exchanging messages using UDP and TCP – Serving web pages with Dynamic Data – Serving web pages that respond to user Input – Email for Embedded Systems – Using FTP – Keeping Devices and Network secure

UNIT –V

Wireless Embedded Networking: Wireless sensor networks – Introduction – Applications – Network Topology – Localization –Time Synchronization - Energy efficient MAC protocols –SMAC – Energy efficient and robust routing – Data Centric routing.

TEXT BOOKS

1. Embedded Systems Design: A Unified Hardware/Software Introduction - Frank Vahid, Tony Givargis, John & Wiley Publications, 2002
2. Parallel Port Complete: Programming, interfacing and using the PCs parallel printer port - Jan Axelson, Penram Publications, 1996.

REFERENCE BOOKS

1. Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F series -Dogan Ibrahim, Elsevier 2008.
2. Embedded Ethernet and Internet Complete - Jan Axelson, Penram publications, 2003.
3. Networking Wireless Sensors - Bhaskar Krishnamachari, Cambridge press 2005.

CMOS MIXED SIGNAL DESIGN

(Professional Elective -V)

M.Tech II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the completion of this course, each student will have demonstrated proficiency in:

1. Designing CMOS analog circuits to achieve performance specifications.
2. Analyzing CMOS based switched capacitor circuits.
3. Designing data converters and know how to use these in specific applications
4. Design mixed-signal circuits with understanding design flow.

UNIT - I

Switched Capacitor Circuits

Introduction to Switched Capacitor circuits- basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, biquad filters.

UNIT - II

Phased Lock Loop (PLL)

Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs-PFD/CP non-idealities, Jitter in PLLs, Delay locked loops, applications.

UNIT - III

Data Converter Fundamentals

DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters-Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters.

UNIT - IV

Nyquist Rate A/D Converters

Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters

UNIT - V

Oversampling Converters

Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multibit quantizers, Delta sigma D/A.

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
3. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013.

REFERENCE BOOKS:

1. CMOS Integrated Analog-to- Digital and Digital-to-Analog converters-Rudy Van De Plassche, Kluwer Academic Publishers, 2003
2. Understanding Delta-Sigma Data converters-Richard Schreier, Wiley Interscience, 2005.
3. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.

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HUMAN MACHINE INTERFACE

(Professional Elective -V)

M.Tech II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: Upon completion of the course, the students will be able to:

1. Design effective dialog for HCI
2. Design effective HCI for individuals and persons with disabilities
3. Assess the importance of user feedback.
4. Explain the HCI implications for design
5. ning multimedia/ e-learning Web sites
6. Develop meaningful user interface.

UNIT - I

Basics of User Interface

Importance of user interface- Definition, importance of good design, benefits of good design, brief history of human-computer interface, Graphical User Interface, Popularity of Graphics, Concept of Direct Manipulation, Graphical Systems, Characteristics of GUI, Web user interface popularity, Characteristics and Principles of user interface

UNIT – II

Foundations of Human Computer Interface

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

UNIT – III

Design Process

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice

– design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

UNIT – IV

Models and Theories

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements, Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT - V

Windows and Interaction Devices

Window characteristics, Components of window, Window Presentation Style, Types of windows, Organizing window functions, Characteristics of input devices, Selection of proper input devices, Output devices

TEXT BOOKS:

1. Wilbert O. Galitz - The essential Guide to User Interface Design. 3rd Ed. Wiley, 2007 (Unit I & V)
2. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, —Human Computer Interaction", 3rd Ed., Pearson Education, 2004 (UNIT II, III & IV)

REFERENCE BOOKS:

1. Daniel Newman, Olivier Blanchard – Human/Machine: The Future of our partnership with machine.
2. Paul R. Daugherty, H. James Wilson – Human+Machine: Reimagining work in the Age of AI Hardcover, Kindle Ed.,

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LOGISTICS & SUPPLY CHAIN MANAGEMENT
(Open Elective)

M.Tech II Year I Semester

L	T	P	C
3	0	0	3

Course Outcome: Students will be able to understand

1. Growing importance of Supply Chain Management
2. SCM Costs and Performance
3. Benchmarking in SCM
4. Sourcing and transportation
5. Global aspects in SCM

UNIT – I:

Logistics and Competitive strategy: Competitive advantage – Gaining Competitive advantage through logistics-Integrated supply chains– Competitive performance - Models in Logistics Management - Logistics to Supply Chain Management – Focus areas in Supply Chain Management- Customer service and retention- Basic service capability Value added services

UNIT – II:

Measuring logistics costs and Performance: The concept of Total Cost analysis – Principles of logistics costing – Logistics and the bottom-line – Impact of Logistics on shareholder value - customer profitability analysis – direct product profitability – cost drivers and activity-based costing.

UNIT – III:

Logistics and Supply chain relationships: Benchmarking the logistics process and SCM operations

–Mapping the supply chain processes – Supplier and distributor benchmarking –setting benchmarking priorities – identifying logistics performance indicators –Channel structure – Economics of distribution

–channel relationships –logistics service alliances.

UNIT – IV:

Sourcing, Transporting and Pricing Products: Sourcing decisions and transportation in supply chain – infrastructure suppliers of transport services – transportation economics and pricing – documentation - pricing and revenue management Lack of coordination and Bullwhip Effect - Impact of lack of coordination. - CRM –Internal supply chain management.

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UNIT – V:

Managing global Logistics and global Supply Chains: Logistics in a global economy – views of global logistics- global operating levels – interlinked global economy – The global supply chains - Global supply chain business processes –Global strategy –Global purchasing – Global logistics – Channels in Global logistics –Global alliances –Issues and Challenges in Global supply chain Management

TEXT BOOKS:

1. Donald J. Bowersox and David J. Closs: "Logistical Management" The Integrated Supply Chain Process, TMH, 2011.
2. Edward J Bradi, John J Coyle: "A Logistics Approach to Supply Chain Management, Cengage Learning, New Delhi, 2012.
3. Sunil Chopra and Peter Meindl: "Supply chain Management: Strategy, Planning and Operation", Pearson Education, New Delhi 2013
4. Rahul V Altekar: Supply Chain Management, PHI Learning Ltd, New Delhi, 2009
5. Logistics & Supply chain Management , Himalaya Publishers , K. Sridhara Bhat.

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MAINTENANCE AND SAFETY ENGINEERING
(Open Elective)

M.Tech II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes

1. Understanding the need for maintenance of industries for overall productivity improvement.
2. Classifying the maintenance methods in terms of time and condition of equipment.
3. Applying the concepts of quality, reliability and inventory for effective maintenance and safety.
4. Evaluate the maintenance policies to reduce the total cost.

UNIT – I

Introduction: Need for Maintenance, Facts and Figures, Modern Maintenance, Problem and Maintenance strategy for the 21st Century Engineering Maintenance Objectives and Maintenance in Equipment Life cycle. Terms and Definitions.

Maintenance Management and Control: Maintenance Manual Maintenance, Facility Evaluation Functions of Effective Maintenance Management, Maintenance Project Control Methods, Maintenance Management Control indices.

UNIT – II

Types of Maintenance: Preventive Maintenance, Elements of Preventive, Maintenance Program, Establishing Preventive Maintenance Program, PM Program Evaluation and improvement, PM Measures, PM Models, Corrective Maintenance, Corrective Maintenance Types, Corrective Maintenance Steps and Downtime Components, Corrective Maintenance Measures, Corrective Maintenance Models.

UNIT – III

Inventory Control in Maintenance: Inventory Control Objectives and Basic inventory Decisions, ABC inventory Control Models Two Bin inventory Control and Safety Stock, spares Determination Factors spares calculation methods.

UNIT – IV

Quality and Safety in Maintenance: Needs for Quality Maintenance Processes, Maintenance Work Quality, Use of Quality Control Charts in Maintenance Work Sampling, Post Maintenance Testing, Reasons for Safety Problems in Maintenance, Guidelines to improve Safety in Maintenance Work, Safety Officer's Role in Maintenance Work, Protection of Maintenance Workers.

Maintenance Costing: Reasons for Maintenance Costing, Maintenance Budget Preparation Methods and steps, Maintenance Labor Cost Estimation, Material Cost Estimation, Equipment Life Cycle Maintenance Cost Estimation, Maintenance Cost Estimation Models.

UNIT – V

Reliability, Reliability Centered Maintenance, RCM: Goals and Principles, RCM Process and Associated Questions, RCM Program Components Effectiveness Measurement indicators, RCM Benefits and Reasons for its Failures, Reliability Versus Maintenance and Reliability Measures and Formulas, Reliability Networks, Reliability Analysis Techniques.

Maintainability: Maintainability importance and Objective, Maintainability in Systems Life Cycle, Maintainability Design Characteristics, Maintainability Functions and Measures, Common Maintainability Design Errors.

TEXT BOOKS:

1. Reliability, Maintenance and Safety Engineering, Dr. A.K Guptha, Laxmi Publications.
2. Industrial Safety Management, L.M.Deshmukh, TMH

REFERENCES:

1. Maintenance Engineering & Management, R.C.Mishra, PHI
2. Reliability Engineering, Elsayed, Pearson
3. Engineering Maintenance a modern approach, B. S. Dhallon, C.R.R Publishers.
4. Industrial Safety Engineering, Garg, Danpathrai Publishers

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OPERATIONS RESEARCH
(Open Elective)

M.Tech II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes:

1. Model the real life situations with mathematical models. Understand the concept of linear programming.
2. Solve transportation and assignment problems.
3. Understand the various waiting lines and replacement concepts.
4. Identify and apply game theory and inventory models.
5. Apply Sequencing shop floor problems and network scheduling models.

UNIT – I

Development Definition, historic developments of operation research, Characteristics and Phases Types of models Operations Research models applications.

Allocation: Linear Programming Problem Formulation Graphical solution Simplex method Artificial variables techniques: Two phase method, Big-M method; Duality Principle.

UNIT – II

Transportation Problem: Formulation Optimal solution, unbalanced transportation problem Degeneracy.

Assignment Problem: Formulation Optimal solution Variants of Assignment Problem; Traveling Salesman problem.

UNIT – III

Replacement: Introduction Replacement of items that deteriorate with time when money value is not counted and counted Replacement of items that fail completely- Group Replacement.

Waiting Lines: Introduction Terminology-Single Channel Poisson arrivals and Exponential Service times with infinite population and finite population models.

UNIT – IV

Theory of Games: Introduction Terminology Solution of games with saddle points and without saddle points- 2 x 2 games m x 2 & 2 x n games graphical method m x n games dominance principle.

Inventory: Introduction Single item, Deterministic models Types Purchase inventory models with one price break and multiple price breaks stochastic models demand discrete variable or continuous variable Single Period model with no setup cost.

UNIT – V

Sequencing: Introduction Flow Shop sequencing n jobs through two machines n jobs through three machines two jobs through 'm' machines

Network Scheduling: Critical path method, Programme evaluation and review technique, crashing of networks, resource leveling.

Text Book:

1. Operations Research, S.D.Sharma, Kedarnath

Reference Books:

1. Operations Research, A.M. Natarajan, P. Balasubramaniam, A. Tamilarasi, Pearson.
2. Operations Research, Wagner, PHI Publications
3. Operations Research: Methods and Problems, Maurice Saseini, ArhurYaspan and Lawrence Friedman, Literary Licensing Publishers
4. Operations Research, ACS Kumar, Yesdee Publications

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BUSINESS ANALYTICS

(Open Elective)

M.Tech II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: Upon completion of the course, the students will be able to:

1. Students will demonstrate knowledge of data analytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision- making.
4. Students will demonstrate the ability to translate data into clear, actionable insights

UNIT -I

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT - II

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

UNIT – III

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes, Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization

UNIT – IV

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

UNIT – V

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

UNIT – VI

Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

TEXT BOOKS:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.

2. Business Analytics by James Evans, persons Education.

COMPOSITE MATERIALS
(Open Elective)

M.Tech II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: Upon completion of the course, the students will be able to:

1. At the end of the course, the student will be able to
2. Explain the advantages and applications of composite materials.
3. Describe the properties of various reinforcements of composite materials.
4. Summarize the manufacture of metal matrix, ceramic matrix and C-C composites.
5. Describe the manufacture of polymer matrix composites.
6. Formulate the failure theories of composite materials.

UNIT–I

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–IV

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.
3. Hand Book of Composite Materials-ed-Lubin.
4. Composite Materials – K.K.Chawla.
5. Composite Materials Science and Applications – Deborah D.L. Chung.
6. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

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II YEAR II – SEMESTER

Course Code	Course Title	L	T	P	Credits
Dissertation	Dissertation Work Review – III	0	0	12	06
Dissertation	Dissertation VIVA-VOCE	0	0	28	14
	Total	**0**	**0**	**40**	**20**

1. 4 2
5 6 8 9
10 11 12 13