2007-2008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

ELECTRONICS AND INSTRUMENTATION ENGINEERING

III YEAR II SEMESTER
COURSE STRUCTURE

CODE	SUBJECT	T	P	C
	Automation of Industrial Processes	4+1*	-	4
	Microprocessors and Interfacing	4+1*	-	4
	Digital Signal Processing	4+1*	-	4
	Principles of Communication	4+1*	-	4
	Optoelectronic and Laser Instrumentation	4+1*	-	4
	Biomedical Instrumentation	4+1*	-	4
	Electronics Design Automation Lab	-	3	2
	Instrumentation Lab – II	-	3	2
	TOTAL	**30**	**6**	**28**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD.

III Year B.Tech. EIE II-Sem	**T**	**P**	**C**
	4+1*	**0**	**4**

AUTOMATION OF INDUSTRIAL PROCESSES

UNIT – I:

INTRODUCTION TO COMPUTER CONTROL

Role of computers in the control of Industrial processes (plants). Elements of Computer Controlled Process / Plant. Classification – Batch, Continuous, Supervisory and Direct Digital Controls. Architecture – Centralized, Distributed and Hierarchical Systems. Man Machine or Human Computer Interface (HCI).

UNIT – II:

BUILDING BLOCKS

Process Control Requirements of Computers. Process related variables. Computer Network. Communications in Distributed control Systems. Smart Sensors and Field bus.

UNIT – III:

CONTROL SYSTEM DESIGN -I

Control System Design – Heuristics, Structural Controllability and Relative Gain Array. Controller Design – Regulator design and other design considerations. Controller Tuning – P, PI, PID, and Ziegler-Nicholas method. Computer aided Control System Design.

UNIT – IV:

CONTROL SYSTEM DESIGN –II

Computer control loop, Modified Z – Transform, Zero-order hold equivalence, First order system with time delay, Converting continuous time controller to discrete time domain, Design of controllers based on discrete time model – Deadbeat and Dahlin's algorithms.

UNIT – V:

DESIGN OF FEED FORWARD CONTROLLER

Block Diagram, Feed Forward control algorithms – dynamic, static, Deadbeat

UNIT – VI:

CASCADE, PREDICTIVE AND ADAPTIVE CONTROL

Cascade Control – Dynamic response, Types, Implementation. Predictive Control – Model based and Multivariable System. Adaptive Control – Adjustment, Schemes, and Techniques.

UNIT – VII:

ADVANCED STRATEGIES

Inferential Control. Intelligent Control. Statistical Process Control. Algorithms for Processes with Dead Time – Smith Predictor (SP), Analytical Predictor (AP). Optimal Control

UNIT – VIII:

DISTRIBUTED DIGITAL CONTROL

Programmable logic controllers (PLC)- Architecture , Selection. Overview of Distributed Digital Control System (DCS). DCS Software configuration. DCS Communication – Data Highway. DCS Supervisory computer Tasks. DCS
Integration with PLCs and Computers.

TEXT BOOKS:

1. Computer Aided Process Control – S.K.Singh. PHI 2004
2. Computer Control of Processes – M.Chidambaram. Narosa 2003.

REFERENCES:

1. Computer-based Industrial Control by Krishna Kanth. PHI 1997
2. Real Time Control: An Introduction – second edition - S.Bennett, Pearson Education India 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD.

III Year B.Tech. EIE II-Sem	**T**	**P**	**C**
	4+1*	**0**	**4**

MICROPROCESSORS AND INTERFACING

UNIT-I
An over view of 8085, Architecture of 8086 Microprocessor. Special functions of General purpose registers. 8086 flag register and function of 8086 Flags. Addressing modes of 8086. Instruction set of 8086. Assembler directives, simple programs, procedures, and macros.

UNIT-II
Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation.

UNIT-III
Pin diagram of 8086-Minimum mode and maximum mode of operation. Timing diagram. Memory interfacing to 8086 (Static RAM & EPROM). Need for DMA. DMA data transfer Method. Interfacing with 8237/8257.

UNIT-IV
8255 PPI – various modes of operation and interfacing to 8086. Interfacing Keyboard, Displays, 8279 Stepper Motor and actuators. D/A and A/D converter interfacing.

UNIT-V
Interrupt structure of 8086. Vector interrupt table. Interrupt service routines. Introduction to DOS and BIOS interrupts. 8259 PIC Architecture and interfacing cascading of interrupt controller and its importance.

UNIT-VI
Serial data transfer schemes. Asynchronous and Synchronous data transfer schemes. 8251 USART architecture and interfacing. TTL to RS 232C and RS232C to TTL conversion. Sample program of serial data transfer. Introduction to High-speed serial communications standards, USB.

UNIT-VII
Advanced Micro Processors - Introduction to 80286, Salient Features of 80386, Real and Protected Mode Segmentation & Paging, Salient Features of Pentium, Branch Prediction, Overview of RISC Processors.

UNIT-VIII
8051 Microcontroller Architecture, Register set of 8051, Modes of timer operation, Serial port operation, Interrupt structure of 8051, Memory and I/O interfacing of 8051.

TEXT BOOKS :

1. Advanced microprocessor and Peripherals - A.K.Ray and K.M.Bhurchandi, TMH, 2000.
2. Micro Controllers – Deshmukh, Tata McGraw Hill Edition.

REFERENCES :

1. Micro Processors & Interfacing – Douglas U. Hall, 2007.
2. The 8088 and 8086 Micro Processors – PHI, 4th Edition, 2003.
3. Micro Computer System 8086/8088 Family Architecture, Programming and Design - By Liu and GA Gibson, PHI, 2nd Ed.,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD.

III Year B.Tech. EIE II-Sem	**T**	**P**	**C**
	4+1*	**0**	**4**

DIGITAL SIGNAL PROCESSING

UNIT I

INTRODUCTION: Introduction to Digital Signal Processing: Discrete time signals & sequences, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

UNIT II

DISCRETE FOURIER SERIES: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT. Relation between Z-transform and DFS

UNIT III

FAST FOURIER TRANSFORMS: Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT, and FFT for composite N

UNIT IV

REALIZATION OF DIGITAL FILTERS: Review of Z-transforms, Applications of Z – transforms, solution of difference equations of digital filters, Block diagram representation of linear constant-coefficient difference equations, Basic structures of IIR systems, Transposed forms, Basic structures of FIR systems, System function,

UNIT V

IIR DIGITAL FILTERS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples: Analog-Digital transformations

UNIT VI

FIR DIGITAL FILTERS : Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR & FIR filters.

UNIT VII

MULTIRATE DIGITAL SIGNAL PROCESSING: Decimation, interpolation, sampling rate conversion, Implementation of sampling rate conversion.

UNIT VIII

INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory, multiport memory, VLSI Architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Architecture of TMS 320C5X- Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Registrar, Index Registrar, Auxiliary Registger Compare Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, Some flags in the status registers, On- chip registers, On-chip peripherals

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis,
   Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI
3. Digital Signal Processors – Architecture, Programming and Applications,, B.Venkataramani, M. Bhaskar, TATA McGraw Hill, 2002

Reference Books:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.
3. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
4. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris, Thomson, 2007.
5. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD.

III Year B.Tech. EIE II-Sem	**T**	**P**	**C**
	4+1*	**0**	**4**

PRINCIPLES OF COMMUNICATIONS

UNIT I

Introduction : Block diagram of Electrical communication system, Radio communication : Types of communications, Analog, pulse and digital Types of signals, Fourier Transform for various signals, Fourier Spectrum, Power spectral density, Autocorrelation, correlation, convolution.

UNIT II

Amplitude Modulation : Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC, Power and BW requirements, generation of AM, DSB SC, SSB SC, Demodulation of AM : Diode detector, Product demodulation for DSB SC & SSB SC.

UNIT III

Angle Modulation : Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

UNIT IV

Pulse Modulations : Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM, Time Divison Multiplexing, Frequency Divison Multiplexing, Asynchronous Multiplexing.

UNIT V

Digital Communication : Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison.

UNIT VI

Digital Modulation : ASK, FSK, PSK, DPSK, QPSK demodulation, coherent and incoherent reception, Modems.

UNIT VII

Information Theory : Concept of information, rate of information and entropy, Source coding for optimum rate of information, Coding efficiency, Shanon-Fano and Huffman coding.

UNIT VIII

Error control coding : Introduction, Error detection and correction codes, block codes, convolution codes.

TEXT BOOKS:

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 20th reprint, 2004.
2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

REFERENCES

1. Electronic Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.
2. Communication Systems Engineering – John. G. Proakis and Masoud Salehi, PHI, 2ndEd. 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD.

III Year B.Tech. EIE II-Sem	**T**	**P**	**C**
	4+1*	**0**	**4**

OPTOELECTRONIC AND LASER INSTRUMENTATION

UNIT – I:
OPTICAL FIBERS AND THEIR PROPERTIES
Introduction to optical fibers – Light guidance – Numerical aperture – Dispersion – Different types of fibers and their properties.

UNIT – II:
Light Sources for fiber optics, Photo detectors, source coupling, splicing and connectors.

UNIT – III:
LASER FUNDAMENTALS
Laser configuration – Q-Switching – Mode locking – Different types of Lasers – Ruby, Nd-Yag, He-Ne, CO2, Orgon ion.

UNIT – IV:
FIBER OPTIC SENSORS
IR sources and detectors – Interferometer method of measurement of length – Moire fringes – Measurement of pressure, Temperature, Current, Voltage, Liquid level and strain - fiber optic Gyroscope – Polarization maintaining fibbers – Applications.

UNIT – V:
LASER INSTRUMENTATION
Industrial applications of lasers – Bio-medical application – Laser Doppler velocity meter – Laser heating

UNIT – VI:
HOLOGRAPHY: Principle, Methods, Holographic Interferometers and applications.

UNIT – VII:
MEDICAL APPLICATIONS: Lasers and tissue interaction, Laser instruments for surgery, removal tumors of vocal cords, plastic surgery, DERMATOLOGY.

UNIT – VIII:
OPTO-ELECTRONIC COMPONENTS
LED, LD, PIN & APD, Electro-optic, Magneto optic and Acousto-optic Modulators.

TEXT BOOKS:
1. An Introduction to Optical fibers.- Allen H.C. McGraw Hill, Singapore, 1993
2. Optics – A.K. Ghatak, Second edition, Tata McGraw Hill, New Delhi,1992.

REFERENCES
1. Lasers : Theory and Applications – by Thyagarajan K. and Ghatak A.K., Plenum Press, New York.
2. Lasers and Optical Engineering – by Das P., Springers International Students Edition, 1991.
3. Optical Electronics – by Ghatak A.K. and Thyagarajan K., Foundation Books, 1991.
4. Laser and Applications – by Guimarass W.O.N. and Mooradian A., Springer Verlag, 1981.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD.

III Year B.Tech. EIE II-Sem	**T**	**P**	**C**
	4+1*	**0**	**4**

BIO-MEDICAL INSTRUMENTATION

UNIT – I:
Components of Medical Instrumentation System. Bioamplifier. Static and dynamic characteristics of medical instruments. Biosignals and characteristics. Problems encountered with measurements from human beings.

UNIT – II:
Organisation of cell. Derivation of Nernst equation for membrane Resting Potential Generation and Propagation of Action Potential, Conduction through nerve to neuromuscular junction.

UNIT – III:
Bio Electrodes – Biopotential Electrodes-External electrodes, Internal Electrodes. Biochemical Electrodes.

UNIT – IV:
Mechanical function, Electrical Conduction system of the heart. Cardiac cycle. Relation between electrical and mechanical activities of the heart.

UNIT – V:
Cardiac Instrumentation: Blood pressure and Blood flow measurement. Specification of ECG machine. Einthoven triangle, Standard 12-lead configurations, Interpretation of ECG waveform with respect to electro mechanical activity of the heart.

UNIT – VI:
Therapeutic equipment.: Pacemaker, Defibrillator, Shortwave diathermy. Hemodialysis machine.

UNIT – VII:
Neuro-Muscular Instrumentation: Specification of EEG and EMG machines. Electrode placement for EEG and EMG recording. Intrepretation of EEG and EMG.

UNIT – VIII:
Respiratory Instrumentation: Mechanism of respiration, Spirometry, Pnemuotachograph Ventilators.

TEXT BOOKS:
1. Biomedical Instrumentation and Measurements – by Leslie Cromwell, F.J. Weibell, E.A. Pfeiffer, PHI.
2. Medical Instrumentation, Application and Design – by John G. Webster, John Wiley.

REFERENCES:
1. Principles of Applied Biomedical Instrumentation – by L.A. Geoddes and L.E. Baker, John Wiley and Sons.
2. Hand-book of Biomedical Instrumentation – by R.S. Khandpur, McGraw-Hill, 2003.
3. Biomedical Telemetry – by Mackay, Stuart R., John Wiley.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD.

III Year B.Tech. EIE II-Sem	**T**	**P**	**C**
	0	**3**	**2**

ELECTRONIC DESIGN AND AUTOMATION LAB

Analog Circuit Simulation :

Design and simulation in simulation laboratory using multisium Or Pspice OR equivalent simulation software.

1. Common Eruilter and common source amplifier.
2. Two stage RC coupled amplifier
3. any two of the following :
   - (i). Current Services Feedback amplifier.
   - (ii). Voltage Services Feedback amplifier.
   - (iii). Voltage Shunt Services Feedback amplifier.
   - (iv). Current Services Feedback amplifier.
4. RC phase shift ascillator
5. class A / Class B power amplifier.
6. High Frequency Common Base (BJT) / Common Gate (JFET) amplifier.

Digital circuits simulation

Simulate the internal structure of the following digital IC's using VHDL/UERILOG and verify the operations of the digital IC's (Hardware) in laboratory:

1. Logic Gates.
2. D or T flipflop.
3. Decade (7490) / 4 bit counter 97493)
4. Shift registers (left/right shift) – 7495
5. 4 – bit componator – 7485
6. 8 X 1 or 16 X 1 multiplexer and 2 X 4 or 4 X 6 Demultplexer.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD.

III Year B.Tech. EIE II-Sem	**T**	**P**	**C**
	0	**3**	**2**

(EI05330) INSTRUMENTATION LAB – II

(Minimum of ten experiments should be conducted.)
Design and simulation of Analog Circuits using CAD Package.
Design of PCBs using Packages and Fabrication of PCB.
Linearization of Thermistor using Microprocessor.
Study of Level monitoring Instruments using PLC.
pH measurements.
Measurement of Blood Pressure.
Calibration of P to I and I to P converters.
RPM indicator using Strobostrom/Gyroscope.
Measurement of Humidity.
Measurement of velocity of liquid using Ultrasonic (Doppler effect) method and also flow measurement.
Measurement of Level using Capacitance method/Transducer.
Displacement measurement using inductive pickup and capacitive pickup.
PID Controller setup (Flow/Temp. Level).