JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

B.TECH. ELECTRONICS AND INSTRUMENTATION ENGINEERING

IV YEAR II SEMESTER
COURSE STRUCTURE

CODE	SUBJECT	T	P	C
	Industrial Electronics	4+1*	-	4
	ELECTIVE – III	4+1*	-	4
	Robotics and Automation			
	Micro Controllers and Applications			
	Embedded and Real Time Systems			
	ELECTIVE – IV	4+1*	-	4
	Management Information Systems			
	Telemetry and Telecontrol			
	DSP Processors and Architectures			
	Industry Oriented Mini Project Work	-	-	2
	Seminar	-	-	2
	Project Work	-	-	10
	Comprehensive Viva	-	-	2
TOTAL		**15**		**28**

NOTE: All University Examinations (Theory and Practical) are of 3 hours duration.
* : Tutorials
T : Theory periods per week P: Practical /Drawing Periods per week
C : Total Credits for the subject

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	4+1*	**0**	**4**

INDUSTRIAL ELECTRONICS
(ELECTIVE - III)

UNIT I
DC AMPLIFIERS:
Need for DC amplifiers, DC amplifiers—Drift, Causes, Darlington Emitter Follower, Cascode amplifier, Stabilization, Differential amplifiers—Chopper stabilization, Operational Amplifiers, Ideal specifications of Operational Amplifiers, Instrumentation Amplifiers.

UNIT II
REGULATED POWER SUPPLIES:
Block diagram, Principle of voltage regulation, Series and Shunt type Linear Voltage Regulators, Protection Techniques— Short Circuit, Over voltage and Thermal Protection.

UNIT III
SWITCHED MODE & IC REGULATORS :
Switched Mode voltage regulator, Comparison of Linear and Switched Mode Voltage Regulators, Servo Voltage Stabilizer, monolithic voltage regulators Fixed and Adjustable IC Voltage regulators, 3-terminal Voltage regulators—Current boosting .

UNIT IV
SCR AND THYRISTOR:
Principles of operation and characteristics of SCR, Triggering of Thyristors, Commutation Techniques of Thyristors—Classes A, B, C, D, E and F, Ratings of SCR.

UNIT V
APPLICATIONS OF SCR IN POWER CONTROL:
Static circuit breaker, Protection of SCR, Inverters—Classification, Single Phase inverters, Converters – single phase Half wave and Full wave.

UNIT VI
DIAC, TRIAC AND THYRISTOR APPLICATIONS:
Chopper circuits – Principle, methods and Configurations, Diac and Triac, Triacs – Triggering modes, Firing Circuits, Commutation.

UNIT VII
INDUSTRIAL APPLICATIONS - I
Industrial timers -Classification, types, Electronic Timers – Classification, RC and Digital timers, Time base Generators. Electric Welding – Classification, types and methods of Resistance and ARC wielding, Electronic DC Motor Control.

UNIT VIII
INDUSTRIAL APPLICATIONS - II
High Frequency heating – principle, merits, applications, High frequency Source for Induction heating. Dielectric Heating – principle, material properties, Electrodes and their Coupling to RF generator, Thermal losses and Applications.Ultrasonics – Generation and Applications.

TEXTBOOKS:
1. Industrial and Power Electronics – G.K. Mithal and Maneesha Gupta, Khanna Publishers, 19th Ed., 2003.
2. Integrated Electronics – J. Millman and C.C Halkias, McGraw Hill, 1972.
REFERENCES :
1. Electronic Devices and circuits – Theodore.H.Bogart, Pearson Education,6th Edn., 2003.
2. Thyristors and applications – M. Rammurthy, East-West Press, 1977.
3. Integrated Circuits and Semiconductor Devices – Deboo and Burroughs, ISE.

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ROBOTICS AND AUTOMATION
(ELECTIVE - III)

UNIT – I BASIC CONCEPTS
Automation and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system, Dynamic stabilization of Robotics.

UNIT – II POWER SOURCES AND SENSORS
Hydraulic, Pneumatic and electric drivers – Determination HP of motor and gearing ratio, variable speed arrangements, Path Determination - Machinery Vision – Ranging – Laser – Acoustic, Magnetic Fiber Optic and Tactile Sensor

UNIT – III MANUPULATORS
Construction of Manupulators, Manupulator Dynamic and Force Control, Electronic and Pneumatic manupulators.

UNIT – IV ACTUATORS AND GRIPPERS
Pneumatic, Hydraulic Actuators, Stepper Motor Control Circuits, End Effecter, Various types of Grippers, Design consideration.

UNIT – V
Differential transformation and manipulators, Jacobians – problems.Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

UNIT VI KINEMATICS
Forward and Inverse Kinematic Problems, Solutions of Inverse Kinematic problems, Multiple Solution, Jacobian Work Envelop – Hill Climbing Techniques.

UNIT VII PATH PLANNING
Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion – Robot programming, languages and software packages.

UNIT VIII CASE STUDY
Multiple Robots – Machine Interface – Robots in Manufacturing and Non- Manufacturing applications – Robot Cell Design Selection of a Robot.

TEXT BOOKS:
1. Industrial Robotics / Groover M P /Pearson Edu.
    1. Robotics / Fu K S/ McGraw Hill.
    2.

REFERENCES:
1. Robotics, CSP Rao and V.V. Reddy, Pearson Publications (In press)
2. Robotics and Control / Mittal R K & Nagrath I J / TMH.
3. An Introduction to Robot Technology, / P. Coiffet and M. Chaironze / Kogam Page Ltd. 1983 London.
4. Robotic Engineering / Richard D. Klafter, Prentice Hall
5. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science
6. Introduction to Robotics / John J Craig / Pearson Edu.
7. Robot Dynamics and Control by Mark W. Spong and M. Vidyasagar, John Wiley & Sons.

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MICROCONTROLLERS AND APPLICATIONS
(ELECTIVE-III)

UNIT I
OVERVIEW OF ARCHITECTURE AND MICROCONTROLLER RESOURCES
Architecture of a microcontroller – Microcontroller resources – Resources in advanced and next generation microcontrollers – 8051 microcontroller – Internal and External memories – Counters and Timers – Synchronous serial-cum-asynchronous serial communication - Interrupts.

UNIT II
8051 FAMILY MICROCONTROLLERS INSTRUCTION SET
Basic assembly language programming – Data transfer instructions – Data and Bitmanipulation instructions – Arithmetic instructions – Instructions for Logical operations on the tes among the Registers, Internal RAM, and SFRs – Program flow control instructions – Interrupt control flow.

UNIT III
REAL TIME CONTROL : INTERRUPTS
Interrupt handling structure of an MCU – Interrupt Latency and Interrupt deadline – Multiple sources of the interrupts – Non-maskable interrupt sources – Enabling or disabling of the sources – Polling to determine the interrupt source and assignment of the priorities among them – Interrupt structure in Intel 8051.

UNIT IV
REAL TIME CONTROL : TIMERS
Programmable Timers in the MCU's – Free running counter and real time control – Interrupt interval and density constraints.

UNIT V
SYSTEMS DESIGN : DIGITAL AND ANALOG INTERFACING METHODS
Switch, Keypad and Keyboard interfacings – LED and Array of LEDs – Keyboardcum- Display controller (8279) – Alphanumeric Devices – Display Systems and its interfaces – Printer interfaces – Programmable instruments interface using IEEE 488 Bus – Interfacing with the Flash Memory – Interfaces – Interfacing to High Power Devices – Analog input interfacing – Analog output interfacing – Optical motor shaft encoders – Industrial control – Industrial process control system – Prototype MCU based Measuring instruments – Robotics and Embedded control – Digital Signal Processing and Digital Filters.

UNIT VI
REAL TIME OPERATING SYSTEM FOR MICROCONTROLLERS
Real Time operating system – RTOS of Keil (RTX51) – Use of RTOS in Design –Software development tools for Microcontrollers.

UNIT VII
16-BIT MICROCONTROLLERS
Hardware – Memory map in Intel 80196 family MCU system – IO ports – Progammable Timers and High-speed outputs and input captures – Interrupts –
instructions.

UNIT VIII
ARM 32 Bit MCUs
Introduction to 16/32 Bit processors – ARM architecture and organization – ARM / Thumb programming model – ARM / Thumb instruction set – Development tools.

TEXT BOOKS
1. Microcontrollers Architecture, Programming, Interfacing and System Design –
Raj Kamal, Pearson Education, 2005.
2. The 8051 Microcontroller and Embedded Systems – Mazidi and Mazidi, PHI,
2000.

REFERENCES
1. Microcontrollers (Theory & Applications) – A.V. Deshmuk, WTMH, 2005.
2. Design with PIC Microcontrollers – John B. Peatman, Pearson Education, 2005.

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EMBEDDED AND REAL TIME SYSTEMS
(ELECTIVE - III)

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.

UNIT II
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 III
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.

UNIT IV
COMMUNICATION INTERFACE
Need for communication interfaces, RS232 / UART, RS422 / RS485, USB, Infrared, IEEE 1394 Firewire, Ethernet, IEEE 802.11, Blue tooth.

UNIT V
EMBEDDED / RTOS CONCEPTS – I
Architecture of the Kernel, Tasks and Task scheduler, Interrupt service routines, Semaphores, Mutex.

UNIT VI
EMBEDDED / RTOS CONCEPTS – II
Mailboxes, Message Queues, Event Registers, Pipes, Signals

UNIT VII
EMBEDDED / RTOS CONCEPTS – III
Timers, Memory Management, Priority inversion problem, Embedded operating systems Embedded Linux, Real-time operating systems, RT Linux, Handheld operating systems, Windows CE.

UNIT VIII
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. Embedded / Real Time Systems – KVKK Prasad, Dreamtech Press, 2005.

REFERENCES
1. Embedded Microcomputer Systems – Jonathan W. Valvano, Brooks / Cole,
Thompson Learning.
2. An Embedded Software Primer – David E. Simon, Pearson Ed., 2005.
3. Introduction to Embedded Systems – Raj Kamal, TMS, 2002.

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MANAGEMENT INFORMATION SYSTEMS
(ELECTIVE - IV)

UNIT I - Information systems in the enterprise : Why information systems, perspectives on information systems, contemporary approaches to information systems, four major types of systems in organizationstransaction
processing systems, management information systems, decision support systems, executive support systems.

UNIT II - Systems from a functional perspective- Sales and Marketing Systems, Manufacturing and Production Systems, Financial and Accounting Systems, Human Resources Systems. Integrating functions and business processes.

UNIT III - **The Digital Firm, Electronic Business and Electronic Commerce :** Internet technology and the digital firm, categories of electronic commerce, customer centered retailing, business-to-business electronic commerce, commerce payments, electronic business, management opportunities, challenges and solutions.

UNIT IV - The wireless revolution: business value of wireless networking, wireless transmission media and devices, cellular network standards and generations, wireless computer networks and internet access, M-commerce and Mobile computing, wireless technology in the enterprise.

UNIT V - **Security and control :** system vulnerability and abuse, business value of security and control, establishing a management framework for security and control, technologies and tools for security and control.

UNIT VI - Enterprise Applications and Business Process Systems : What are enterprise systems, How enterprise systems work, supply chain management systems, customer relationship management systems, enterprise integration trends.

UNIT VII - Redesigning the organizations with information systems : systems as planned organizational change, business process reengineering and process improvement, overview of system development, alternative systems building approaches – traditional systems life cycle, prototyping, enduser development, application software package and outsourcing.

UNIT VIII - Managing change and international information systems : The importance of change management in information systems success and failure, managing implementation, the growth of international systems, organizing international information systems, managing global systems, technology issues and opportunities for global value chains.

TEXT BOOK

1. Management Information Systems Kenneth - C. Laudon, Jane P. Laudon & VM Prasad, 9/e, Pearson Education, 2005.

REFERENCES

1. Management Information Systems - Effy Oz, Third Edition, Thomson, 2002.
2. Information Technology-Strategic Decision Making for Managers - M Henry C.Lucas, Jr., John Wiley & Sons, Inc, 2005.
3. Introduction to Information Systems, - James A. O'Brien, TMH, New Delhi, 2002.
4. Information Systems Today - Jessup &Velacich, PHI, 2004.
5. Management Information Systems - Sadagopan, PHI, 2004.
6. Information Systems, Pearson Education - Steven Alter, Fourth Edition, 2004.
7. Information Technology, - Turban, Rainer, Potter, John Wiley, 2003.
8. Management Information Systems - W S Jawadekar, TMH, Second Edition, 2002.

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TELEMETRY AND TELECONTROL
(ELECTIVE - IV)

UNIT – I: TELEMETRY PRINCIPLES
Introduction, Functional blocks of Telemetry system, Methods of Telemetry - Non Electrical, Electrical, Pneumatic, Frequency, Power Line Carrier Communication .
UNIT – II: SYMBOLS AND CODES
Bits and Symbols, Time function pulses, Line and Channel Coding, Modulation Codes. Intersymbol Interference.
UNIT – III: FREQUENCY DIVISION MULTIPLXED SYSTEMS
FDM, IRIG Standard, FM and PM Circuits, Receiving end, PLL
UNIT – IV: TIME DIVISION MULTIPLXED SYSTEMS
TDM-PAM, PAM /PM and TDM – PCM Systems. PCM reception. Differential PCM. Introduction, QAM, Protocols.
UNIT – V: SATELLITE TELEMETRY
General considerations, TT&C Service, Digital Transmission systems, TT&C Subsystems, Telemetry and Communications.
UNIT – VI: OPTICAL TELEMETRY
Optical fibers Cable – Sources and detectors – Transmitter and Receiving Circuits, Coherent Optical Fiber Communication System.
UNIT – VII & VIII: TELECONTROL METHODS
Analog and Digital techniques in Telecontrol, Telecontrol apparatus – Remote adjustment, Guidance and regulation – Telecontrol using information theory – Example of a Telecontrol System.
TEXT BOOKS:
1. Telemetry Principles – D. Patranabis, TMH
2. Telecontrol Methods and Applications of Telemetry and Remote Control – by Swoboda G., Reinhold Publishing Corp., London, 1991
REFERENCES:
1. Handbook of Telemetry and Remote Control – by Gruenberg L., McGraw Hill, New York, 1987.
2. Telemetry Engineering – by Young R.E., Little Books Ltd., London, 1988.
3. Data Communication and Teleprocessing System – by Housley T., PH Intl., Englewood Cliffs, New Jersey, 1987.

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DSP PROCESSORS AND ARCHITECTURES
(ELECTIVE - IV)

UNIT I

INTORODUCTION TO DIGITAL SIGNAL PROCESING

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, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

UNIT II

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 III

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 IV

EXECUTION CONTROL AND PIPELINING

Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT V

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 VI

IMPLEMENTATIONS OF BASIC DSP ALGORITHMS

The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

UNIT VII

IMPLEMENTATION OF FFT ALGORITHMS

An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT VIII

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). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

TEXT BOOKS

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

REFERENCES

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani and M. Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005.

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INDUSTRY ORIENTED MINI PROJECT

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SEMINAR

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PROJECT WORK

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COMPREHENSIVE VIVA