

## Semester 6

### Theory

<b>S.no</b>	<b>Subject name</b>	<b>L</b>	<b>P</b>	<b>M</b>
01	Database Management System	4	0	100
02	Design of Mechatronics System	4	0	100
03	Digital Signal Processing	4	0	100
04	Hydraulics and pneumatics controls	4	0	100
05	Microcontroller and Applications	4	0	100
06	Programmable Logic Control	4	0	100

### Practical

<b>S.no</b>	<b>Subject name</b>	<b>L</b>	<b>P</b>	<b>M</b>
07	Digital Micro Controller and PLC Lab	0	3	100
08	Hydraulics and Pneumatics Control Lab	0	3	100

## Semester VI

### Microcontroller and Applications

4 0 100

#### UNIT I

(9)

8051 Architecture: Comparison of Microprocessors and Microcontrollers - A Microcontroller Survey – 8051 Microcontroller Hardware- I/O Pins, Ports - External memory - Counters and Timers - Serial data I/O - Interrupts.

#### UNIT II

(9)

8051 Assembly Language Programming: Instruction set of 8051 Addressing modes Data transfer Instructions Arithmetic and Logical Instructions Jump and Call Instructions Interrupts and Returns Interrupt handling.

#### UNIT III

(9)

8051 Microcontroller Design: 8051 Microcontroller Specification 8051 Microcontroller System Design Testing the Design Timing Subroutines Look up Tables Serial Data Transmission.

#### UNIT IV

(9)

8051 Microcontroller Applications I: Interfacing of Keyboards Interfacing of Display Devices Pulse measurement Analog to Digital and Digital to Analog Converter Interfacing Hardware Circuit Multiple Interrupts.

#### UNIT V

(9)

8051 Microcontroller Applications II: Serial Data Communication Introduction - Network Configuration -8051 Data communication modes A Complete 8051 Microcontroller based System Design: Interfacing of alphanumeric LCD display and keyboard.

**TOTAL HOURS:45**

#### TEXT BOOKS:

1.Kennath J. Ayala. The 8051 Microcontroller Architecture, Programming and Applications , Penram International publishing (India), Second Edition, Mumbai, 1996.

## **REFERENCE BOOKS:**

1. B.P. Singh, Microprocessors and Microcontrollers, Galcotia Publications (P) Ltd, First edition, New Delhi, 1997.
2. Embedded Controller Hand book, Intel Corporation, USA.

## Semester VI

### Programmable Logic Control

4 0 100

#### UNIT I

(9)

Programmable Logic Introduction, programmable Logic structures Programmable Logic Arrays (PLAs), Programmable Array Logic (PALs), Programmable Gate Arrays (PGAs), Field Programmable Gate Arrays (FPGAs) Sequential network design with Programmable Logic Devices (PLDs) Design of sequential networks using ROMs and PLAs Traffic light controller using PAL.

#### UNIT II

(9)

Programmable Logic Controllers (PLCs) Introduction Parts of PLC Principles of operation PLC sizes PLC hardware components I/O section Analog I/O section Analog I/O modules, digital I/O modules CPU Processor memory module Programming devices Diagnostics of PLCs with Computers.

#### UNIT III

(9)

PLC programming Simple instructions Programming EXAMINE ON and EXAMINE OFF instructions Electromagnetic control relays Motor starters Manually operated switches Mechanically operated and Proximity switches Output control devices Latching relays PLC ladder diagram Converting simple relay ladder diagram in to PLC relay ladder diagram.

#### UNIT IV

(9)

Timer instructions ON DELAY timer and OFF DELAY timer counter instructions Up/Down counters Timer and Counter applications program control instructions Data manipulating instructions math instructions.

#### UNIT V

(9)

Applications of PLC Simple materials handling applications Automatic control of warehouse door Automatic lubricating oil supplier Conveyor belt motor control Automatic car washing machine Bottle label detection Process control application.

**TOTAL HOURS:45**

#### **Text Books:**

1. Charles H. Roth, Jr " Fundamentals of Logic Design ", Fourth Edition, Jaico Publishing house, 1999,

2. Frank D. Petruzella " Programmable Logic Controllers ", McGraw- Hill book, company, 1989
3. Siemens " PLC Handbook ".

**References:**

1. William I. Fletcher " An Engineering Approach to Digital Design ", Prentice, Hall of India Ltd., New Delhi, 1999.

## Semester VI

### Digital Signal Processing

4 0 100

#### **INTRODUCTION: (9)**

Characterization and classification of signals - examples of signals - multichannel - multi-dimensional - continuous versus discrete - analog versus digital - concept of frequency. Concepts of signal processing – typical applications - advantages of digital signal processing compared with analog processing.

#### **DISCRETE TIME SYSTEMS (9)**

Representations - classifications - time domain and frequency domain characterization - transfer functions - Z- transform and applications.

#### **FREQUENCY ANALYSIS OF SIGNALS (9)**

Analysis of analog and discrete signals - using Fourier series, Fourier transform, Fourier transform of discrete sequence and discrete Fourier transform - properties of transforms - computation of discrete Fourier transforms - Radix 2. FFT algorithms.

#### **DIGITAL PROCESSING OF CONTINUOUS SIGNALS (9)**

Sampling of continuous signals - analog filter design - anti aliasing filters - sample and hold circuit - reconstructing filters - analog to digital and digital to analog converters.

#### **DIGITAL FILTERS (9)**

Discrimination of analog filters - direct discrete design - IIR and FIR structures - window functions – filter realization - introduction to digital signal architecture.

**TOTAL HOURS:45**

#### **Text Books:**

1. S.K. Mitra, " Digital signal processing - A Computer based approach ", Tata McGraw - Hill Edition,1998.

#### **References:**

1. Lonnie C. Lumen, " Fundamentals of Digital Signal Processing ", John Wily and Sons, 1987.
2. J.G. Prookis and D.G.Manolakis, " Introduction to Digital Signal Processing ", Macmillan Publishing company, 1989.
3. Oppenheim and Schafer, " Discrete Time Signal Processing ", Prentice Hall of India, 1992.
4. R.G.Lyons, " Understanding Digital Signal Processing ", Addison Wesley, 1997.

## Semester VI

### Database Management System

4 0 100

**INTRODUCTION: (9)**

Introduction to File and Database System-Database system Structure-Data Models-E.R Model.

**RELATIONAL MODEL: (9)**

Relational model-relational algebra and calculus -commercial query language-security and integrity-functional dependency -normalization-relational data bases design.

**ADVANCED CONCEPTS: (9)**

Query processing-crash recovery-concurrency control-distributed databases-file and system structures-indexing and hashing.

**OTHER DATABASES: (9)**

Hierarchical model-network model -active and deductive data bases -temporal databases-parallel databases-multimedia databases.

**CURRENT TRENDS: (9)**

Object oriented databases-design of object oriented databases-data warehousing-data warehousing-data mining- association rules-application of data mining -classification and prediction -XML-case studies.

**TOTAL HOURS:45**

**Text Book:**

- 1.Ramez Elmasri,SHamkant B.Navathe."Fundamentals of database system" 3rd Edition.Addison wesley,McGrawHill,2000.
- 2.Araham sillerschatz,Henry F.Korth and S.Sudharshan" Database system concepts" 4th Edition.2002

**Reference:**

- 1.C.J.Date,"Introduction to database systems" Addison Wesley,7th Edition,2001.
- 2.Hector Gracla-Molina , J.D.Ullman and J.Widom,"Database System Implementation", Addison Wesley,2001.
- 3.J.D.Ullman,J.Widom,"A first Course in Database Systems",Addison Wesley,2001.

4. Raghu Ramakrishnan, "Database Management Systems", McGraw Hill, publishing company, 1998.
5. Jan L. Harrington, "Object oriented database design" Harcourt India private limited, 2000.
6. Jiawei Han, Michaline Kamber, "Data Mining concepts and techniques", Harcourt India Private Limited, 2001.

## Semester VI

### Hydraulic and Pneumatic Controls

4      0      100

**BASIC PRINCIPLES:** (9)

Hydraulic Principles - Hydraulic pumps - Characteristics - Pump Selection - Pumping Circuits – Hydraulic Actuators - Linear Rotary - Selection - Characteristics - Hydraulic Valves - Pressure - Flow - Direction Controls - Applications - Hydraulic Fluids-Symbols.

**HYDRAULIC CIRCUITS:** (9)

Hydraulic circuits - Reciprocating - Quick return - Sequencing synchronizing - Accumulator circuits – Safety circuits - Industrial circuits - Press - Milling Machine - Planner - Fork Lift, etc.

**DESIGN & SELECTION:** (9)

Design of Hydraulic circuits - Selection of components.

**PNEUMATIC SYSTEMS:** (9)

Pneumatic fundamentals - Control Elements - Logic Circuits - Position - Pressure Sensing - Switching – Electro Pneumatic - Electro Hydraulic Circuits - Robotic Circuits.

**DESIGN & SELECTION:** (9)

Design of Pneumatic circuits - Classic-Cascade-Step counter - Combination -Methods - PLC- Microprocessors -Uses - Selection criteria for Pneumatic components - Installation and Maintenance of Hydraulic and Pneumatic power packs - Fault finding - Principles of Low Cost Automation - Case studies.

**TOTAL HOURS:45**

**Text Books:**

1. J.Michael, Pinches and John G.Ashby, " Power Hydraulics ", Prentice Hall, 1989.
2. Andrew Parr, " Hydraulics and Pnematics (HB) ", Jaico Publishing House, 1999.

**References:**

1. Dudleyt, A. Pease and John J. Pippenger, " Basic Fluid Power ", Prentice Hall, 1987.
2. Anthony Esposite, " Fluid Power with Applications ", Prentice Hall, 1980.

## Semester VI

### Design of Mechatronics System

4      0      100

**UNIT I:** (9)

Rotational drives - Pneumatic Motors: continuous and limited rotation - Hydraulic Motors: continuous and limited rotation - Brushless DC Motors - Motion convertors, Fixed ratio, invariant motion profile, variators, remotely controlled couplings Hydraulic Circuits and Pneumatic Circuits.

**UNIT II:** (9)

Mechanical Systems and Design - Mechatronic approach - Control program control, adaptive control and distributed systems - Design process - Types of Design - Integrated product design - Mechanisms, load conditions, design and flexibility Structures, load conditions, flexibility and environmental isolation – Man machine interface, industrial design and ergonomics, information transfer from machine from machine to man and man to machine, safety.

**UNIT III:** (9)

Real time interfacing - Introduction Elements of data acquisition and control Overview of I/O process - Installation of I/O card and software - Installation of application software- Over framing.

**UNIT IV:** (9)

Case studies on Data Acquisition - Testing of transportation bridge surface materials - Transducer calibration system for Automotive applications Strain Gauge weighing system - Solenoid force - Displacement calibration system - Rotary optical encoder - Inverted pendulum control - Controlling temperature of a hot/cold reservoir - Pick and place robot - Carpark barriers.

**UNIT V:** (9)

Case studies on Data Acquisition and Control - Thermal cycle fatigue of a ceramic plate - pH control system -De-Icing Temperature Control System - Skip control of a CD Player - Autofocus Camera, exposure control. Case studies on design of Mechatronic products - Motion control using D.C. Motor, A.C. Motor & Solenoids -Car engine management - Barcode reader.

**TOTAL HOURS:45**

**Text Books:**

- 1) Bolton, -Mechatronics - Electronic Control systems in Mechanical and Electrical Engineering-, 2nd Edition, Addison Wesley Longman Ltd., 1999.
- 2) Devdas shetty, Richard A. Kolk, -Mechatronics System Design,- PWS Publishing company, 1997

3) Bradley, D.Dawson, N.C. Burd and A.J. Loader, Mechatronics: Electronics in Products and Processes, Chapman and Hall, London, 1991.

**Reference Books :**

- 1) Brian Morriss, Automated Manufacturing Systems - Actuators, Controls, Sensors and Robotics, Mc Graw Hill International Edition, 1995.
- 2) Gopel Sensors A comprehensive Survey Vol I & Vol VIII, BCH Publisher, New York.

## SemesterVI

### Digital Micro Controller and PLC Lab

0 3 100

1. Study of Micro controller Kits.
2. 8051 / 8031 Programming Exercises.
3. Stepper Motor interface.
4. D.C motor controller interface.
5. Study of interrupt structure of 8051.
6. Interfacing high power devices to microcomputer port lines, LED, relays and LCD displays.
7. Linear actuation of hydraulic cylinder with counter and speed control.
8. Hydrometer rotation with timer and speed control.
9. Sequential operation of pneumatic cylinders.
10. Traffic light controller.
11. Speed control of DC motor using PLC.
12. Testing of Relays using PLC.

**TOTAL HOURS:45**

## SemesterVI

### Hydraulic and Pneumatic Control Lab

0 3 100

#### 1. Design and testing of the circuits such as

- i) Pressure control
- ii) Flow control
- iii) Direction control
- iv) Driving of circuit with programmed logic sequence, using an optional PLC in hydraulic Electro hydraulic Trainer.

#### 2.Design and testing of the circuits such as

- i) Pressure control
- ii) Flow control
- iii) Direction control
- iv) Circuits with logic controls
- v) Circuits with timers
- vi) Circuits with multiple cylinder sequences in Pneumatic Electro pneumatic Trainer.

3. Modeling and analysis of basic electrical, hydraulic, and pneumatic systems using MATLAB/LAB VIEW software

4. Simulation of basic hydraulic, pneumatic and electric circuits using automation studio software

5. Programming in simple Computer Integrated Manufacturing system such as FMC/FMS models.

6.Practice in modeling and analysis software (IDEAS Master series / PRO-E / ANSYS / CATIA)

**TOTAL HOURS:45**