JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	L	T/P/D	C
	4	-/-/-	4

(A71114) MEDICAL IMAGE PROCESSING

The Course Objective is to make the learner understand

- the fundamental concepts of a digital image processing system
- Image Enhancement, Restoration, Compression
- Processing of Medical Images

UNIT-I

Digital Image fundamentals: Digital Image Processing System, Applications, Digitization of an image – Spatial and Intensity Quantization, Quality of an Image – Spatial resolution, Brightness Representation, Noise Content, Color Images

Image transforms: Unitary, 1D-DFT, 2D-DFT, Discrete Cosine Transform (DCT) and Discrete Sine Transform (DST)

UNIT II

Image Enhancement: Spatial domain, frequency domain methods, Histogram equalization, Mask Processing: Image Smoothing, Image sharpening (filters).

Image Segmentation – Masks – Point detection – Line Detection – Edge Detection.

UNIT III

Image Restoration – Model of the image Degradation Process, Restoration in the presence of noise only spatial filtering, periodic Noise reduction by Frequency Domain Filtering, Inverse Filtering, Minimum Mean Square Error(Weiner) Filtering, Least Squares Filtering.

UNIT – IV

Image Compression – Fundamentals, Image compression Models, Error-free Compression, Lossy Compression, Image Compression Standards.

UNIT – V

Processing of Medical Images – Processing and Feature Extraction of CT, MRI, Ultrasound and PET Images.

TEXT BOOKS:

1. Geoff Dougherty, Digital Image Processing for medical Applications. Cambridge University Press, 2007.
2. Kayvan Najarian and Robert Splinter, Biomedical Signal and Image Processing, CRC Press, Taylor and Francis, 2006.
3. Digital Image Processing – by R.C. Gonzalez & R.E. Woods, A dison

Wesley.

REFERENCE

1. Pattern Recognition Principles – J.T.TOU.R.C. Gonzalez, Addison Wesley.
2. Fundamentals of Digital Image Processing – by A.K. Jain, PHI Pearson Education

Course Outcomes

At the end of the course students who shall be able to:

- Explain the fundamental concepts of a digital image processing system.
- Analyze images in spatial and frequency domain.
- Design and implement algorithms for digital image processing with the Signal and Image Processing Toolboxes.
- Apply image processing to Medical Images.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	L	T/P/D	C
	4	-/-/-	4

(A71115) REHABILITATION ENGINEERING

Course Objective is to understand

- the key concepts in sensory and motor rehabilitation and the augmentation and substitution devices
- the prosthetic and orthotic devices used in rehabilitation
- computer interface for visual perception and improved mobility

UNIT-I

Engineering concepts in Rehabilitation Engineering. Anthropometry: Methods for Static and dynamic Measurements, Area Measurements, Measurement of characteristics and movement, Measurement of Muscular Strength and Capabilities. Measurement tools and processes in Rehabilitation engineering: fundamental principles, structure, function; performance and behaviour. Subjective and objective measurement methods.

UNIT-II

Orthopedic Prosthetics and Orthotics in rehabilitation: Engineering Principles.

Prosthesis - Amputation Types and Prescribed Prostheses, Components of Upper Limb Prosthesis – Sockets and Liners, Suspension, Control Systems (Myoelectric), Shoulder, Elbow and Wrist Components, Terminal Devices. Components of Lower Limb Prosthesis – Sockets and Liners, Suspension, Hip, Pelvic, Knee and Ankle Components,

Orthotics – Biomechanical Principles, Spinal, Upper Extremity and Lower Extremity

FES Systems - Restoration of hand function, restoration of standing and walking.

UNIT-III

Engineering concepts in sensory rehabilitation Engineering. Sensory augmentation and substitution.

Assistive Technology for visually Impaired – General Purpose, Task Specific (Mobility, Reading, Writing, Computer Access, Communication)

Assistive Technology for Hearing Impaired – Hearing Assistance Solutions – Medical and Surgical Approach to restore function - Hearing aids, cochlear implantation, Assistive Listening Solutions, visual and tactual Substitution.

UNIT-IV

Alternative and Augmentative Communication (AAC) – user interface, Language Representation, Technology and Devices Features. Human

Factors, Performance Measurement.

Wheelchairs – Manual, Electric Power, Power Assisted, Multi Functional, Standards, Wheelchais Transportation System, Securement Systems.

UNIT-V

Rehabilitation Robotics – Intelligent Mobility Aids, Robotic Manipulation Aids, Therapeutic Robots

Environmental Control Systems.

Brain computer interface

TEXTBOOKS:

1. Rory A. Cooper, Hisaichi Ohnabe, Douglas A. Hobson – An introduction to Rehabilitation Engineering – CRC Press, Taylor and Francis Group, 2007.
2. Bronzino, Joseph; Handbook of biomedical engineering. 2nd edition CRC Press, 2000.

REFERENCE:

1. Horia-Nocholai Teodorecu, L.C. Jain , intelligent systems and technologies in rehabilitation engineering; CRC; December 2000.
2. Robinson C.J Rehabilitation engineering. CRC press 1995

Course Outcome:

At the end of this course, the learner will be able to answer the key questions faced by the rehabilitation engineers like.

- How can a diminished function or sense be successfully augmented?
- Is there a substitute way to return the function or to restore a sense?
- Is the solution appropriate and cost effective?

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	L	T/P/D	C
	4	-/-/-	4

(A70515) COMPUTER NETWORKS

Objectives:

- To introduce the fundamental various types of computer networks.
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- To explore the various layers of OSI Model.
- To introduce UDP and TCP Models.

UNIT-I

Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history standards and administration; Comparison of the OSI and TCP/IP reference model.

Physical Layer: Guided transmission media, wireless transmission media.

Data Link Layer – design issues, CRC Codes, Elementary Data link Layer protocols, sliding window protocol.

UNIT-II

Multiple Access Protocols –ALOHA, CSMA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges , switches, routers and gateways.

UNIT-III

Network Layer: Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Count to Infinity Problem, Hierarchical Routing, Congestion control algorithms, admission control.

UNIT-IV

Internetworking: Tunneling, Internetwork Routing, Packet fragmentation, IPv4, Ipv6 Protocol, IP addresses, CIDR, IMCP, ARP, RARP, DHCP.

Transport Layer: Services provided to the upper layers elements of transport protocol-addressing connection establishment, connection release, Connection Release, Crash Recovery.

UNIT-V

The Internet Transport Protocols UDP-RPC, Real Time Transport Protocols, The Internet Transport Protocols- Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP

Connection Release, The TCP Connection Management Modeling, The TCP Sliding Window, The TCP Congestion Control, The future of TCP.

Application Layer-Introduction ,providing services, Applications layer paradigms, Client server model, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS, SSH.

TEXT BOOKS:

1. Data Communications and Networking – Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks — Andrew S Tanenbaum, 4th Edition, Pearson Education.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning.
3. Introduction to Computer Networks and Cyber Security, Chwan-Hwa (John) Wu, J. David Irwin, CRC Press.
4. Computer Networks, L.L.Peterson and B.S.Davie, 4th edition, ELSEVIER.
5. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose,K.W.Ross,3rd Edition, Pearson Education.

Outcomes:

- Students should be understand and explore the basics of Computer Networks and Various Protocols. He/She will be in a position to understand the World Wide Web concepts.
- Students will be in a position to administrate a network and flow of information further he/she can understand easily the concepts of network security, Mobile and ad hoc networks.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	L	T/P/D	C
	4	-/-/-	4

(A71113) BIOMEDICAL SIGNAL PROCESSING

The **course objective** is to make the learner understand

- The fundamental concepts of a basic signal processing.
- The key components of a biomedical signal processing.
- Analysis tools for biological signals.
- The various biological phenomena.

UNIT-I

Discrete and continuous Random variables, Probability distribution and density functions. Gaussian and Rayleigh density functions, Correlation between random variables, Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth, Noise figure of systems.

UNIT-II

Data Compression Techniques: Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantization, DCT and the K L transform. Cardiological Signal Processing: Pre-processing. QRS Detection Methods. Rhythm analysis. Arrhythmia detection Algorithms. Automated ECG Analysis. ECG Pattern Recognition. Heart rate variability analysis.

UNIT-III

Adaptive Noise Canceling: Principles of Adaptive Noise Canceling. Adaptive Noise Canceling with the LMS adaptation Algorithm. Noise Canceling Method to Enhance ECG Monitoring. Fetal ECG Monitoring.

UNIT-IV

Signal Averaging, polishing–mean and trend removal, linear prediction. Yule–walker(Y–W) equations. Their applications in ECG and EEG.

UNIT-V

Neurological Signal Processing: Modeling of EEG Signals. Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves. Auto Regressive (A.R.) modeling of seizure EEG. Sleep Stage analysis. Inverse Filtering. Least squares and polynomial modeling. Original Prony's Method. Prony's Method based on the Least Squares Estimate. Analysis of Evoked Potentials and PCG.

TEXT BOOKS

1. Rangaraj M. Rangayyan – Biomedical Signal Analysis. IEEE Press, 2001.
2. D.C.Reddy, Biomedical Signal Processing- principles and techniques, Tata McGraw-Hill, 2005.
3. Biomedical Digital Signal Processing, Willis J.Tompkins, PHI.

REFERENCE:

1. Weitkunat R, Digital Bio signal Processing, Elsevier, 1991.
2. Akay M , Biomedical Signal Processing, Academic: Press 1994.
3. Cohen.A, Biomedical Signal Processing -Vol. I Time & Frequency Analysis, CRC Press, 1986.

Course Outcomes:

By the end of this course, students should be able to:

- Explain the basic signal processing techniques.
- Develop basic mathematical, scientific and computational skills necessary to analyze biomedical signals.
- Formulate problems in biomedical signals.
- Design analysis tools for biological signals.
- Explain the complexity of biological signals and the impact, promise of biomedical engineering in understanding these signals.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem

L	T/P/D	C
4	-/-/-	4

(A70441) LASERS & FIBER OPTIC INSTRUMENTATION

(Elective-I)

Objective: To make the students under stand the application of Opto Electronics and Lasers in the quantifying.

UNIT – I

Optical Fibers and Their Properties: Introduction to optical fiber - fiber characteristics - principles of light propagation through a fiber - Different types of fibers and their properties - Losses in the optical fiber - Dispersion - advantages and disadvantages of optical fibers.

UNIT – II

Laser Fundamentals: Introduction to lasers - Laser characteristics – Laser configuration – Three level and four level lasers – Q-switching – Mode locking – Types of lasers: Gas lasers, Solid lasers, Liquid lasers and Semiconductor lasers.

UNIT – III

Opto-Electronic Components: Optical sources: LED, LD - Optical detectors: PIN, APD - Electro-optic, Magneto optic and Acousto-optic Modulators.

UNIT – IV

Industrial Applications of Optical Fibers: Interferometer method of measurement of length – Moire fringes – Measurement of pressure, Temperature, Current, Voltage, Liquid level and strain - fiber optic Gyroscope – Polarization maintaining fibers – Applications.

UNIT–V

Laser instrumentation: Industrial applications of lasers – Lasers for measurement of distance, length, velocity, acceleration, current, voltage and atmospheric effect - Bio-medical applications - Holography: Principle, Methods, Holographic Interferometers and applications.

TEXT BOOKS

1. 'Optical Fiber Communication – Principles and Practice', J.M. Senior, Prentice Hall of India, 1985.
2. 'Introduction to Opto Electronics', J. Wilson and J.F.B. Hawkes, Prentice Hall of India, 2001.

REFERENCES

1. Understanding Fiber Optics, 4th or 5th edition; Jeff Hecht; Prentice Hall publishers.

2. 'Optical Fibre Communication and Sensors', M. Arumugam, Anuradha Agencies, 2002.
3. 'Optical Fibre Communication', G. Keiser, 'McGraw Hill, 1995.
4. Lasers: Theory and Applications – by Thyagarajan K. and Ghatak A.K., Plenum Press
5. Monte Ross, 'Laser Applications', McGraw Hill, 1968

Outcome:

Upon completion of this course the student shall be able to apply his instrumentation knowledge and understand how light and LASER can be used for measurements.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	L	T/P/D	C
	4	-/-/-	4

(A70527) ARTIFICIAL NEURAL NETWORKS

(Elective-I)

Course Objectives:

The objectives of this course are to:

- Understand the basic building blocks of artificial neural networks (ANNs).
- Understand the role of neural networks in engineering and artificial intelligence modelling.
- Provide knowledge of supervised/unsupervised learning in neural networks.
- Provide knowledge of single layer and multilayer perceptions.
- To know about self-organizational maps and Hopfield models.

UNIT -I:

Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks.

Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process.

UNIT -II:

Single Layer Perceptions: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perception –Convergence Theorem, Relation Between Perception and Bayes Classifier for a Gaussian Environment.

Multilayer Perception: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection.

UNIT -III:

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning.

UNIT -IV:

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-

Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification.

UNIT -V:

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm.

Hopfield Models – Hopfield Models, Computer Experiment.

TEXT BOOKS:

1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

REFERENCE BOOKS:

1. Artificial Neural Networks - B. Vegnanarayana Prentice Hall of India P Ltd 2005.
2. Neural Networks in Computer Inteligance, Li Min Fu TMH 2003.
3. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

Learning outcomes

After the course the student should be able to:

- Explain the function of artificial neural networks of the Back-prop, Hopfield and SOM type.
- Explain the difference between supervised and unsupervised learning.
- Describe the assumptions behind, and the derivations of the ANN algorithms dealt with in the course.
- Give example of design and implementation for small problems.
- Implement ANN algorithms to achieve signal processing, optimization, classification and process modeling.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem

L	T/P/D	C
4	-/-/-	4

(A72909) NANO TECHNOLOGY

(Elective-I)

Objective:

Nano Technology is one of the core subjects of multidisciplinary nature. This has extensive applications in the field of energy, electronics, Biomedical Engg. Etc. Built to specifications by manufacturing matter on the atomic scale, the Nano products would exhibit an order of magnitude improvement in strength, toughness and efficiency. The objective here is impart the basic knowledge in Nano Science and Technology.

Unit-I:

Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges and Future Prospects.

Unit-II:

Unique Properties of Nanomaterials: Microstructure and Defects in Nanocrystalline Materials:Dislocations, Twins,stacking faults and voids, Grain.

Boundaries, triple and disclinations, **Effect of Nano-dimensions on Materials Behavior:** Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, Enhanced solid solubility, **Magnetic Properties**: Soft magnetic nanocrystalline alloy, Permanent magnetic nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties and Mechanical Properties.

Unit-III:

Synthesis Routes: Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Sol-gel method ,Self assembly, **Top down approaches:** Mechanical alloying, Nano-lithography, **Consolidation of Nanopowders**: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

Unit-IV:

Tools to Characterize nanomaterials: X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional

Atom Probe (3DAP), Nanoindentation.

Unit-V:

Applications of Nanomaterials: Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water- Treatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Defence and Space Applications, Concerns and challenges of Nanotechnology.

TEXT BOOKS:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

REFERENCES BOOKS:

1. Nano: The Essentials by T.Pradeep, Mc Graw- Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L.Schodek.
3. Transport in Nano structures- David Ferry, Cambridge University press 2000.
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S.,S. R. Kumar, J. H. Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press.

Outcome:

The present syllabus of "Introduction to Nano Technology" will give insight into many aspects of Nanoscience, technology and their applications in the prospective of materials science.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	L	T/P/D	C
	4	-/-/-	4

(A70438) EMBEDDED & REAL TIME SYSTEMS

(Elective – II)

Objective: To learn the method of designing real time systems.

UNIT- I :

Introduction: Embedded systems overview, design challenge, processor technology, IC technology, Design Technology, Trade-offs. Single purpose processors RT-level combinational logic, sequential logic (RT-level), custom single purpose processor design (RT-level), optimizing custom single purpose processors.

General Purpose Processors: Basic architecture, operation, Pipelining, Programmer's view, development environment, Application Specific Instruction-Set Processors (ASIPs) – Micro Controllers and Digital Signal Processors.

UNIT- II:

State Machine and Concurrent Process Models: Introduction, models Vs. languages, finite state machines with data path model (FSMD), using state machines, program state machine model (PSM), concurrent process model, concurrent processes, communication among processes, synchronization among processes, implementation, data flow model, real-time systems.

Communication Interface: Need for communication interfaces, RS232 / UART, RS422 / RS485, USB, Infrared, IEEE 1394 Firewire, Ethernet, IEEE 802.11, Blue tooth.

UNIT -III :

Introduction to Real – Time Operating Systems : Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment.

Basic Design Using a Real-Time Operating System : Principles, Semaphores and Queues, HardReal-Time Scheduling Considerations, Saving Memory and Power, An example RTOS like uC-OS (Open Source); Embedded Software Development Tools: Host and Target machines, Linker/ Locators for Embedded

Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, An Example System.

UNIT -IV:

Introduction to advanced architectures : ARM and SHARC, Processor and memory organization and Instruction level parallelism; Networked embedded systems: Bus protocols, I2C bus and CAN bus; Internet-Enabled Systems, Design Example-Elevator Controller.

UNIT – V:

Design Technology: Introduction, Automation, Synthesis, Parallel evolution of compilation and synthesis, Logic Synthesis, RT synthesis, Behavioral Synthesis, Systems Synthesis and Hardware/ Software Co-Design, Verification, Hardware/Software co-simulation, Reuse of intellectual property codes.

TEXT BOOKS:

1. Embedded System Design – A Unified Hardware/Software Introduction – Frank Vahid, Tony D. Givargis, John Wiley, 2002.
2. An Embedded Software Primer – David E. Simon, Pearson Ed., 2005.
3. Computers and Components, Wayne Wolf, Elseveir.

REFERENCES:

1. Embedded Microcomputer Systems – Jonathan W. Valvano, Brooks / Cole, Thompson Learning.
2. Embedded / Real Time Systems – KVKK Prasad, Dreamtech Press, 2005.
3. Introduction to Embedded Systems – Raj Kamal, TMS, 2002.

Outcomes:

Upon completion of this course, the student will be able to

- Understand the basics of an embedded system
- Design, implement and test an embedded system.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem

L	T/P/D	C
4	-/-/-	4

(A70432) VLSI DESIGN

(Elective-II)

Course Objectives: The objectives of the course are to:

- Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/BICMOS transistors and passive components.
- Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
- Give exposure to the design rules to be followed to draw the layout of any logic circuit.
- Provide concept to design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
- Provide design concepts to design building blocks of data path of any system using gates.
- Understand basic programmable logic devices and testing of CMOS circuits.

UNIT –I:

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS

Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds}-V_{ds} relationships, MOS transistor threshold Voltage, g_m, g_{ds}, Figure of merit ωo; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT -II:

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 µm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT –III:

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

UNIT -IV:

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT -V:

Programmable Logic Devices: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

TEXT BOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.
3. VLSI Design – M. Michael Vai, 2001, CRC Press.

REFERENCE BOOKS:

3. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
4. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
5. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
6. VLSI Design- K .Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
7. Introduction to VLSI – Mead & Convey, BS Publications, 2010.

Course Outcomes:

Upon successfully completing the course, the student should be able to:

- Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors.
- Choose an appropriate inverter depending on specifications required for a circuit
- Draw the layout of any logic circuit which helps to understand and estimate parasitics of any logic circuit
- Design different types of logic gates using CMOS inverter and analyze their transfer characteristics

- Provide design concepts required to design building blocks of data path using gates.
- Design simple memories using MOS transistors and can understand Design of large memories.
- design simple logic circuit using PLA, PAL, FPGA and CPLD.
- Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem

L	T/P/D	C
4	-/-/-	4

(A70437) DSP PROCESSORS AND ARCHITECTURES
(Elective-II)

Course Objectives:

The objectives of the course are:

- To recall digital transform techniques.
- To introduce architectural features of programmable DSP Processors of TI and Analog Devices.
- To give practical examples of DSP Processor architectures for better understanding.
- To develop the programming knowledge using Instruction set of DSP Processors.
- To understand interfacing techniques to memory and I/O devices.

UNIT –I:

Introduction to Digital Signal Processing: Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations : Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT –II:

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT -III:

Programmable Digital Signal Processors: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX

processors, Pipeline Operation of TMS320C54XX Processors.

UNIT –IV:

Analog Devices Family of DSP Devices: Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.

Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

UNIT –V:

Interfacing Memory and I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach To Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009.
3. Embedded Signal Processing with the Micro Signal Architecture Publisher: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007.

REFERENCE BOOKS:

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH.
2. Digital Signal Processing – Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI.
5. The Scientist and Engineer's Guide to Digital Signal Processing by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997.
6. Embedded Media Processing by David J. Katz and Rick Gentile of Analog Devices, Newnes.

Course Outcomes: Upon completion of the course, the student

- Be able to distinguish between the architectural features of General purpose processors and DSP processors.
- Understand the architectures of TMS320C54xx and ADSP 2100 DSP devices.
- Be able to write simple assembly language programs using instruction set of TMS320C54xx.
- Can interface various devices to DSP Processors.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem

L	T/P/D	C
-	-/3/-	2

(A71183) BIOMEDICAL SIGNAL PROCESSING LAB

Course Objective

To understand

- Signal Conditioning
- Filters
- Data Compression Techniques
- Noise Cancellation Techniques

1. Computation of Convolution and Correlation Sequences.
2. Analog and Digital Signal Conditioning.
3. Signal Averaging Improvement in the SNR Using Coherent Averaging.
4. Signal Averaging Improvement in the SNR Using Incoherent Averaging.
5. Exponential Averaging.
6. Data Polishing: Mean and Trend Removal.
7. Design or I I R Filter.
8. Design of F I R Filter.
9. PSD Estimation.
10. Data Compression Techniques: AZTEC. TP.
11. Data Compression Technique: CORTES.
12. Data Compression Technique: K. L. Transform.
13. Data Compression Techniques: DCT, Wavelets.
14. Noise Cancellation Techniques.
15. QRS Detections and HRV Analysis.

Using Matlab and signal processing toolbox. (20 keys / 60 intake)

Course Outcome

At the end of the course the learner will be able to

- Design filters
- Apply various data compression and noise cancellation techniques to biomedical signals

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem

L	T/P/D	C
-	-/3/-	2

(A71184) MEDICAL IMAGING LAB

Course Objective

Understand medical diagnostic image reconstruction and enhancement techniques using MATLAB

Implementation of the below Algorithms.

1. Algorithms for Low Pas filter, High Pass Filter, Median Filter
2. Prewitt Edge, Quick Edge Detector
3. Miller's Algorithm
4. Cooley -Turkey Algorithm
5. Point Detection.
6. Line Detection.
7. Edge Detection.
8. Reconstruction Algorithm for Parallel and Fan Beam Projections.
9. Back Projection Algorithm.
10. A.R.T. (Algebraic Reconstruction Techniques).
11. S. A. R. T. (Simultaneous Algebraic Reconstruction Technique)
12. S. I. R T (Simultaneous Iterative Reconstruction Technique)
11. Image Enhancement –Histogram.

Additional requirements along with the computer facilities C compiler

Matlab with signal processing and image processing tooiboxes. (20 keys / 60 intake)

Course Outcome

At the end of the course the learner will be able to

- Apply filtering and detection techniques to images.
- Implement reconstruction techniques.