SEMESTER V

THEORY:

S.No	Subject Name	L	P	M
1.	Industrial Instrumentation – 1	4	0	100
2.	Linear and Digital Integrated Circuits	4	0	100
3.	Electronic Instrumentation	4	0	100
4.	Microprocessor and Microcontrollers	4	0	100
5.	Fundamentals of Digital Signal Processing	4	0	100
6.	Control Engineering.	4	0	100

PRACTICALS:

S.No	Subject Name	L	P	M
1.	Microprocessor Laboratory	0	3	100
2.	Electrical and Electronics Measurement Laboratory	0	3	100

SEMESTER V

INDUSTRIAL INSTRUMENTATION – I

1. MEASUREMENT OF FORCE TORQUE, VELOCITY
7

Electric balance – different types of load cells – magnets – elastics load cell-strain gauge load cell-different methods of torque measurement, strain gauge, relative regular twist-speed measurement-revaluation counter- capacitive tacho-drag up type tacho D.C and A.C tacho generators – stroboscope.

2. MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY
8

Accelerometers – LVDT, piezo-electric, strain gauge and variable reluctance type accelerometers – mechanical type vibration instruments – seismic instrument as an accelerometer and vibrometer – calibration of vibration pick ups – units of density, specific gravity and viscosity used in industries – Baume scale API scale – pressure head type densitometer – float type densitometer – ultrasonic densitometer Bridge type gas densitometer.

3. PRESSURE MEASUREMENT
12

Units of pressure – manometers – different types – elastic type pressure gauges – Bourdon type bellows – diaphragms – Electrical methods – elastic elements with LVDT and strain gauges – capacitive type pressure gauge –measurement of vacuum – McLeod gauge – thermal conductivity gauges – Ionization gauge cold cathode and hot cathode types – testing and calibration of pressure gauges – dead weight tester.

4. TEMPERATURE MEASUREMENT
9

Definitions and standards – primary and secondary fixed points – calibration of thermometers different types of filled in system thermometer – sources of errors in filled in systems and their compensation – Bimetallic thermometers – Electrical methods of temperature measurement – signal conditioning of industrial RTDs and their characteristics –3 lead and 4 lead RTDs.

5. THERMOCOUPLES AND PYROMETERS
9

Thermocouples – law of thermocouple – fabrication of industrial thermocouples – signal conditioning of thermocouple output – thermal block references functions – commercial circuits for cold junction compensation – response of thermocouple – special techniques for measuring high temperature using thermocouples – Radiation methods of temperature measurement – radiation fundamentals – total radiation and selective radiation pyrometers – optical pyrometer – two colour radiation pyrometer.

Total Hours

45

TEXT BOOKS

1.Ernest O.Doebelin, Measurement systems Application and Design, International Student Edition, IV Edition, McGraw Hill Book Company, 1998.

2.R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999.

REFERENCES

1. D.Patranabis, Principles of Industrial Instrumentation, Tata McGraw Hill Publishing Ltd., New Delhi, 1999.

2. A.K.Sawhney, A course in Electrical and Electronic Measurement and Instrumentation – Dhanpat Raj and Sons, New Delhi, 1999.

SEMESTER V

LINEAR & DIGITAL INTEGRATED CIRCUITS

1. FABRICATION OF INTEGRATED CIRCUITS 9

Crystal – growth – water preparation – epitoxy – vapour – phase, molecular – beam oxidation – oxide properties – induced defects – lithography – optical, reactive plasma etching and feature size control – models of diffusion in solids, in SiO_2 - diffusion enhancements and retardation – ion implementation – metallisation – packing – realisation of passive and active devices like, R, C, diodes, transistors in IC's.

2. LINEAR INTEGRATED CIRCUITS 9

Introduction to Linear IC – operational amplifiers – characteristics – application of op amp – arithmetic circuits, amplifier, rectifiers, op amp circuits using diodes – I, II order filters, waveform generators, using op amps – square, triangular and sine wave generation. Basic functional internal block diagram, characteristics and applications of following ICs: 555, 565, 566 LM 723 voltage regulator and current regulators.

3.DIGITAL INTEGRATED CIRCUITS 9

Designing combinational logic gates in CMOS – very high performance – Design of sequential logic circuits – arithmetic building blocks – design of memory and array structures

5.VLSI INTEGRATED CIRCUITS 9

Fundamental consideration – NMOS, CMOS, Bipolar IC technology – IC fabrication - assembly technique and packaging of VLSI devices – reliability requirements for VLSI – failure mechanisms and rates – future trends.

6. SPECIAL APPLICATION IC's 9

Functional Block diagram of ADC and DAC – Integrating ADC – Sigma Delta ADC – Study of successive approximation ADC MC0809 – Study of Integrating ADC ICL 7107 – Study of Sigma Delta ADC Ad7714 – Study of 8 bit DAC0800 –

Waveform Generation, V/F Conversion and FSK Generation using IC XR2206 – Serial port Driver Max 232 – Temperature Transducer AD590

Total Hours 45

TEXT BOOKS

1.Ramakant A, Gayakwad, OP-Amps and Linear Integrated Circuits 'Prentice Hall of India, New Delhi, 3rd Edition, 1997.
2.Roy Choudhury and Shail Jain, 'Linear Integrated Circuits', 1995.

REFERENCES

1. S.M.Sze, 'VLSI Technology', 2nd Edition, Tata McGraw-Hill Publishing Co., New Delhi, 1996.
2. Sergio Franco, 'Design with Operational Amplifiers and Analog and Integrated Circuits', 2nd Edition Tata McGraw Hill Publishing Co., New Delhi, 1997.
3. R.A.Gaya Kwad, 'Opamplifiers and Linear Integrated Circuits', Prentice Hall of India, New Delhi, 1995.
4. National Semiconductor/Texas – TTL/MOS/VLSI Data Manuals.

SEMESTER V

ELECTRONIC INSTRUMENTATION

1. ANALOG AND DIGITAL BUILDING BLOCKS 8

Linear and Digital IC's of different types – specifications of IC's such as LM 741, NE 555, LM 725, NE 565, 7400 series digital IC's.

2. POWER SUPPLIES 9

Fixed and variable power supplies – positive and negative voltage regulators – functional block diagram of typical regulator IC's – precision power supplies using IC's – current boosting circuits – protection circuits – tracking power supply.

3. ANALOG INSTRUMENTS 9

Cathode ray oscilloscope – general purpose and advanced types – sampling and storage scopes – A.C. millivolt meters of different types – wave analysers – signal and function generators – noise generator – frequency synthesizer distortion factor meter – Q meter – lock-in amplifier – Instrumentation amplifier – Programmable gain amplifier.

4. DIGITAL INSTRUMENTS 9

Digital voltmeters and multimeters – successive approximation and dual slope types of ADC – digital frequency counters – digital waveform generator – μp based DMM's with auto ranging and self diagnostic features – digital storage oscilloscopes – digital Q meter – digital IC tester – digital LCR meter.

5. DIGITAL DISPLAY AND RECORDING DEVICES 10

Bar graph display – seven segment and dot matrix displays – signal recorders – X-Y recorders – magnetic tape recorders – digital recording and data loggers

Total Hours 45

TEXT BOOKS

1.Cooper W.D., Electronic Instrumentation and measurement techniques, Prentice Hall of India, New Delhi, 1981.
2.Bouwens A.J., Digital Instrumentation, McGraw Hill Ltd., USA, 1992.
3. H S Kalsi, 'Electronic Instrumentation', Tata McGraw Hill Publishing Company Ltd, New Delhi (1995).

REFERENCES

1.Rangan, C.S., Sarma G.R. and Mani V.S.V., instrumentation devices and systems, Tata McGraw Hill, New Delhi.
2.Byers T.J., Electronic test Equipment: Principle and applications, McGraw Hill, USA 1987.
3.Oliver B.H., and Cage J.M., Electronics Measurements and Instrumentation, McGraw Hill, 1992.

SEMESTER V

MICROPROCESSORS AND MICROCONTROLLERS

1. ARCHITECTURE

9

General 8-bit microprocessor and its architecture – 8085 functional block diagram – architecture functions of different sections – architecture of 8086 CPU.

2. INSTRUCTION SETS

9

Instruction format-addressing addressing modes – instruction set of 8085 CPU – instruction cycle – timing diagrams – different machine cycles – fetch and execute operations – estimation of execution time.

3. ASSEMBLY LANGUAGE PROGRAMMING

9

Assembly format of 8085 – assembly directions – multiple precision arithmetic operations – binary to BCD and BCD to binary code conversion – ALU programming using look up table – stack and subroutines

4. DATA TRANSFER AND INTERFACING

9

Data transfer schemes – program I/O û interrupt structure of 8085 – interrupt driven I/O – DMA serial I/O – input/output ports – latches and buffers – peripheral interface IC's –

8212, 8255, 8251, 8279, 8259 – interfacing of A/D and D/A converters – RAM and ROM – memory devices – display devices – applications.

5. MICROCONTROLLERS **9**

Architecture of 8-bit micro controller (8051) – bus configuration – reset circuitry – power down considerations – instruction sets - programming exercises and micro controller's software design - development and troubleshooting tools – applications.

Total Hours **45**

TEXT BOOKS

1. Gaonkar R.S., Microprocessor architecture Programming and application, Wiley Eastern Ltd., New Delhi, 1995.
2. Kenneth Hint, and Daniel Tabak, Microcontrollers, Architecture, Implementation and Programming, McGraw Hill International, USA, 1992.

REFERENCES

1. Mathur A.P., Introduction of Microprocessors, Tata McGraw-Hill Publishing Co.Ltd, New Delhi, 1989.
2. John B.Peatman, Design with Microcontrollers, McGraw Hill International, USA, 1988.
3. Kenneth J.Aylal, The 8051 Microcontroller, Architecture and Programming applications.

SEMESTER V

FUNDAMENDALS OF DIGITAL SIGNAL PROCESSING

(COMMON for V-SEM BME, V SEM MECT,VI-SEM CSE ,V-SEM EIE,VI SEM EEE and VI-SEM IT)

1. DISCRETE – TIME SIGNALS AND SYSTEMS **9**

Sampling of Analogue signals – aliasing – standard discrete time signals – classification – discrete time systems – Linear time invariant stable casual discrete time systems – classification methods – linear and circular convolution – DFS,. Time response and frequency response analysis of discrete time systems to standard input signals. Z transform – Properties

2. DFT & FFT **9**

DTFT-Discrete Fourier transforms and Properties – Linear filtering- Fast Fourier transform (FFT) & DIT & DIF Algorithms.

3. IIR FILTER DESIGN **9**

Structure of IIR – System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance-Bilinear transformation – Design of IIR filter in the Frequency domain.

4. .FIR FILTER DESIGN **9**

Symmetric & Antisymteric FIR filters – Linear phase filter – Windowing technique – Rectangular, Kaiser Windows – Frequency sampling techniques – Structure for FIR systems.

5. SPECIAL TOPICS IN DSP **9**

Periodiogram - QMF filters -Principles of Multirate DSP-Interpolation - Decimation by Integer factor- Sub band coding - Polyphase rectification

Total Hours 45

TEXT BOOK:

1. John G.Proakis and Dimitus G.Manolakis, "Digital Signal Processing, Principles, Algorithms and applications, Prentice Hall of India, New Delhi 3rd edition, 2002.

REFERENCES:

1. Sanjit K.Mitra 'Digital Signal Processing', A Computer Based Approach, Tata McGraw-Hill, New Delhi, 1998.
2. Allan V. Oppenheim et al & Schaffer , " Discrete time signal Pr

SEMESTER V

CONTROL ENGINEERING

1. SYSTEMS AND THEIR REPRESENTATION **9**

Basic elements in control systems-open and closed loop systems – electrical analogy of physical systems – transfer function – AC and DC servomotors – block diagram reduction techniques – signal flow graph.

2. TIME RESPONSE **9**

Time response – time domain specifications – types of test inputs – I and II order system response – error coefficients – generalised error series – steady state error – PID controller response with and without I order system.

3. FREQUENCY RESPONSE **9**

Frequency response – definition – Bode plot – polar plot – constant M and N circles – Nichols chart – determination of closed loop response from open loop response.

4. STABILITY OF CONTROL SYSTEM **9**

Characteristic equation – location of roots in s-plane for stability – Routh Hurwitz criterion – root locus techniques – construction – gain margin and phase margin – Nyquist stability criterion.

5. CONTROL SYSTEM DESIGN **9**

Performance criteria – selection of controller modes – lag, lead, and lag-lead networks – compensator design for desired response.

Total Hours 45

TEXT BOOKS

1. Ogata K., Modern Control Engineering, Prentice Hall of India Ltd., New Delhi, 1995.
2. I.Gopal, and M.Nagrath, Control Systems, Wiley Eastern, Ltd., New Delhi, 1985

REFERENCES

1. Kuo B.C., Automatic Control Systems, Prentice Hall of India Ltd., New Delhi, 1995.
2. M.Gopal, Control Systems, Principles and Design, Tata McGraw-Hill Publishing Co., New Delhi, 1997.

SEMESTER V

PRACTICAL

MICROPROCESSOR LABORATORY

1. Familiarisation of 8085 microprocessor kit
2. Familiarisation of 8051 microcontroller kit
3. 8085 and 8051 assembly language programming exercises
4. Interfacing of switches and display devices
5. Interfacing of D/A and A/D converters
6. Interface of key board and display using programmable controllers
7. Interface of programmable timer
8. Stepper motor control using microprocessor
9. Simple 8086 assembly language programming exercises
10. Study of MASM and DEBUG utilities

Total Hours 45

SEMESTER V

ELECTRICAL AND ELECTRONIC MEASUREMENTS LAB

1. Use of Wheatstone bridge as resistance to voltage converter and to determine its sensitivity for various ratios
2. Kelvin's double bridge
3. Determination of critical damping resistance of a D'Arsonval Galvanometer
4. Tests on a single-phase energy meter
5. Calibration of wattmeter at different power factors
6. Testing of current transformers
7. Calibration of ammeter, voltmeter and wattmeter using student type potentiometer
8. Design, construction and calibration of series and shunt type ohmmeters
9. Operational amplifier applications
10. Regulated power supply using fixed voltage IC regulators and LM 723
11. Study of feedback in amplifiers
12. RC phase shift and Wien bridge oscillator.

Total Hours 45