SEMESTER VII

THEORY:

S.No	Subject Name	L	P	M
1.	Computer Control Process	4	0	100
2.	Computer Networks and Distributed Control System	4	0	100
3.	Robotics and Automation	4	0	100
4	Environmental science and Engineering	4	0	100
5.	Elective-II	4	0	100
6.	Elective-III	4	0	100

PRACTICALS:

S.No	Subject Name	L	P	M
1.	Computer Control Laboratory	0	3	100
2.	Comprehension	0	3	100

SEMESTER V II

COMPUTER CONTROL PROCESS

1. ANALYSIS OF DISCRETE DATA SYSTEM **9**

State space representation of Discrete Data Systems – Selection of sampling process – Selection of Sampling period – Z- transform – pulse transfer function – modified Z-transform – Stability of Discrete Data System

2. DESIGN OF DIGITAL CONTROLLER **9**

Digital PID – Dead beat – Dahlin algorithms – pole placement controller Design of feed forward controller – predictive controller

3. COMPUTER AS A CONTROLLER **9**

Basic building blocks of computer control system – SCADA – Direct Digital Control – AI and expert control systems – Case studies on computer control for Industrial process

4. PLC **9**

Evolution of PLC's – Sequential and programmable controllers – Architecture-Programming of PLC – Relay logic – Ladder logic – Functional blocks.

5. COMMUNICATION IN PLC's **9**

Requirement of communication networks of PLC – connecting PLC to computer – Use of PC and PLC – Case study of bottle filling system.

Total Hours 45

TEXT BOOKS

1. Depande, P.B. and Ash R.H., Computer process control publication, USA, 1995
2. Petrezeulla, Programmable Controllers, McGraw Hill, 1989

REFERENCES

1. Houpis C.M., Lamount, G.B., Digital Control Systems – Theory, Hardware and Software International student Edition, McGraw-Hill Book Co., 1985
2. Stephanoupoulis, G., Chemical Process Control, Prentice Hall of India, New Delhi, 1990

Hughes T, Programmable Logic Controllers, ISA Press, 1989.

SEMESTER VII

COMPUTER NETWORKS AND DISTRIBUTED CONTROL SYSTEM

1. DATA NETWORK FUNDAMENTALS **9**

Network hierarchy and switching – open system interconnection model of ISO – Data link control protocol – BISYNC – SLDC – HLDC – media access protocol – Command – response – Token passing – CSMA/CD, TCIP/IP.

2. INTER NETWORKING **7**

Bridges – Routers – Gateways – open system with bridge configuration – open system with gateway configuration – Standard ETHERNET and ARCNET configuration – Special requirement for networks used for control.

3. DISTRIBUTED CONTROL SYSTEMS **9**

Evolution – Different architecture – local control unit – Operator interface – Displays – Engineering interface

4. APPLICATIONS OF DCS **8**

DCS applications in Power plants, Iron and Steel plants, Chemical plants, Cement plants and Pulp and Paper plants

5. HART ABD FIELD BUS **12**

Introduction – Evolution of signal standards – HART communication protocol – communication modes – HART networks – Control system interface – HART commands – HART field controller implementation – HART and OSI model – Field bus – Introduction – General field bus architecture – basic requirements of field bus standard – field bus topology – interoperability – interchangeability.

Total Hours 45

TEXT BOOKS

1. A.S.Tanenbaum, Computer Networks, Third Edition, Prentice Hall of India, 1996
2. Michal P.Lucas, Distributed control systems, Van nostrand Reinhold Co., 1986

REFERENCES

1. Romily Bowden, HART application guide and the OSI communication foundation., 1999

2.G.K.McMillan, Process/ Industrial instrument and handnook, McGraw-Hill, New york, 1999.
3.Popovic D. and Bhatkar V.P., Distributed Computer Control for industrial automation,Marcel Dekkar Inc., 1990 (for Unit 4)
4.Buchanan W., Computer Busses, Arnold Publishers, London, 2000.

SEMESTER VII

ROBOTICS AND AUTOMATION

1. BASIC CONCEPTS **9**

Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Asimov's laws of robotics – dynamic stabilization of robots.

2. POWER SOURCES AND SENSORS **9**

Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable speed arrangements – path determination – micro machines in robotics – machine vision – ranging – laser – acoustic – magnetic, fiber optic and tactile sensors.

3. MANIPULATORS, ACTUATORS AND GRIPPERS **9**

Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

4. KINEMATICS AND PATH PLANNING **9**

Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill climbing techniques – robot programming languages

5. CASE STUDIES **9**

Mutiple robots – machine interface – robots in manufacturing and non- manufacturing applications – robot cell design – selection of robot .

Total Hours 45

TEXT BOOKS

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., Industrial Robotics, McGraw Hill Singapore, 1996.

2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.

REFERENCES

1. Deb.S.R., Robotics technology and flexible Automation, John Wiley, USA 1992.
2. Asfahl C.R., Robots and manufacturing Automation, John Wiley, USA 1992.
3. Klafter R.D., Chimielewski T.A., Negin M., Robotic Engineering – An integrated approach, Prentice Hall of India, New Delhi, 1994.
4. Mc Kerrow P.J. Introduction to Robotics, Addison Wesley, USA, 1991.
5. Issac Asimov I Robot, Ballantine Books, New York, 1986.

SEMESTER VII
(Common to EEE & EIE)
ENVIRONMENTAL SCIENCE AND ENGINEERING

1. INTRODUCTION AND COMPONENTS OF ENVIRONMENT 9

Definition - Scope and Role of Environmental Engineer - Components – Water, air and land – Inter-relationship between components – Subcomponents; Ecosystem – Structure and functional components of ecosystem – Development and evolution of ecosystem – Energy flow and material cycling in ecosystem.

2. ENVIRONMENTAL IMPACTS OF DEVELOPMENT 9

Natural and man made impacts on water, air and land; Environment and development – Concept of sustainable development - Environmental impacts of Development – sustainable development – Environmental pollution – Water, Air and Land.

3. PLANNING FOR WATER SUPPLY AND SEWERAGE SYSTEMS 9

Public water supply and sewerage systems – Objectives – Design period – Population forecasting – Water demand – Sources of water – Source Selection – Water quality – Characterization – Water quality standards – Sources of wastewater – Quantity of sanitary sewage – Estimation of storm runoff – Characteristics and composition of sewage and their significance – Effluent standards.

4. CONVEYANCE SYSTEM 9

Water supply – intake structures – Pipe materials - Hydraulics of flow in pipes – Transmission main design – Laying, jointing & testing of pipes – appurtenances – Pumps

– Sewerage – Hydraulics of flow in sewers – Design of sanitary and storm sewers – Computer applications – Laying, jointing & testing of sewers – appurtenances – Pumps.

5. WATER SUPPLY AND DRAINAGE IN BUILDINGS 9

Principles of design of water supply and drainage in buildings – House service connection – Sanitary fixtures and fittings – Systems of sanitary plumbing – House drainage – House sewer connection.

Total Hours = 45

TEXT BOOKS:

1.Garg, S.K., Environmental Engineering, Vols. I and II, Khanna Publishers, New Delhi, 1994

2.C.S.Shah, Water Supply and Sanitation, Galgotia Publishing Company, New Delhi, 1994.

REFERENCES:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.

2. Manual on Sewerage and Sewage Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1993

3. H.S.Peavy, D.R.Rowe and George Tchobanoglous, Environmental Engineering, McGraw- Hill Book Company, New Delhi, 1995.

SEMESTER VII

PRACTICAL

COMPUTER CONTROL LABORATORY

(Any TEN experiments)

1.Simulation of first order system with and without dead time using discretization method and Runge-Kutta method

2.Simulation of second order system with and without dead time using discretization method and Runge-Kutta method

3.Design of discrete P+I+D Controller for first order system

4.Study of Programmable logic controller

5.Control of bottle filling system using PLC

6.Interface of data acquisition cards to PC

7.Simulation of complex control systems using MATLAB package

8.Operation of computer controlled liquid level system

9.Operation of computer controlled thermal system
10. Development of Human Machine Interface using any SCADA package
11. Study of Distributed Control System
12. Design of Dead beat / Dahlin algorithms

Total Hours 45