

Diploma Programme in Instrumentation and Control (For the State of Haryana)

1. SALIENT FEATURES OF THE PROGRAMME

- 1) Name of the Programme : Diploma Programme in
Instrumentation and Control
- 2) Duration of the Programme : Three years
- 3) Entry Qualification : Matriculation or equivalent as prescribed by
State Board of Technical Education, Haryana
- 4) Intake : 30 (or as prescribed by the Board)
- 5) Pattern of the Programme : Semester Pattern
- 6) Ratio between theory and Practical : 60 : 40 (Approx.)
- 7) **Industrial Training:**
A minimum duration of four weeks of industrial training is included after 4th semester during summer vacation. An Internal assessment out of 50 marks and an external assessment out of another 50 marks have been added in 5th semester. Total marks allotted to industrial training will be 100.
Distribution of Marks:

➤ Daily diary and reports of training	-	50 Marks
➤ Viva Voce	-	50 Marks
- 8) **Ecology and Environment :**
As per directives of Government of India directives, a subject on Environmental Education has been incorporated in the scheme.
- 9) **Entrepreneurship Development:**
A subject on Entrepreneurship Development and Management has been incorporated in the scheme.
- 10). **Personality Development**
A camp focusing on personality development of students has been incorporated in the fifth semester. There will be assessment under SCA.
- 11) **Student Centred Activities:**
A provision of 5-6 hrs per week has been made for organizing Student Centred Activities for overall personality development of students. Such activities will comprise of co-curricular activities activities like extension lectures, library studies, games, hobby clubs e.g. photography, painting, singing, seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, Civil Defence/ Disaster Management activities etc.

2 EMPLOYMENT OPPORTUNITIES AND ACTIVITY PROFILE OF DIPLOMA HOLDERS IN INSTRUMENTATION AND CONTROL

A diploma holder in Instrumentation and Control may find employment in the following industry/organizations. The approximate distribution of employment is given in brackets.

Employment /Placement Opportunities

- | | | |
|----|---|------------|
| 1. | Process Industry
Industries like textiles, steel, pharmaceuticals, cement,
power generation, fertilizers, petrochemicals, food processing and paper etc | (45 – 55%) |
| 2. | Manufacturing Industry | (15 – 20%) |
| 3. | Marketing and Sales Organization | (15 – 20%) |
| 4. | Service Organization including Defence | (10%) |
| 5. | Research Laboratories, Medical and Health Care Institutions,
Universities and Colleges | (10 – 15%) |
| 6. | Self Enterprise including Dealership | (5%) |

A survey of industry/organization reveals that in each of the above mentioned organizations the diploma holders in instrumentation and technology have the following designations:

1. Process Industries
 - Supervisor/technician (Maintenance and repair)
 - Supervisor/technician (Erection, commissioning and testing)
 - Laboratory technician/workshop in charge in process industries
 - Console operator in cement, pharmaceutical, paper, hydro and other process industries
 - Measuring and controlling of different variables during process line, pressure, temperature etc.
 - Supervisor (automation)
2. Manufacturing Industries:
 - Design and development assistant
 - Production supervisor/senior assistant
 - Foreman
 - Erection, calibration, testing and commissioning supervisor in measuring instruments and control system of manufacturing and assembly industries

3. Marketing and Service Organization:
 - Marketing Assistant
 - Sales and Service Engineer
 - Customer Support Service Engineer
4. Service Organization:
 - Repair and Maintenance Technician
 - Customer Support Service Engineer
5. Instrumentation User Organization
 - Instrument technician/supervisor, in institutions / research laboratories
 - Junior Engineer
 - Maintenance Mechanic/Supervisor
6. A small percentage of diploma holders may also become entrepreneurs either in manufacturing instruments or service and maintenance of instruments
7. Laboratory Supervisor in Educational Institutions
8. Medical and Healthcare Institutions for
 - Repair and Maintenance &
 - sales and service

Activity Profile

The diploma holders in Instrumentation and Control are employed in process industries, manufacturing and assembly industries of instrumentation, marketing and servicing organization. The activities they perform are listed below.

1. Reading, interpreting and preparing instrumentation drawings and circuits
2. Preparing estimates of men and material required for simple jobs of installation and maintenance
3. Selecting instruments and devices for simple applications including specifications
4. Developing control circuits and instrumentation for simple application/ modification of existing circuits
5. Assembly, alignment, calibration and Testing of electronic process instruments
6. Installing instruments, control accessories and panels
7. Doing wiring/pneumatic connection of system/panel and check the systems as per instruction of suppliers
8. Inspecting system, diagnose fault and take corrective action
9. Testing instruments and devices on simulated systems and actual system(s)
10. Performing routine preventive maintenance of instruments and system(s)
11. Activities related to teaching profession in laboratories
12. Fault finding through tests, repair and calibration of instruments, devices and systems

13. Sale and service of equipment/instruments and systems
14. Repairing of analog and digital electronic instruments
15. Managing a small repair shop
16. Dealing and communicating effectively with the people
17. Process blue print generation
18. PLCs, DCS, SCADA networking and installation
19. Procurement System – documentation, hierarchical involvement in management information system
20. Awareness of Standards/Codes/Safety measures
21. Safety hazards
22. Process Operation and Control eg electroplating
23. Disaster mitigation and management-seismic data monitoring and use
24. Terrorism acts mitigation – using safety controls, close circuit TV and sensing elements
25. Preparation of Management Information System
26. Process parameter monitoring and taking corrective action. Process trend/alarm monitoring and report generation by making use of latest control software like Yokogawa, CS=3000/100, TATA Honeywell, DCS software etc.

3. COMPETENCY PROFILE OF DIPLOMA HOLDERS IN INSTRUMENTATION AND CONTROL

Keeping in view the job opportunities and activity profile of the diploma holders in Instrumentation and Control, following competency profile is aimed at for developing necessary knowledge and skills in the students:

- 1) Understanding of various stages of process, process variables, methods adopted for measurement and control including recording data in industries
- 2) Understanding of the principles of operation, constructional details, error adjustment and process of assembly of instruments and devices
- 3) Ability to identify various types of control devices, systems and instruments
- 4) Understanding of basic principles of electrical and electronics engineering
- 5) Understanding of electrical equipment and machines
- 6) Ability to draw and interpret various types of drawings used in the process and control systems
- 7) Competency of designing the layout of control circuits and fabricate small control panels
- 8) Ability to select appropriate instruments for the control and measurement of particular parameter
- 9) Ability to select and use actuators, different devices and interface circuits, components, tools and instruments for testing, maintenance and repair of instruments including bio-medical instruments
- 10) Competency to install/erect and commission, equipment including power electronic devices and control panels including preparation of estimates for given job of installation/repair/survey
- 11) Ability to test and calibrate various components and instruments in industry
- 12) Knowledge and skills in using information technology tools for information storage, retrieval and dissemination, and making use of computer application software like Matlab, Allenbradely, SLC 100 on PLCs, DCS software etc.
- 13) Knowledge of digital devices, microprocessors and micro controllers and their applications in electronic instrumentation system
- 14) Knowledge of digital bus technologies in Automated Process/Manufacturing industries like Foundation Field Bus, MOD Bus etc.
- 15) Modern control strategies which one is used by the Industries in the present context
- 16) Knowledge of hybrid systems being used by developed countries.

- 17) Knowledge of basic principles of management and entrepreneurship to manage men, material and machines optimally
- 18) Knowledge of setting up an enterprise in small scale of tiny sector and competency to promote marketing/servicing of the products
- 19) Proficiency in oral and written communication, preparation of projects and technical report writing, managing relationship with juniors, peers and seniors for effective functioning in the world of work
- 20) Knowledge of using quality control standards (national and international) for instrumentation and control
- 21) Understanding of basic principles of sciences and foundation for further studies
- 22) Awareness about environment, pollution control and technological advancements in areas of instrumentation and control

4. DERIVING CURRICULUM AREAS DERIVED FROM COMPETENCY PROFILE

Keeping in view the four domains of learning viz professional development domain, continued learning domain, human relation domain and personal development domain, and also for developing necessary knowledge and skills in diploma holders in the field of Instrumentation and Control, following curriculum areas have been identified:

Sr. No.	Competency Profile	Curriculum Area/Subjects
1.	Understanding of various stages of process, process variables, methods adopted for measurement and control including recording data in industries	<ul style="list-style-type: none"> - Process Instrumentation - Control Systems - Principles of Measurement - Transducers and Signal Conditioning
2.	Understanding of the principles of operation, constructional details, error adjustment and process of assembly of instruments and devices	<ul style="list-style-type: none"> - Process Control - Fundamentals of Digital Electronics - Test and Measuring Instruments
3.	Ability to identify various types of control devices, systems and instruments	<ul style="list-style-type: none"> - Process Control - Principles of Instrumentation Engg. - Transducers and Signal Conditioning
4.	Understanding of basic principles of electrical and electronics engineering	<ul style="list-style-type: none"> - Basic Electrical Engineering - Analog Electronics
5.	Understanding of electrical equipment and machines	<ul style="list-style-type: none"> - Electrical Machines
6.	Ability to draw and interpret various types of drawings used in the process and control systems	<ul style="list-style-type: none"> - Engineering Drawing - Process Control - Process Instrumentation - Instrumentation drawing and Documentation
7.	Competency of designing the layout of control circuits and fabricate small control panels	<ul style="list-style-type: none"> - Instrumentation Workshop - Process Instrumentation
8.	Ability to select appropriate instruments for the control and measurement of particular parameter	<ul style="list-style-type: none"> - Principles of Instrumentation - Test and Measuring Instruments - Process Instrumentation
9.	Ability to select and use different devices and interface circuits, components, tools and instruments for testing, maintenance and repair of instruments including bio-medical instruments	<ul style="list-style-type: none"> - Digital Electronics - Principles of Instrumentation Engg. - Test and Measuring Instruments - Bio Medical Instrumentation - Repair and Maintenance of Instruments

Sr. No.	Competency Profile	Curriculum Area/Subjects
10.	Competency to install/erect and commission, equipment including power electronic devices and control panels and preparation of estimates	<ul style="list-style-type: none"> - Advance Control Systems - Transducers and Signal Conditioning
11.	Ability to test and calibrate various components and instruments in industry	<ul style="list-style-type: none"> - Test and Measuring Instruments - Bio-Medical Instrumentation - Power Electronics - Microprocessor
12.	Knowledge and skills in using information technology tools for information storage, retrieval and dissemination, and making use of computer application software	<ul style="list-style-type: none"> - Basics of Information Technology - Computer Aided Instrumentation - Computer Programming and Application
13.	Knowledge of digital devices microprocessors and micro controllers and their applications in electronic instrumentation system	<ul style="list-style-type: none"> - Digital Electronics - Microprocessors, Micro-controllers and their Applications - DCS and PLC based Applications
14.	Knowledge of basic principles of management and entrepreneurship to manage men, material and machines optimally	<ul style="list-style-type: none"> - Entrepreneurship Development and Management
15	Knowledge of digital bus technologies in Automated Process/Manufacturing industries like Foundation Field Bus, MOD Bus etc.	<ul style="list-style-type: none"> - Bus Technologies - Process Instrumentation
16.	Modern control strategies which one is used by the Industries in the present context	<ul style="list-style-type: none"> - Control Systems
17.	Knowledge of hybrid systems being used by developed countries.	<ul style="list-style-type: none"> - New Technologies - DCS, SCADA
18.	Knowledge of setting up an enterprise in small scale of tiny sector and competency to promote marketing/servicing of the products	<ul style="list-style-type: none"> - Entrepreneurship Development and Management
19.	Proficiency in oral and written communication, preparation of projects and technical report writing, managing relationship with juniors, peers and seniors for effective functioning in the world of work	<ul style="list-style-type: none"> - Entrepreneurship Development and Management - Communication Skills - Employability Skills
20.	Knowledge of using quality control standards (national and international) for instrumentation and control	<ul style="list-style-type: none"> - Entrepreneurship Development and Management

Sr. No.	Competency Profile	Curriculum Area/Subjects
21.	Understanding of basic principles of sciences and foundation for further studies	<ul style="list-style-type: none">- Applied Physics- Applied Chemistry- Applied Mathematics
22.	Awareness about environment, pollution control and technological advancements in areas of instrumentation and control	<ul style="list-style-type: none">- Environmental Education- Opto Electronic Devices and their applications- Advanced Measurement Techniques- Virtual Instrumentation

5. ABSTRACT OF CURRICULUM AREAS/ SUBJECTS

A General Studies

1. Communication Skills I & II
2. Employability Skills 1 & II
3. Entrepreneurship Development and Management
4. Environmental Education

B Applied Sciences

5. Applied Mathematics I & II
6. Applied Physics I & II
7. Applied Chemistry I & II

C Basic Courses in Engineering / Technology

8. Engineering Drawing I
9. General Workshop Practice I&II
10. Basics of Information Technology

D Applied Courses in Engineering / Technology

11. Basic Electrical Engineering
12. Analog Electronics
13. Basics of Control System
14. Electrical and Electronics Engineering Materials and Components
15. Principals of Instrumentation
16. Test and Measuring Instruments
17. Electrical Machines
18. Fundamentals of Digital Electronics
19. Microprocessors, Microcontroller and their Applications
20. Transducers and Signal Conditioning
21. Advance Control System
22. Instrumentation Drawing
23. Principles of Telemetry
24. Computer Programming and Applications
25. Power Electronics
26. Analytical and Environmental Instruments
27. Process Instrumentation
28. Process Control
29. PLC, DCS and SCADA
30. Biomedical Instrumentation
31. Minor Project Work
32. Major Project Work

E Specialized Courses in Engineering/ Technology**Elective :** to choose any one from the following:

- (a) Opto Electronic Devices and their Applications
- (b) Advanced Measurement Techniques
- (c) Virtual Instrumentation

In addition,

- a) *Industrial Training after 4th semester and*
- b) *Personality Development Camp will be organized in 5th Semester.*

6. HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS

Sr. No.	Subjects	Distribution in Hours/Week in Various Semesters					
		I	II	III	IV	V	VI
1	Communication Skills	5	5	-	-	-	-
2	Applied Mathematics	5	5	-	-	-	-
3	Applied Physics	6	6	-	-	-	-
4	Applied Chemistry	5	5				
5	Engineering Drawing-I	6	-				
6	Basic of Information Technology	4	-	-	-	-	-
7	Analog Electronics - I	-	6	-	-	-	-
8	Basic Electrical Engineering	-	5	-	-	-	-
9	General Workshop Practice	6	6	-	-	-	-
10	Basics of Control System	-	-	7	-	-	-
11	Electrical and Electronics Materials and Components	-	-	4	-	-	-
12	Principals of Instrumentation	-	-	6	-	-	-
13	Test and Measuring Instruments	-	-	6	-	-	-
14	Electrical Machines	-	-	6	-	-	-
15	Fundamentals of Digital Electronics	-	-	6	-	-	-
16	Microprocessors, Microcontroller and their Applications	-	-	-	7	-	-
17	Transducers and Signal Conditioning	-	-	-	6	-	-
18	Advance Control System	-	-	-	6	-	-
19	Principles of Telemetry	-	-	-	6		
20	Instrumentation Drawing	-	-	-	4	-	-
21	Computer Programming and Applications	-	-	-	6	-	-
22	Employability Skills	-	-	-	-	2	2
23	Power Electronics	-	-	-		6	-
24	Analytical and Environmental Instruments					7	
25	Process Instrumentation					7	
26	Process Control	-	-	-	-	7	-
27	Environmental Education					3	
28	Minor Project Work	-	-	-	-	3	-
29	PLC, DCS and SCADA					-	7
30	Biomedical Instrumentation	-	-	-	-	-	7
31	Elective	-	-	-	-	-	7
32	Entrepreneurship Development and Management	-	-	-	-	-	3
33	Major Project Work	-	-	-	-	-	9
34	Student Centred Activities	3	2	5	5	5	5
Total		40	40	40	40	40	40

- Elective I
- (a) Opto Electronic Devices and their Applications
 - (b) Advanced Measurement Techniques
 - (c) Virtual Instrumentation