

VEER NARMAD SOUTH GUJARAT UNIVERSITY



PG DIPLOMA IN INDUSTRIAL AUTOMATION

Semester-II

Sr. No.	Subject Code	Subject Name	Scheme		Marks	
			L	P	L	P
1	IA 201	Distributed Control System and Data Communication	3	9	100	150
2	IA 202	Industrial Instrumentation – II	3		100	
3	IA 203	Industrial Drives	3		100	
4	IA 204	Project Management and Quality Standards	3		100	
5	IA 205	Project	0	6	0	200
TOTAL			12	15	400	350

Minimum Marks required for passing is 40% in each theory papers, practical and project separately.

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IA 201

DISTRIBUTED CONTROL SYSTEM AND DATA COMMUNICATION

Introduction to Data Acquisition System: Architecture of different type of DAS, PC based DAS

Distributed Control System: Evolution of DCS, Architecture of DCS, Direct Digital Control, Hierarchical structure, different functional levels, database organization for DCS, data communication link, reliability and consideration in DCS, flow sheet symbols

Introduction to communication system: Significance and impact on distributed industrial control and automation. Digital signal formats, error detection, correction and recovery circuit, message and packet switching.

Basic standards and protocols for data communication: RS485, Industrial Ethernet, Concept of Fieldbus, study of MODBUS protocol, HART

Text/References:

- LIPTAK: Instrumentation Engineering Handbook, Chilton Book Company
- POPOVIC & BHATKAR: Distributed Computer Control for Industrial Automation
- KRISHNA KANT: Computer Based Industrial Control, PHI
- DCS Manuals of Allen Bradley, ABB, Honeywell
- Manuals for Fieldbus System

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IA 202

INDUSTRIAL INSTRUMENTATION – II

Measurement of process variables (Displacement, Force, Velocity, Torque, pH, Conductivity, Position): Types, Application and Selection

Instrument Air System: Sizing criterion, air supply source, dryers, distribution system

Control Valve: Classification, Characteristic, Sizing, Testing procedure of Control valve, valve accessories and positioners.

Control Room and Control Panels: Control room layout, Electrical and Instrumentation Power Systems, Control Panel types, Panel bid specification and panel inspection

Area classification and Intrinsic Safety: Hazardous Area definitions, Protection methods, NEMA enclosures, Ingress Protection, Purging and intrinsic safety.

Text/References:

- LIPTAK: Instrumentation Engineering Handbook, Chilton Book Company
- ANDREWS: Applied Instrumentation in Process Industries (Volume II & III)
- DOEBLIN: Measurement Systems: Application and Design, TMH
- T. H. RATHORE: Digital measurement techniques
- R. K. JAIN: Mechanical and Industrial Measurements, Khanna Publishers.

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IA 203 INDUSTRIAL DRIVES

Introduction to electrical drives

Induction motor drives: different methods of speed control, variable voltage control, variable frequency control and V/F control, Field oriented control, direct torque control and vector control drives for induction motors.

Stepper Motor Drives: Full step/Half step mode, L/nR drive, PWM drive.

Servo Motor Drives: types of servo motor, closed loop position and speed control with servo motors.

Drives for BLDC motor

Text/References:

- G.K.DUBEY, Fundamentals of Electrical Drives, Narosa Publications, 1995.
- BOSE BK. “ Modern Power Electronics & AC drives” IEEE press, 1998
- NED MOHAN: Power Electronics: Converters, Applications and Design
- ATHANI V. V.: Stepper motor Principle and Application, New Age International
- VEDAM SUBHARAMANIAN “Electric drives: Concepts and Applications”, TMH, 1994

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IA 204

PROJECT MANAGEMENT AND QUALITY STANDARDS

Introduction: Foundations of Project Management, Project Life Cycle, Project Environment, Project Selection, Project Proposal, Project Scope, Work Breakdown Structure, documentation.

Project Monitoring, Control and Costing: Critical Path Method, Program Evaluation & Review Technique, Planning and Scheduling of Activity Networks, Assumptions in PERT Modeling, Time-cost Trade-offs, Estimation of Project Costs, Monitoring Project Progress, Project Appraisal and Selection, Recent Trends in Project Management, Introduction to project management software.

Quality Systems: Introduction to ISO, TQM and 6 σ , Quality Systems Standards, Quality functions & functions-various definitions such as quality function, quality measurement, quality costs. Quality in production, design, marketing etc. Quality conduit, SQC, quality assurance, total quality control, TQM- Introduction, history, principles, Quality policy, Quality system, Quality management, TQM system & models, Essentials of TQM, ISO 9000 quality management system, ISO 9000 elements, applications and benefits. Zero defect. Implementation registration & certification for ISO 9000, Case studies on TQM.

Text/Reference:

- LIPTAK: Process Control Handbook
- ANDREWS: Applied Instrumentation in Process Industries
- TAPAN BAGCHI: ISO-9000 Concepts, Methods and Implementation, WHEELER
- ISO-9000 Guidelines for the process industries
- N. LOGO THETIS, "Managing for total quality"-Prentice Hall of India Pvt. Ltd.-1997.
- JOEL E. ROSS, "Total Quality Management"-Varity Book International, New delhi-1995.
- S.M. SUNDAVA RAJU, "Total Quality Management"-Tata Mc Graw Hill Publishing Co. P. Ltd, New Delhi-1995.
- A.N.SINGH, "reparation, Implementation & Registration of ISO 9000 Quality System"- Dolphin Books, New Delhi-1993.

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Proposed List of Practicals for PG Diploma in Industrial Automation

1. Study of induction motor drive.
2. Study of V/F and Vector control modes of operation of AC drive.
3. Study of AC drive parameters – I.
4. Study of AC drives parameters – II.
5. Interfacing AC drive with PLC-I.
6. Interfacing AC drive with PLC-II.
7. Design of stepper motor drive with Microcontroller.
8. Design of PMDC drive with encoder feedback.
9. Study of servo drive and position control.
10. Study of DCS-I.
11. Study of DCS-II.
12. Study of HMI.
13. HMI configuration - I.
14. HMI configuration - II.
15. HMI configuration - III.
16. Study of SCADA.
17. SCADA configuration - I.
18. SCADA configuration - II.
19. SCADA configuration - III.
20. Study of PC based DAS-I
21. Study of PC based DAS-II
22. Study of data communication protocols - I.
23. Study of data communication protocols - II.
24. Study of control valves-I.
25. Study of control valves-II.
26. Study of displacement sensors.
27. Study of Level Measurement.
28. Study of strain gauge and torque measurement.
29. Simulation of Process Control on MATLAB - I.
30. Simulation of Process Control on MATLAB - II.
31. Simulation of Process Control on MATLAB - III.

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Practical List (Semester II)

1. Introduction to different Finite Element Solver.
2. Introduction to creating and editing simple finite element model.
3. To study how to mesh the part with free shell mesh, mapped shell mesh, free solid mesh and mapped solid mesh with quality check of meshing.
4. To study the effect of different of elements (2-D element with linear and parabolic shape function, 3-D element with linear and parabolic shape function, Plane stress element, Plane strain element, Membrane element etc.) on a simple model subject to simple loading.
5. Introduction to boundary condition set-I. (Geometrical based boundary conditions.)
6. Introduction to boundary condition set-II. (FE based boundary conditions.)
7. Study of different type of boundary condition sets.
8. Introduction to solution set. (Memory usage, solver property, solver methodology, solver set creation etc.)
9. Introduction to the post processor-I. (Visualizer, results, template options, calculation domain, plot generation etc.)
10. Introduction to post processor-II. (Colorbar control, nodal value probe, result combination, report writing, animation of results etc.)
11. To study the thermal analysis.(Temperature set, Temperature loading, Thermal stress calculation etc.)
12. To study the Axysymmetric analysis.(Axysymmetric modeling, Axysymmetric loading, effect of element edge/surface on loading)
13. To study the buckling analysis.
14. To study the beam analysis. (Beam section generation, beam loading, beam Visualizer)
15. Project: FE analysis of pressure vessel.
16. Project: FE analysis of different textile machine parts.
17. Introduction to manual part programming, part program syntax, CNC control system, control system specific command.
18. Finding co-ordinates of geometry, incremental and absolute part programming.

19. Machine zero, Program zero, Rapid travel, Up-milling, Down-milling.
20. Interpolation, Linear interpolation, Circular interpolation, Helical interpolation, Plane selection.
21. Position compensation, Cutter radius compensation, Work offsets.
22. Face milling, Peripheral milling, Slots and Pocket cutting.
23. Special milling operations, Helical milling, Thread milling, Eng milling using tapered end mills, Part reversals.
24. Machining holes, Pattern of holes.
25. Fixed cycles, Dwell cycles.
26. Standard tapping operation, rigid tapping.
27. Advance part programming, Block skip functions, mirror image, co-ordinate rotation, scaling function.
28. Development of sub-program.
29. Parametric programming, FANUC custom macros.
30. Query Session
31. Project feasibility study and Project selection.
32. Project: Development of part program for gears.
33. Project: Development of part program for cam profile.
34. Project: Development of part program for hole patterns.
35. Project: Development of part program for die and mould making.
36. Design Calculation for Pressure Vessel subjected to Internal & External Pressure
37. Design Calculation for Nozzle Reinforcement
38. GA Drawing Preparation/Modeling
39. Detail Drawing (Top Head /Bottom Head/Skirt to Head Junction)
40. Nozzle Drawing
41. Insulation & External drawings
42. Design Calculation for Pressure Vessel subjected to Internal & External Pressure
43. Design Calculation for Nozzle Reinforcement