BHARATHIDASAN UNIVERSITY
TIRUCHIRAPPALLI

M.Sc., Electronics (Non Semester)

COURSE STRUCTURE& SYLLABUS

(Candidates admitted from the year 2014 onwards under Distance Education mode)

Year	Paper	Title of the Paper	Exam Hours	Marks
I	Paper –I	Analog and Digital Electronics	3	100
	Paper – II	Power Electronics	3	100
	Paper – III	Electronic Communication Systems	3	100
	Paper – IV	Nano,Optical and Organic Electronics	3	100
	Paper – V	Practical-I: Analog, Digital and Circuit simulation	4	100
II	Paper – VI	Microcontroller and Applications	3	100
	Paper – VII	Digital Signal Processing	3	100
	Paper –VIII	Data, Cellular and Mobile Communications	3	100
	Paper –IX (Elective)	Embedded System Design /Instrumentation and Measurements	3	100
	Paper-X	Practical-II: Microcontroller and Interfacing	4	100
			Total	**1000**

FOR PRACTICALS (Record has to be submitted at the time of Practical Examination)

Paper I Analog and Digital Electronics

UNIT –I SEMICONDUCTOR DEVICES

Theory of PN junction diode –Diode resistance - Effect of Temperature on PN junction diodes – Junction diode switching characteristics – Breakdown in PN junction diodes – PN diode applications – Clippers –Clampers – Zener diode – Bipolar Junction transistor – construction – operation of NPN transistor and PNP transistor – Types of configuration

UNIT- II FET

Construction and operation of N-Channel FET – Characteristic parameters of the JFET- Comparison of JFET and BJT – Applications of JFET –FET as voltage variable resistor –MOSFET- Construction and Characteristics- Depletion mode and Enhancement mode

UNIT – III OPERATIONAL AMPLIFIERS AND TIMER

Operational amplifier – Characteristics – Applications of op-amps – Inverting amplifier –Non inverting amplifier – voltage follower – Summing amplifiers – Subtractor - Integrator – Differentiator –Comparators and circuits – Active Filters (first order only) - Instrumentation amplifier – D/A converter – Binary weighted method – R- 2R ladder method - IC 555- Block diagram – Monostable multivibrator – Astable multivibrator

UNIT –IV BOOLEAN FUNCTIONS AND COMBINATIONAL LOGIC

Boolean functions – Demorgan's theorem – Map method – Two and Three variable maps – Four variable map – Product of sums simplification – Don't care conditions Introduction - Design procedure –Half and Full adders – Half and Full Subtractors – Code conversion – Universal gates – Exclusive OR functions – Binary parallel adder – BCD adder – Magnitude comparator – Decoders – Demultiplexers –Encoders – Multiplexers

UNIT –V SEQUENTIAL LOGIC

Flip flops- RS flip flops – Edge triggered RS,D and JK flip flop – Types of registers – serial in serial out – Serial in parallel out – Parallel in serial out – Parallel in parallel out – Ring counters – Asynchronous counter – Synchronous counter – Changing the counter modules

BOOKS FOR STUDY

1. *S.Salivahanan, N. Suresh Kumar, A.Vallavaraj, Electronic Devices and Circuits, Tata McGraw- Hill Publishing Company Limited, New Delhi, 2006.*
2. *LD.RoyChoudhury, Shail Jain, Linear Integrated Circuits, New Age International Pvt., Ltd., New Delhi, 1999*
3. *M.Morris Mano, Digital Logic and Computer Design, Prentice Hall of India Private Limited, New Delhi, 1996.*
4. *Leach and Malvino, Digital Principles and Applications, Tata McGraw Hill Publishing Company Limited, New Delhi, Second reprint, 2002.*

BOOKS FOR REFERENCE

1. *RamkantA.Gayakward, Op-amps and Linear Integrated* ***Circuits, Prentice*** *Hall of India, New Delhi, Third Edition.*
2. *R.P.Jain, Digital Electronics and Systems, Tata McGraw Hill, New Delhi, 2004*

3. *Rajeev Ratan, Deepak Batra, Digital Electronics, Acme Learning Pvt., Ltd., New Delhi, First Edition, (2009)*
4. *Milman and Halkias, Integrated Electronics, Tata McGraw Hill, New Delhi.*

Paper – II POWER ELECTRONICS

UNIT – I POWER SEMI-CONDUCTOR DEVICES

Current Controlled Devices -BJT's – Construction, static characteristics, switching Characteristics; Negative temperature co-efficient and secondary breakdown; Thyristors – Physical and electrical principle underlying operating mode -Two transistor analogy – Gate and switching characteristics- Voltage Controlled Devices -Power MOSFETs and IGBTs – Principle of voltage controlled devices, construction, types, static and switching characteristics, steady state and dynamic models of MOSFET and IGBTs

UNIT –II SINGLE PHASE AND THREE PHASE AC-DC CONVERTER

Static Characteristics of power diode, SCR and GTO, half controlled and fully controlled converters with R-L, R-L-E loads and freewheeling diodes – continuous and discontinuous modes of operation– Dual converter – Sequence control of converters – performance parameters: harmonics, ripple, distortion, power factor – Three Phase AC-DC Converter Semi and fully controlled converter with R, R-L, R-L-E - loads and freewheeling diodes–dual converter– performance parameters

UNIT – III DC-DC CONVERTERS, AC VOLTAGE CONTROLLERS AND CYCLOCONVERTERS

Principles of step-down and step-up converters – Analysis of buck, boost, buck-boost and Cuk converters – time ratio and current limit control – Full bridge converter - AC voltage controllers - Static Characteristics of TRIAC- Principle of phase control: single phase and three phase controllers – various configurations – analysis with R and R-L loads- Cycloconverters - Principle of operation – Single phase and three phase cyclo converters – power factor Control-Forced commutated cyclo converters

UNIT – IV SINGLE PHASE AND THREE PHASE INVERTERS

Introduction to self-commutated switches : MOSFET and IGBT - Principle of operation of half and full bridge inverters – Performance parameters – Voltage control of single phase inverters using various PWM techniques - Three Phase Voltage Source Inverters - 180 degree and 120 degree conduction mode inverters with star and delta connected loads –Current Source Inverters - Operation of six-step thyristor inverter – inverter operation modes – load – commutated inverters – Auto sequential current source inverter -Multilevel Inverters - Multilevel concept – Resonant Inverters - Series and parallel resonant inverters

UNIT – V FIRING, PROTECTING CIRCUITS AND THERMAL PROTECTION

Necessity of isolation, pulse transformer, optocoupler – Gate drives circuit: SCR, MOSFET, IGBTs and base driving for power BJT. - Over voltage, over current and gate protections; Design of snubbers- Thermal Protection - Heat transfer – conduction, convection and radiation; Cooling – liquid cooling, vapour –phase cooling; Guidance for hear sink selection – Thermal resistance and impedance -Electrical analogy of thermal components, heat sink types and design – Mounting types.

BOOKS FOR STUDY

1. *Ned Mohan, Undeland and Robbin, "Power Electronics: converters, Application and design" John Wiley and sons.Inc, Newyork, 1995.*
2. *Rashid M.H., "Power Electronics Circuits, Devices and Applications ", Prentice Hall India, New Delhi, 1995.*
3. *Jai P.Agrawal, "Power Electronics Systems", Pearson Education, Second Edition, 2002.*

BOOKS FOR REFERENCE

1. *P.C. Sen, "Modern Power Electronics", Wheeler Publishing Co, First Edition, New Delhi, 1998.*
2. *P.S.Bimbra, "Power Electronics", Khanna Publishers, Eleventh Edition, 2003.*

Paper III ELECTRONIC COMMUNICATION SYSTEMS

UNIT - I MODULATION AND ANTENNAS

Theory of amplitude modulation – Theory of frequency modulation – Theory of phase modulation. Noise: Internal noise-External noise-noise calculation –noise figure-noise temperature-Antennas: antenna equivalent circuits-coordinate system-radiation fields –Polarization-power gain of Antenna-Hertzian dipole-Half wave dipole-Vertical antenna-Loop ferrite rod antenna-non-resonant antenna-driven array Parastic arrays-UHF-VHF antenna-microwave antenna.

UNIT – II DIGITAL COMMUNICATION

Pulse amplitude modulation-pulse code modulation- delta modulation-Pulse frequency modulation-pulse time modulation-pulse position modulation-pulse width modulation –digital carrier systems – Amplitude shift keying- Frequency shift keying-Phase shift keying- differential and quadrapolar phase shift keying- error control coding-multiplex transmission-frequency and time division multiplexing.

UNIT - III MICROWAVES AND RADAR COMMUNICATION

Radiation and propagation of waves: Electromagnetic radiation - Fundamentals of EM Waves - Reflection and refraction of EM waves - Propagation of waves: - Ground wave Propagation - Sky wave propagation - Ionosphere layers - Skip Distance - Space waves-Generation of microwaves- Klystron - Reflex Klystron- Multicavity Klystron- Magnetron-detection of microwaves-IMPATT, TRAPATT and Gunn diodes.

UNIT - IV OPTICAL FIBER COMMUNICATION

Fiber optics-Different types of fiber: Step index and Graded index fibers- signal degradation fibers: Absorption, attenuation, Scattering losses and dispersion- Optical sources and detectors (quantitative Only)-Power launching and coupling: Source to fiber launching -fiber joints- Splicing techniques- general optical communication system

UNIT - V SATELLITE COMMUNICATION

Introduction - Kepler's laws - orbits - Geo-stationary orbits - Power systems - Attitude control - satellite station keeping- Antenna look angles - Limits of visibility - frequency plans and polarization - Transponders - Multiple access methods.

BOOKS FOR STUDY

1. *Dennis Roddy and John Coolen, Electonic communication-fourth edition, PHI private Ltd, (1999).*
2. *G. Kennedy and Davis, Electronic communication system, TMH, New Delhi, (1999).*
3. *Gerd Keiser, Optical Fiber Communication, Third Edition, McGraw-Hill, Singapore, (2000).*

BOOKS FOR REFERENCE

1. *Sanjeev Gupta, Electronic Communication Systems, Khanna publications, New Delhi, (1995).*
2. *N.D.Deshandae, P.K Rangole, Communication Electronics, Tata McGraw Hill Pvt.Ltd, (1998).*
3. *M. Arumugam, Optical Fiber Communication and Sensors, Anuradha Agencies, Kumbakonam, (2002).*

Paper – IV
NANO, OPTICAL AND ORGANIC ELECTRONICS

UNIT - I NANO ELECTRONICS

Overview of basic Nano electronics - Quantum and classical regimes of electron transport - Mesoscopic transport - Diffusive transport: Boltzman transport equation - Electron mobility and diffusion coefficient - Drift-diffusion model - Quantum electron transport - Infinite array of potential wells-Barrier penetration applications - Tunnel diode-Josephson effect - Electron wave transistor -Electron spin transistor -Basic logic gates and dynamic logic gates-Principle of single electron tunneling - Coulomb blockade.

UNIT - II NANO ELECTRONICSDEVICES

Introduction to Nanoelectronics and nanocomputers - Quantum DOT cellular Automata (QCA) - Single electron circuits - molecular circuits - Nanocomputers Architecture - Introduction to MEMs / NEMs - Nanosensors: Temperature Sensors, Smoke Sensors, Sensors for aerospace and defense - electronic noses – identification of hazardous solvents and gases – semiconductor sensor array - Integration of sensor with actuators and electronic circuitry Biosensors - Nanostructure based Photovoltaic Cells - Spintronic devices and applications.

UNIT - III QUANTUM ELECTRONICS & APPLICATIONS

Coherent light sources - Basic principle of lasers - laser pumping - stimulated emission - light amplification - threshold condition - Einstein's coefficient - laser rate equations for two, three and four level systems - variation of power around threshold - rectangular cavity - open plane resonator - mode locking and Q-switching of lasers - Types of lasers:Ruby,He-Ne,Ar-ion,CO_2 ,dye and semiconductor laser - laser in manufacturing - laser cutting of material - laser marking - laser transmitter - measurement of distance through laser.

Unit - IV OPTO ELECTRONICS AND DEVICES

Basic optical laws and definitions - Optical sources-light emitting diodes-laser diodes-modes of threshold condition –Photo detectors-Principles of photo diodes - Fundamental receiver operation –digital receivers-performance calculations-pre amplifierdesign - analog receivers -photonic switching-integrated optical switch - Optical fibers: Structures and wave guiding fundamentals-signal distortion in optical waveguides - Optical Kerr effect - electro optic modulator - LED,LCD,Plasma display devices - Principle-construction-operation and applications.

UNIT - V ORGANIC ELECTRONICS

General Overview of Organic Semiconductors - Electronic transport in crystalline organic materials and conductive polymers - basics of Molecular Quantum electronics -

Optical and Electrical Properties of Organic Semiconductor Material - Organic Thin Film Transistor (OTFT) - physics and processing - Organic Light Emitting Diode (OLED) - OLED passive and active matrix displays - OTFT circuits - Organic Solar Cell - Research opportunities in organic electronics and the associated technologies.

BOOKS FOR STUDY

1. *Nanoelectronics and Nanosystems: K.Goser, P.Glosekotter, J.Dienstuhl, Springer (2005).*
2. *Organic molecular crystals, E.A. Sininsh EA and V. Capek.*
3. *Optical Electronic Devices and Systems SC Guptha PHI Publication*
4. *Electronic Processes in Organic Crystals and Polymers Second Edition Oxford*
5. *Organic Molecular Crystals -EA Sininsh and V Capek*

BOOKS FOR REFERENCE

1. *MEMS & NEMS Technology and Applications- P. RaiChoudhury*
2. *Sensors: Micro &Nanosensors, Sensor Market trends (Part 1&2) by H. Meixner.*
3. *Nano Engineering in Science & Technology: An introduction to the world of nano design by Michael Reith.*
4. *Optoelectronics- Kaiser, TMH (1992)*
5. *Optical Electronic - GhatakThyagarajan, University Press*

PRACTICAL-I:

ANALOG, DIGITAL AND CIRCUIT SIMULATION

(Any Sixteen experiments)

ANALOG ELECTRONICS

[All analog circuits to be carried out in circuit simulation (PSpice and Multisim)]

1. Study Characteristics of FET

1. Design Adder/Subtractor using op-Amp.

2. Design of Integrator and Differentiator Using op-Amp.

3. Design of Wiens Bridge Oscillator using op-amp.

4. Design of Phase Oscillator using op-amp.

5. Design and study of low pass, high pass circuits using op-amp.

6. Design and study of Band pass, Band reject circuits using op-amp.

7. Design and study Instrumentation amplifier using op-amp.

8. Solving simultaneous equation using op-amp.

9. Design Astable and Monostable multivibrator using IC 555.

10. Construction of Dual regulated power supply.

DIGITAL ELECTRONICS

1. Half adder and full adder.

2. Half Subtractor and Full Subtractor.

3. Study of Flip flops. (D, JK, RS,T)

4. Multiplexer using ICs

5. Demultiplexer using ICs.

6. Shift register.

7. BCD to seven segment Display.

8. Decade counter –MOD 3.5,7,9. (Using IC 7490)

9. A/D converter using IC 0804.

10. Decoder and encoder using ICs.

Paper – VI
MICROCONTROLLER AND APPLICATIONS

UNIT -I 8051 ARCHITECTURE

Introduction - Block diagram of 8051- Registers of 8051 - internal memory - stack and stackpointer - Timers and Counters - I/O ports- Serial Input/output- Interrupts - assembly languageprogramme - 8051 data types - addressing modes - data transfer - data transfer instructions

UNIT -II ASSEMBLY LANGUAGE PROGRAMMING

Arithmetic and logical operator - addition - incrementing and decrementing - subtraction -multiplication - division- logical operations- clear and complement- bit level logical operations – rotateoperations - swap operations - jump and call operations

UNIT -III PROGRAMMING 8051 WITH C

Advantages/Disadvantages of programming in C for microcontrollers - Declaring variables -Writing a simple C program - Delay generation in C - Programming ports of 8051 with C operators in8051 C - serial port programming - Code conversions in C- Code space

UNIT -IV TIMERS/ COUNTERS, SERIAL PORT IN 8051 AND INTERRUPTS

Time delay generation using timers - Application of timers in mode 2 - counter application – serialdata transfer - serial port in 8051- internal and external interrupts - serial communication interrupt -priority implementation for 8051 interrupts

UNIT -V APPLICATIONS

Blinking of LED - LCD Interfacing - Matrix keyboard – ADC interfacing - DAC interfacing- Stepper Motor Interfacing - Temperature Measurement

BOOKS FOR STUDY

1. *Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey,8051 Microcontroller and EmbeddedSystems using Assembly and C, Pearson Education 2008*

BOOKS FOR REFERENCE

1. *MykePredko, "Programming and customizing the 8051 microcontroller", Tata McGraw Hill2001.*
2. *Kenneth J Ayala, The 8051 Microcontroller architecture and Programming, Pearson Education.*
3. *K.UmaRao, AndhePallavi, The 8051 Microcontrollers Architecture, Programming and Applications, Pearson, Second impression 2011.*

Paper – VII
DIGITAL SIGNAL PROCESSING

UNIT -I TIME SYSTEM ANALYSIS

Linear Continuous – Time System Analysis and Discrete – Time signals Continuous time signals – convolution – Fourier series and Gibb's Phenomena – Fourier transform – ideal filter characteristics – continuous time Hilbert transform – Discrete time signals – discrete time sequence – Fourier transform of discrete time sequence – Fourier transform theorems – sampling of continuous time signals - sampling band pass signals

UNIT – II Z- TRANSFORM AND ANALYSIS OF DISCRETE TIME SYSTEMS

Z-transform and region of convergence – Properties of Z-transform – Inverse Z-transform – Analysis of Discrete time systems – Linear constant – Co efficient difference equation – System function – stability – frequency response – stabilization procedure - All pass and minimum phase systems – Linear phase systems- Graphical representation of digital systems – Basic structures – other types of structures

UNIT –III DESIGN OF ANALOG FILTERS AND DIGITAL FILTER DESIGN

Introduction – Butter worth filters – Chebyshev filters – Elliptic filters – frequency transformation – fundamentals of digital filters – design of IIR filters – design of FIR filters – Design of FIR filters – Frequency sampling approach

UNIT – IV DISCRETE FOURIER TRANSFORM AND ITS COMPUTATION AND REALIZATION OF DIGITAL FILTERS

DFT- Properties – Linear and circular convolutions – Computation of DFT – Digital filter structure – Structure of FIR and IIR systems- Applications – Image processing – Speech recognition – Speech synthesis

UNIT –VFINITE WORD LENGTH EFFECTS AND POWER SPECTRUM ESTIMATION

Quantization noise – Derivation for quantization noise power – Fixed point and binary floating point number representation – Comparison – Over flow error – Truncation error – Co-efficientquantization error – Limit cycle oscillation – Signal scaling – Analytical model of sample and hold operations - Computation of energy density spectrum – Auto correlation and power spectrum of randomsignals – Periodogram – Use of DFT in power spectrum estimation – Non parametric methods for powerspectral estimation – Bartlett and Welch methods – Blackman and Tukey method.

BOOKS FOR STUDY

1. *Digital Signal Processing, N.Kesavamuthy, S.Narayana Iyer, Jaico Publishing House, India, Fifth Impression, 2012.*
2. *Digital signal Processing: Simplified, Dilip S Mali, Penram International Pvt. Ltd., First Edition, 2013.*
3. *John G. Proakis, Dimtris G. Manolakis, "Digital Signal Processing Principles, Algorithms andApplication", 3rd Edition, PHI, 2000.*
4. *Alan V. Oppenheim, Ronald W. Schafer, John R. Back, "Discrete Time Signal Processing", 2ndEdition, PHI, 2000.*

BOOK FOR REFERENCE

1. *Alan V. Oppenheim, Ronald W. Schafer, John R. Back, "Discrete Time Signal Processing", 2nd Edition, PHI, 2000.*

Paper – VIII
DATA, CELLULAR AND MOBILE COMMUNICATIONS

UNIT -I DATA COMMUNICATIONS

Data communication – Network architecture – standards – Importance of standards – The standards of organization – forms of data transmission – Digital signal encoding schemes – Data transmission techniques –Methods of data transmission – protocols and buffers – detecting errors - Parallel and serial interface – rate of data transmission – transmission modes – communication channel configurations – micro to micro link – communication challenges – communication procedures – communication processing – applications of data communication

UNIT -II CELLULAR MOBILE RADIO SYSTEMS AND ELEMENTS OF CELLULAR RADIO SYSTEM DESIGN

Introduction to Cellular Mobile System - Performance criteria - uniqueness of mobile radio environment - operation of cellular systems- Hexagonal shaped cells - Analog and Digital Cellular systems- General description of the problem - concept of frequency channels -Co-channel Interference Reduction Factor -desired C/I from a normal case in a omnidirectional Antenna system - Cell splitting, consideration of the components of Cellular system.

UNIT -III CO - CHANNEL INTERFERENCE AND TYPES

Introduction to Co-Channel Interference - real time Co-Channel interference - Co-Channel measurement - design of Antenna system - Antenna parameters and their effects - diversity receiver - non-co-channel interference-different types – Cell cover cell coverage FOR:-Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model.

UNIT -IV CELL SITE AND MOBILE ANTENNAS AND FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT

Sum and difference patterns and their synthesis, omni directional antennas - directional antennas for interference reduction - space diversity antennas - umbrella pattern antennas - minimum separation of cell site antennas - high gain antennas- Numbering and grouping - setup access and paging channels channel assignments to cell sites and mobile units - channel sharing and borrowing – sectorization - overlaid cells – non-fixed channel assignment.

UNIT -V HANDOFF AND DIGITAL CELLULAR NETWORKS

Handoff, dropped calls and cell splitting - types of handoff - handoff invitation - delaying handoff - forced handoff - mobile assigned handoff - Intersystem handoff - cell splitting - micro cells - vehicle locating methods - dropped call rates and their evaluation. GSM architecture - GSM channels - multiplex access scheme – TDMA - CDMA.

BOOKS FOR STUDY

1. *Data Communications and Networking- D.P.Nagpal, S.Chand and CompanyLtd., New Delhi, First Edition 2011.*

2. *Mobile Cellular Telecommunications: Analog and Digital Systems – William.C.Y. Lee, McGraw Hill International Edition Second Edition , 2006.*

BOOKS FOR REFERENCE

1. *Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.*
2. *Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.*
3. *Wireless and Mobile Communications – Lee McGraw Hills, 3rdEdition, 2006.*

Paper –IX **EMBEDDED SYSTEM DESIGN**

(Elective)

UNIT -I EMBEDDED SYSTEMS OVERVIEW

Introduction – Embedded systems overview – Design Challenge – Processor Technology- ICtechnology- Design technology – Tradeoffs - Custom Single Purpose Processors: Hardware- Introduction-Combinational logic – Sequential logic – Custom Single Purpose Processor Design- RT level custom singlepurpose processor design – Optimizing Custom Single Purpose Processors.

UNIT -II GENERAL PURPOSE PROCESSORS: SOFTWARE AND PERIPHERALS

Introduction – Basic architecture- operation – Programmer's view- Development Environment-Application specific Instruction set processors- selecting a microprocessor-general purpose processor design– Peripherals: Timers, Counters and Watchdog Timer – UART – Pulse Width Modulators- LCD controllers-Keypad controllers – Analog to Digital converters.

UNIT -III MEMORY

Introduction – Memory write ability and storage permanence write ability – common memory types –composing memory – Memory Hierarchy and cache – Advanced RAM.

UNIT -IV INTERFACING

Introduction – communication basics – microprocessor interfacing: I/O addressing – interrupts –Direct memory access – Arbitration – Multilevel bus architectures – Advanced communication principles –serial protocols – parallel protocols- wireless protocols

UNIT -V EMBEDDED SYSTEM DESIGN: EXAMPLES

Introduction to a simple digital camera – requirements specification – Design. Control systems: Openloop and Closed loop control systems – General control systems – PID controllers – software coding – PIDtuning – Benefits of Computer based control implementation.

BOOKS FOR STUDY

1. *Frank Vahid, Tony Givargis ,"Embedded System Design: A Unified Hardware/ Software Introduction", Wiley Student Edition, 2008.*

BOOKS FOR REFERENCE

1. *Steve Heath, "Embedded Systems Design", Elsevier Science, Second Edition,2008*
2. *Scott MacKenzie, Raphael C.W.Phan, "The 8051 Microcontroller", Pearson, 2012.*
3. *Rajiv Kapadia, "The 8051 Microcontroller and Embedded Systems", Jaico Student Edition, 2009.*

Paper –IX

(Elective)

INSTRUMENTATION AND MEASUREMENTS

UNIT – I STATIC CHARACTERISTICS OF INSTRUMENTS

Measurement system performance – static characteristics – Errors in measurement – static error – scale range and span – reproducibility and drift – repeatability - noise– accuracy and precision – significant figures – static sensitivity – linearity – Hysteresis – threshold – resolution – Loading effects – Dynamic characteristics- Limiting errors – Relative error – Types of errors – Gross errors – systematic errors – instrumental errors – environmental errors – observational errors – random errors

UNIT – II TRANSDUCERS

Introduction-Primary and Secondary transducers-Electrical Transducers-Active and Passive transducers-Resistive transducers-Potentiometers-Strain TGauges-Resistance thermometers- Thermocouples - Thermistor - variable Inductive transducers-LVDT-Capacitive Transducers - Piezoelectric Transducers- Photo conductive cells – photo voltaic cell – Hall effect transducers

UNIT-III AC BRIDGES

AC bridges – General equation for bridge balance – Measurement of self inductance by Maxwell's bridge – Hay's bridge – Anderson's bridge – Owen's bridge – Measurement of capacitance – Desauty's bridge – Schering's bridge – Measurement of Mutual inductance by Heaviside bridge and Cambell's bridge.

UNIT IV- ELECTRONIC INSTRUMENTATION

CRO – Construction – Deflection Schemes – Working details of CRO Applications– Digital Storage Oscilloscope - Signal Generators– Q Meter – Measurement methods – Wave analyzers – Frequency selective wave analyzer – Heterodyne wave Analyzer – Applications of wave Analyzers – Spectrum analyzer

UNIT- V DATA MANIPULATION AND RECORDING

A/D conversion techniques- D/A conversion- A/D conversion-Successive approximation–Integrating type - Ramp - Recorders- Graphic recorders-Strip chart recorders- XY recorders- Magnetic tape recorders - Radio telemetry.

BOOKS FOR STUDY

1. *A.K. Sawhney and PuneetSawhney, A Course in Mechanical Measurement and Instrumentation, DhanpatRai&Sons, New Delhi (2000).*
2. A.K. Sawhney, A Course in Electrical and Electronic measurements and Instrumentation, DhanpatRai and Sons, New Delhi, (2000).
3. *B.C. Nakra and KK Chaudhry, Instrumentation, Measurement and Analysis, Tata McGraw Hill Publishing Company Ltd, New Delhi (2006).*

BOOKS FOR REFERENCE

1. *Michael sayer and Abhaimansingh, Measurement, Instrumentation and Experiment Design in Physics and Engineering, Prentice Hall of India Pvt. Ltd., New Delhi (2005).*
2. *D.V.S. Murty, Transducers and Instrumentation, Prentice Hall of India Pvt. Ltd., New Delhi (1995).*
3. *D.Patranabis, Sensors and Transducers, Prentice Hall of India Pvt. Ltd., New Delhi (2003).*

Paper –X **PRACTICAL-II: MICROCONTROLLER AND INTERFACING**

(Any Sixteen experiments)

1. 8 – Bit Addition, Subtraction, Multiplication And Division
2. To Find The Biggest And Smallest Number
3. To Find An Ascending And Descending Order
4. Sum Of N Numbers
5. Blinking Of LED
6. Stepper Motor Interfacing
7. ADC Interfacing
8. DAC Interfacing
9. LCD Interfacing
10. DC Motor interfacing
11. Generate Square Using 8 – Bit Auto Reload Mode.
12. Frequency Measurement.
13. Up Counter And Down Counter
14. Temperature Measurement
15. Object Counting
16. Searching No. Of (05H) in a Given Data Series
17. Program to Convert Binary Number To BCD Number
18. Program to Convert Binary Number To ASCII Number
19. Program to Count Zero, Positive, Negative No. in agiven data series
20. Program to Find Out No. Of Even & Odd No. in agiven series