M.TECH. ELECTRICAL ENGINEERING (INSTRUMENTATION & CONTROL)
(1ST SEMESTER)

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
MELE2-101	Advance Transducer Technology	4	0	0	40	60	100	4
MELE2-102	Discrete Time Control Systems	4	0	0	40	60	100	4
MELE2-103	Digital Speech and Image Processing	4	0	0	40	60	100	4
MELE2-104	Software Lab	0	0	2	60	40	100	1
Departmental Elective-I (Choose any one)		4	0	0	40	60	100	4
MELE2-156	Industrial Automation & Process Control							
MELE2-157	Instrumentation Devices and Control							
MELE2-158	Modern Industrial Drives and Control							
MELE2-159	Computational Intelligence							
Departmental Elective-II (Choose any one)		4	0	0	40	60	100	4
MELE2-160	Optical and Laser Instrumentation							
MELE2-161	Real Time Instrumentation Techniques							
MELE2-162	Biomedical Instrumentation							
MELE2-163	Microprocessors & Embedded Control							
Total 5 Theory & 1 Lab. Courses		**20**	**0**	**2**	**260**	**340**	**600**	**21**

TOTAL CONTACT HRS. = 22, TOTAL CREDITS = 21

ADVANCED TRANSDUCER TECHNOLOGY

Subject Code: MELE2-101 **L T P C** **Duration: 40 Hrs.**
4 0 0 4

UNIT I

1. Introduction to Transducers and Its Classification (10 Hrs.)

Characteristics of Transducers. Selection Criteria of Transducers. Errors in measurement. Types of errors – Statistical analysis of measurement data – Mean, Standard Deviation, Probability errors.

UNIT II

2. Variable Resistance transducers and its types (10 Hrs.)

Concept of Three Wire and Four Wire RTDs. Potentiometers, strain gauges, resistance thermometers, thermistors, hotwire anemometers, Variable Inductance and variable capacitance transducers. Piezoelectric, Magnetostrictive, Electromagnetic transducers, thermo-electric sensor, semiconductor temperature sensors. Force balance transducers.

UNIT III

3**. Analog Signal Conditioning techniques (10 Hrs.)**

Bridge Amplifier, Carrier Amplifiers, Charge Amplifiers and Impedance Converters, Modulation and demodulation Techniques, dynamic compensation, linearization, multiplexing and demultiplexing.

UNIT IV

4. Digital Interfacing Techniques (10 Hrs.)

Interfaces, processors, code converters, liberalizers. Single transmission .Cable transmission of analog and digital signal, fiber optic signal transmission, radio, telemetry, pneumatic transmission. Signal Display/Recording systems. Graphic display systems, storage oscilloscope, recorders-ink, thermal, UV. Smart Sensors.

Recommended Books:

1. Doeblin, E.O. – Measurement Systems: Application and Design, Mc Graw Hill International.
2. Patranabis, D – Sensors and Transducers, Wheeler Pub., New Delhi.
3. Murthy, D.V.S., Transducers and Instrumentation, PHI, New Delhi.
4. Swobada, G. – Telecontrol: Methods and Applications of Telemetry and Remote Control. Van Nostrand.
5. Newbert, H. K. – Instrument Transducers, Oxford University Press.

DISCRETE TIME CONTROL SYSTEMS

Subject Code: MELE2-102 **L T P C** **Duration: 40 Hrs.**
4 0 0 4

UNIT I

1. Introduction (10 Hrs.)

Configuration of the basic Digital Control Systems, types of sampling operations, Sample and Hold operations, Sampling theorem, Basic discrete time signals'-Transforms, Properties of Z-Transform, Inverse Z-Transforms, Pulse Transfer Function, Difference equations, Z-Transform method for solving the difference equations, Block diagram and signal flow graph analysis, Time response of digital control systems .

UNIT II

2. **Stability Methods (10 Hrs.)**: Mapping between s-plane and z-plane, stability methods: Modified Routh Criterion, Jury's method, and modified Schur-Cohn criterion. State variable representation, conversion of state variable models to transfer function and vice-versa, Eigen values and Eigen vectors, Solution of state equations, Concepts of controllability and observability.

UNIT III

3. Models of Digital Control Systems (10 Hrs.): Digital temperature control System, Digital position control system, stepping motors and their control. Design of Digital compensator using frequency response plots.

UNIT IV

4. State Variable analysis of Digital Control Systems (10 Hrs.): State variable description of digital control systems , conversion of state variable models to pulse transfer function and vice versa , solution of state difference equations, controllability and observability.

Recommended Books:

1. M. Gopal, Digital Control and State Variable Methods, Tata Mc-Graw-Hill.
2. K. Ogata, Discrete Time Control Systems, Pearson Education, (Singapore) (Thomson Press India).
3. B.C. Kuo, Digital Control Systems, Prentice Hall.
4. I.J. Nagrath & M. Gopal, Control System Engg., John Wiley & sons.
5. K.K. Aggarwal, Control System Analysis and Design, Khanna Publishers

DIGITAL SPEECH AND IMAGE PROCESSING

Subject Code: MELE2-103 **L T P C** **Duration: 40 Hrs.**
4 0 0 4

UNIT I

1. Review of Filter design (10 Hrs.)

Linear phase FIR filters. Methods of FIR filter design. Methods of IIR filter design. Applications of FIR &IIR filters in speech, image, seismic, medical and other areas.

UNIT II

2. Speech Processing Review of human speech (10 Hrs.)

Acoustic theory, nature of sound, harmonics, resonance measurement, virtual display. Music theory, pitch, duration, intervals, rhythm. Human speech production, the vocal tract, the Larynx, the source filter. Speech signal processing-the phasor mode, Fourier transfer, DFT, FFT. The hardware use of FIR & IIR filters. Software, Elements of speech Synthesis-speech Recognition-speech in the computer-human interface.

UNIT III

3. Image Processing Characterization (10 Hrs.)

Image Processing Characterization of images as two-dimensional discrete fields, unitary transforms—DFT. Hadamard, slant and cosine transforms, compression schemes-Karhunen Loeve compression predictive coding schemes.

UNIT IV

4. Image Enhancement (10 Hrs.)

Gray scale modification, edge enhancement, restoration-Wiener filtering, constrained deconvolution, recursive filtering. Segmentation, edge detection, thresholding, textural properties, geometry and shape description.

Books Recommended:

1. Digital Signal Processing - by Proakis & Manolakis
2. Speech and Audio Processing for multimedia PC's - by Iain Murray
3. Digital Image Processing - by Keenneth R. Castleman, Pearson Education Society.
4. Digital Image Processing - by Rafact Gonzalez and Richard E. Woods, Pearson.

SOFTWARE LABORATORY

Subject Code: MELE2-104 **L T P C** **Duration: 45 Hrs.**
0 0 2 1

Development of algorithms & flowcharts and digital simulation of the following

using MATLAB Software package:

1) Transfer Function from ZEROS & POLES.
2) Transfer Function from POLES & ZEROS.
3) Step, Impulse and Ramp response of a Transfer Function.
4) Transfer Function of a DC Motor.
5) Root Locus from a Transfer Function.
6) Bode Plot from a Transfer Function.
7) Transfer Function from a State Model.
8) State Model from Transfer Function.
9) Zeros and Poles from State Model.
10) PID Controller
11) LEAD, LAG, LEAD-LAG Compensator
12) Nyquist Plot from a Transfer Function.
13) Filter Circuits
14) Simulation of a Closed Loop System

ELECTIVE I: INDUSTRIAL AUTOMATION & PROCESS CONTROL

Subject Code: MELE2-156 **L T P C** **Duration: 40 Hrs.**

4 0 0 4

UNIT I

1. Introduction to Industrial Automation, Automation Strategy (12 Hrs.)

Introduction to Industrial Automation, Role of automation in industries, Introduction to the types of manufacturing industries, Introduction to type of automation system, Benefits of automation. Introduction to automation tools like PAC, PLC, SCADA, DCS, Hybrid DCS with reference to automation pyramid, Comparison of PLC, PAC, and SCADA on the basis of Performance criteria Control system audit, Performance criteria, Development of User Requirement Specifications (URS) for automation. Functional Design Specifications (FDS) for automation tools.

UNIT II

2. Instrumentation Standard Protocols (8 Hrs.)

Definition of protocol, Introduction to Open System Interconnection (OSI) model, Communication standard (RS232, RS485), Modbus (ASCII/RTU), Introduction to third party interface, concept of OPC (Object linking and embedding for Process Control), HART Protocol: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation. Foundation Fieldbus H1: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation. Comparison of HART, Foundation Fieldbus, Devicenet, Profibus, Controlnet, Industrial Ethernet.

UNIT III

3. **PLC Configuration (10 Hrs.)**

Applications and Machine automation PLC programming methods as per IEC 61131, Developing programs using Sequential Function Chart, Functional Block Diagram, Analog control using PLC (PID controller configuration), Interfacing PLC to SCADA/DCS using communication link (RS232, RS485) , Protocols (Modbus ASCII/RTU) and OPC, Development stages involved for PLC based automation systems. Introduction to Computer Numerically Controlled (CNC) Machines, Basic CNC Principle, servo control, types of servo control for motion axes, Control system of CNC, Introduction to G-code.

UNIT IV

4. Distributed Control System (10 Hrs.)

Basics DCS introduction, Various function Blocks, DCS components/block diagram, DCS Architecture of different makes, comparison of these architectures with automation pyramid, DCS specification, latest trend and developments, DCS support to Enterprise Resources Planning (ERP), performance criteria for DCS and other automation tools.

Books Recommended:

1.The management of control system: Justification and Technical Auditing, N.E. Bhttiha, ISA

2.Computer aided process control, S.K. Singh, PHI.

3.Understanding Distributed Process Systems for Control, Samuel Herb, ISA.

4.Programmable Logic Controllers: Principles and Applications, Webb &Reis, PHI.

5.Introduction to Programmable Logic Controllers, Garry Dunning, Thomson Learning.

6.Distributed computer control for industrial automation, Ppovik Bhatkar, Dekkar Pub.

7.Computer Based Process control, Krishna Kant, PHI

8.Mechatronics, HMT, TMH publication.

INSTRUMENTATION DEVICES & CONTROL

Subject Code: MELE2-157 **L T P C** **Duration: 40 Hrs.**

4 0 0 4

UNIT I

1. Process characteristics (10 Hrs.)

Incentives for process control, Process Variables types and selection criteria, Process degree of freedom, The period of Oscillation and Damping, Characteristics of physical System: Resistance, Capacitive and Combination of both. Elements of Process Dynamics, Types of processes- Dead time, Single /multicapacity, self-Regulating /non self-regulating, interacting non interacting, Linear/non-linear, and Selection of control action for them. Study of Liquid Processes, Gas Processes, Flow Processes, Thermal Processes in respect to above concepts.

UNIT II

2. Analysis of Control Loop (10 Hrs.)

Steady state gain, Process gain, Valve gain, Process time constant, Variable time Constant, Transmitter gain, Linearizing an equal percentage valve, Variable pressure drop. Analysis of Flow Control, Pressure Control, Liquid level Control, Temperature control, SLPC-features, faceplate, functions, MLPC- features, faceplate, functions, SLPC and MLPC comparison. Scaling: types of scaling, examples of scaling

UNIT III

3. Feedback Control (10 Hrs.)

Basic principles, Elements of the feedback Loop, Block Diagram, Control Performance Measures for Common Input Changes, Selection of Variables for Control Approach to Process Control. Factors in Controller Tuning, Determining Tuning Constants for Good Control Performance, Correlations for tuning Constants, Fine Tuning of the controller tuning Constants. The performance of feedback Systems, Practical Application of Feedback Control: Equipment Specification, Input Processing, Feedback Control Algorithm, Output Processing.

UNIT IV

4. Multi Loop & Nonlinear Systems (10 Hrs.)

Cascade control, Feed forward control, feedback-feedforward control, Ratio control, Selective Control , Split range control- Basic principles, Design Criteria , Performance, Controller Algorithm and Tuning, Implementation issues, Examples and any special features of the individual loop and industrial applications. Nonlinear Elements in Loop: Limiters, Dead Zones, Backlash, Dead Band Velocity Limiting, Negative Resistance, Improvement in nonlinear process performance through: Deterministic Control Loop Calculations, Calculations of the measured variable, final control element selection, cascade control design, Real time implementation issues. Multivariable Control: Concept of Multivariable Control: Interactions and its effects, Modelling and transfer functions, Influence of Interaction o the possibility of feedback control, important effects on Multivariable system behavior Relative Gain Array, effect of Interaction on stability and Multiloop Control system. Multiloop control Performance through: Loop Paring, tuning, Enhancement through Decoupling, Single Loop Enhancements.

Books Recommended:

1. Donald Eckman – Automatic Process Control, Wiley Eastern Limited

2. Thomas E Marlin - Process Control- Designing processes and Control Systems for Dynamic Performance, McGraw-Hill International Editions
3. Process control Systems-F.G. Shinskey, TMH
4. Computer Based Industrial Control –Krishna Kant, PHI
5. Handbook of Instrumentation -Process control –B.G. Liptak, chilton
6. Fundamentals of Process Control - Murrill ISA
7. Chemical Process Control- Stephanopoulos George, PHI
8. Applications concepts of Process control- By Murrill ISA

ELECTIVE I: MODERN INDUSTRIAL DRIVES AND CONTROL

Subject Code: MELE2-157 **L T P C** **Duration: 40 Hrs.**
4 0 0 4

UNIT-I

1. **Selection of Motors (10 Hrs.)**

Introduction, selection of drive, rating of motors, speed – torque characteristics of various types of loads & drive motors, starting braking and reversing operations.

UNIT-II

2. DC Drives (10 Hrs.)

Speed control of DC motors – Thyristor converter fed DC drives: Single, two and four quadrant operations. Chopper Drives – control strategies, operation of step-up and step-down choppers, chopper configuration – operation of class A, B, C, D & E.

UNIT-III

3. AC Motor Drives (10 Hrs.)

Speed control of Induction motors – Stator control – stator voltage and frequency control, AC chopper, Inverter cycloconverter fed induction motor drives. Rotor control – Rotor resistance control and slip-power recovery schemes, static control of rotor resistance using DC chopper, static kramer and scherbius drives, cycloconverter fed drives. Speed control of 3-phase synchronous motors – VSI & CSI fed synchronous motors, cyclo converter fed synchronous motors. Effects of harmonics on the performance of AC motors PWM inverter fed synchronous motors construction, principle of operation and drive circuits of variable reluctance stepper motors.

UNIT-IV

4. Microprocessors In The Control Of Electric Drives (10 Hrs.)

Applications of microprocessors on electrical variable speed drive – d.c. motor speed control, Induction motor speed control, synchronous motor speed control using a microprocessor.

Books Recommended:

1. Dubey G.K. and Kasarabada Rao., Power Electronic and Drives, Narosa Publications, 1986.
2. Vedam Subramaniyam, Thyristor control of Electric drives, Tata McGraw Hill Publishing Ltd, 1998.
3. Vedam Subramaniyam, Electric Drives, Tata McGraw Hill Ltd, 1994.
4. 2. Pillai S.K., A First course on Electric Drives, Wiley Eastern Ltd, 1989.
5. Singh M.D., Power Electronics, Tata McGraw Hill, N.D.,1998.
6. Dubey G.K., Power Semiconductor controlled Drives, PHI, 1986.

ELECTIVE I: COMPUTATIONAL INTELLIGENCE

Subject Code: MELE2-159 **L T P C** **Duration: 40 Hrs.**

4 0 0 4

UNIT I

1. Introduction (10 Hrs.)

Definition of Artificial Intelligence, History and Applications, Production Systems, database programs Vs expert systems, Components of AI.AI ALGORITHMS Structures and Strategies for state space search- Data driven and goal driven search , Depth First and Breadth First Search, DFS with Iterative Deepening ,Heuristic Search- Best First Search, A* Algorithm, AO* Algorithm, Constraint Satisfaction, Using heuristics in games- Minimax Search, Alpha Beta Procedure.

UNIT II

2. Knowledge Representation (10 Hrs.)

Knowledge representation - Propositional calculus, Predicate Calculus, Theorem proving by Resolution, Answer Extraction, AI Representational Schemes- Semantic Nets, Conceptual Dependency, Scripts, Frames, Introduction to Agent based problem solving.

UNIT III

3. Neural Networks (10 Hrs.)

Neural networks characteristics, History of development in neural networks principles, artificial neural net terminology , Model of a neuron, Topology, Learning, types of learning, Supervised, Unsupervised, Re-enforcement learning. Knowledge representation and acquisition. Radial basis function neural networks ,Basic learning laws in RBF nets, Recurrent back propagation, Introduction to counter propagation networks, CMAC network and ART networks.

UNIT IV

4. Basic Hop filed model (10 Hrs.)

Basic learning laws, Unsupervised learning, Competitive learning, K-means clustering algorithm, Kohonen's feature maps. Application of neural nets such as pattern recognition, Optimization, Associative memories, speech and decision-making. VLSI implementation of neural networks.

Text Book

1. George.F. Luger, Artificial Intelligence- Structures and Strategies for Complex Problem Solving, 4/e, 2002, Pearson Education.
2. E. Rich, K. Knight, Artificial Intelligence, 2/e, Tata McGraw Hill
3. Neural Networks by Simon Hayken

OPTICAL AND LASER INSTRUMENTATION

Subject Code: MELE2-160 **L T P C** **Duration: 40 Hrs.**
4 0 0 4

UNIT 1

1. Laser fundamentals (10 Hrs.)

Laser types and Laser safety, Properties of laser, Laser modes- axial and transverse, single mode operation. Frequency stabilization. Mode locking, Mode hopping, Q-switching techniques. Classes of lasers: Doped insulator lasers, Semiconductor lasers, Gas lasers, Liquid Dye lasers. Laser safety: Biological effects, safety standards, risk of exposure, laser hazard classification and assessment, laser safety system, safe industrial laser laboratory, laser eye protection, laser accidents.

UNIT 2

2. LASER Telemeters (10 Hrs.)

Three main techniques for optical measurement of distance: Triangulation, time-of-flight telemeter and interferometer. Pulse telemeter, Sine-wave telemeter, Imaging telemeter, the LIDAR.

UNIT 3

3. Laser Interferometry and Speckle Pattern Instruments (10 Hrs.)

Laser Interferometry: Basic Optical Interferometers, Performance parameters, Ultimate limits of performance, Laser vibrometry- short distance, medium distance and long distance vibrometry. Injection Interferometry, white light Interferometry. Speckle pattern instruments: Speckle properties, speckle in single point interferometers and electronic speckle pattern Interferometry.

UNIT 4

4. Laser Doppler Velocimetry (10 Hrs.)

Principle of operation, performance parameters: Scale factor relative error, Accuracy of the Doppler Frequency, Size of sensing region, alignment and positioning errors etc. Electronic processing of the Doppler signal: Time domain and Frequency domain processing. Optical configurations. Laser Gyroscopes and basic gyro configurations. Basic principles of Holography, viewing a hologram, volume hologram, multiplex hologram, white light reflection hologram. Measurement of strain, stress, bending moments and vibration by Holography, non destructive testing, medical and dental research, solid mechanics.

Books Recommended:

1. Optoelectronics, J. Wilson, Prentice-Hall of India.

2. Electro-Optical Instrumentation, Silvano Donati, Pearson Education, Inc., 2004.

3. Holographic Interferometry, Charles M. Vest, John Wiley & sons, 1979.

4. Laser electronics, Joseph T. Verdeyen, Prentice-Hall of India Pvt. Ltd., second edition, -1993

ELECTIVE II: REAL TIME INSTRUMENTATION TECHNIQUES

Subject Code: MELE2-161 **L T P C** **Duration: 40 Hrs.**
4 0 0 4

UNIT 1

1. INTRODUCTION (10 Hrs.)

Static and Dynamic characteristics, Error analysis; transducers and sensors; their characteristics and parameters; role of instrumentation in monitoring, control and industrial automation.

UNIT 2

2. SIGNAL CONDITIONING (10 Hrs.)

Amplifiers, multiplexers and dividers, timer multiplexers, Signal converters, ADC and DAC, Signal conditioning, digital signal conditioning, transmission of digital signals, Telemetry methods and errors, PLCC, AM, FM, PAM, PWM, PCM Techniques.

UNIT 3

3. DATA ACQUISITION SYSTEM (10 Hrs.)

Role of dedicated computers, analog and digital control, computer systems for real time applications, distributed and supervisory control, SCADA and its organization and structure, centralized, hierarchical and decentralized control schemes, man machine interface, energy management system.

UNIT 4

4. REAL TIME CONTROL APPLICATIONS (10 Hrs.)

Instrumentation and conditioning of drive signals, data acquisition of drive system, energy management system for AGC, VAR Control, state estimation, security monitoring, economic dispatch, on line load management. Power system digital relaying, Power plant instrumentation.

Books Recommended:

1. Torsten Cegrell, Power System Control Technology, PHI, India.

2. Kusic C. L., Computer Aided Power System Analysis, TMH, New Delhi.

3. Wood A. J. and Wollenberg B., Power generation operation and control, John Wiley.

4. Cerni R.H. and Foster L.E., Instrumentation for Engineering Management, John Wiley and Sons.

ELECTIVE II: BIOMEDICAL INSTRUMENTATION

Subject Code: MELE2-162 **L T P C** **Duration: 40 Hrs.**

4 0 0 4

UNIT 1

1. Life Saving Devices (10 Hrs.)

Pacemaker, Types of pacemakers: External & Internal, Defibrillators: AC & DC Defibrillator, Heart Lung Machine, Elements of Intensive Care Monitoring: Drug Delivery System, ICU layout: Organization Operating Room Instrumentation: Electro surgical Unit, Anesthesia Machine.

UNIT 2

2. Clinical Lab Instrumentation (10 Hrs.)

Blood and its composition and function, Blood Cell Counters, Electrophoresis, Pulse Oximetry, Conventional and Automated, Auto analyzers. Introduction to telemetry & Telemedicine, The Health Level 7 protocol-implementation block diagram.

UNIT 3

3. Imaging Systems (10 Hrs.)

Ray properties, Generation of X-rays, block diagram of X- Ray machine, image intensifier, Draw back of x-ray imaging, CT Scanning, basic CT scanning system, Types of gantries, gray scale [Hounsfield No.], image reconstruction techniques in tomography, image artifacts. Advanced Imaging Systems: Radionuclide Imaging: Rectilinear Scanner, Scintillation Camera, Positron Emission Tomography, Single Photon Emission Computed Tomography , Ultrasound Imaging: Fundamentals of Acoustic propagation, Ultrasonic transducers and frequencies, A, B, M Scan and Echocardiography, Introduction to MRI & Thermography. Kidney Instrumentation: Kidney Structure, Regulation of Water and Electrolyte Balance, Artificial Kidney-types (Coil type, parallel plate Type), Dialysis System, Lithotripsy.

UNIT 4

4. Laser applications in Medicine (10 Hrs.)

Types of Lasers, Properties of Laser, Interaction of Lasers with Tissues -Thermal and Non thermal, Basic Endoscopes system & its characteristics, Laser Applications in ophthalmology- Diabetic Retinopathy , Glaucoma and Retinal hole and detachment treatment , Dermatology- Tattoo, port wine treatment Pain relief Instrumentation: Diathermy: short wave, Microwave, Ultrasound diathermy,Concept of Rehabilitation Engineering: Orthrotics & Prosthetic devices, overview of various orthotics & prosthetic devices along with its materials. Wheelchair Types, Materials used in wheelchair, Joysticks used in wheelchair.

Books Recommended:

1.Medicine and Clinical Engineering By Jacobsons & Webster, PHI
2.Introduction to Biomedical Equipment Technology By Carr & Brown
3.Biomedical Instrumentation and Measurements By Cromwell, PHI
4.Handbook of Biomedical Instrumentation by R. S. Khandpur, TMH
5.The Biomedical Engineering Handbook, Bronzino, IEEEPress
6.Applied Chemical Engineering Feenberg,
7.Principles of Medical Imaging. -By: K. Kirk Shung, Michael B. Smith, Benjamin Tsui.-Pub: Academic Press.

8.Medical Laser Applications -By Carruth
9.Medical Lasers & their safe Use - By Sliney & Troka

ELECTIVE II: MICROPROCESSORS AND EMBEDDED CONTROL

Subject Code: MELE2-163 **L T P C** **Duration: 40 Hrs.**
4 0 0 4

UNIT 1

1. Microprocessor 8086 (10 Hrs.)

Architecture, PIN Diagram, BIU and EU, memory addressing, Clock generator 8284, buffers and latches, maximum and minimum modes.

UNIT 2

2. Addressing modes of 8086 (10 Hrs.)

Assembly language Programming, Assemblers and Procedures, Macros, Interrupts. Interfacing of 8086: IC 8155 (Static RAM with ports and timers), 8755 (EPROM with I/O ports), 8251A (USART), 8255 A, 8253/8254,8257 and 8259 controllers.

UNIT 3

3. Introduction to microcontrollers (10 Hrs.)

Architectures, Pin Diagram, I/O ports, Internal RAM and registers, Interrupts, addressing modes, memory organization and external addressing, Instruction set. Interfacing with LCD, ADC, DAC, Stepper motor, Key Board and sensors.

UNIT 4

4. Embedded Systems (10 Hrs.)

Introduction, Classification, Processors, Hardware units, Software embedded into systems, applications and products of embedded systems, Structural Units in processor, Memory Devices, I/O Devices, Buses, Interfacing of Processor memory and I/O devices. Case Study of an embedded system for a smart card.

Books Recommended:

1. The 8051 Microcontroller and Embedded Systems using Assembly and C, Mazidi, Mazidi & McKinlay, PHI.
2. Programming and Customizing the 8051 Micro-controller, Myke Predko, Tata McGraw-Hill edition.
3. Fundamentals of Microcontrollers and Applications in Embedded Systems (with the PIC18

Microcontroller Family), R. A. Gaonkar, Penram Publishing India. Embedded Systems, Shibu K, Tata McGraw Hill Publishing, New Delhi 2009.

4. The Intel Microprocessors 8086/8088, 8086, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and interfacing, Barry B. Brey, Prentice Hall of India Private Limited, New Delhi, 2003.

5. Design with Microcontroller, John Peatman, McGraw Hill Publishing Co Ltd, New Delhi.