ELECTRONICS AND INSTRUMENTATION
(For the State of Haryana)

1. SALIENT FEATURES OF THE PROGRAMME

1)	Name of the Programme	:	Diploma Programme in **Electronics and Instrumentation**
2)	Duration of the Programme	:	Three years (Six Semesters)
3)	Entry Qualification	:	Matriculation or equivalent as prescribed by State Board of Technical Education, Haryana
4)	Intake	:	40/60 (or as prescribed by the Board)
5)	Pattern of the Programme	:	Semester Pattern
6)	Ratio between theory and Practice	:	45 : 55 (Approx.)

7) Industrial Training:

Four weeks of industrial training is included after IV semester during summer vacation. Internal assessment out of 50 marks and external assessment out of another 50 marks will be 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 (External) - 50 Marks

8) Ecology and Environment:

As per Govt. 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) 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 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 ELECTRONICS AND INSTRUMENTATION

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

Employment /Placement Opportunities

1. Process Industry (45 – 55%)
   Industries like textiles, steel, pharmaceuticals, cement,
   power generation, fertilizers, petrochemicals, food processing and paper etc
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, (10 – 15%)
   Universities and Colleges
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 **Electronics and Instrumentation** 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 tread/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 ELECTRONICS AND INSTRUMENTATION

Keeping in view the job opportunities and activity profile of the diploma holders in **Electronics and Instrumentation**, 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 the 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 **Electronics and Instrumentation**, 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	- Process Instrumentation - Control Systems -- Transducers and Signal Conditioning
2.	Understanding of the principles of operation, constructional details, error adjustment and process of assembly of instruments and devices	- Process Control - Fundamentals of Digital Electronics - Test and Measuring Instruments - Electronic Instruments and Measurements
3.	Ability to identify various types of control devices, systems and instruments	- Process Control and PLCs - Principles of Instrumentation - Transducers and Signal Conditioning
4.	Understanding of basic principles of electrical and electronics engineering	- Basic Electrical Engineering - Analog Electronics
5.	Understanding of electrical equipment and machines	- Electrical Machines
6.	Ability to draw and interpret various types of drawings used in the process and control systems	- Engineering Drawing - Process Control - Process Instrumentation - Instrumentation drawing and Documentation
7.	Competency of designing the layout of control circuits and fabricate small control panels	- Electronics and Instrumentation Workshop - Process Instrumentation
8.	Ability to select appropriate instruments for the control and measurement of particular parameter	- Principles of Instrumentation - 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	- Digital Electronics - Principles of Instrumentation Engg. - Electronic Instruments and Measurements - 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	- Control Systems - Transducers and Signal Conditioning
11.	Ability to test and calibrate various components and instruments in industry	- Testing and Measuring Instruments - Bio-Medical Instrumentation - Power Electronics - Microprocessor - Electronic Instruments and Measurements
12.	Knowledge and skills in using information technology tools for information storage, retrieval and dissemination, and making use of computer application software	- 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	- Digital Electronics - Microprocessors, Micro-controllers and their Applications
14.	Knowledge of basic principles of management and entrepreneurship to manage men, material and machines optimally	- Instrumentation Workshop - Principles of Instrumentation - Test and Measuring Instruments
15	Knowledge of digital bus technologies in Automated Process/Manufacturing industries like Foundation Field Bus, MOD Bus etc.	- Process Instrumentation - DCS, SCADA
16.	Modern control strategies which one is used by the Industries in the present context	- Control Systems
17.	Knowledge of hybrid systems being used by developed countries.	- New Technologies
18.	Knowledge of setting up an enterprise in small scale of tiny sector and competency to promote marketing/servicing of the products	Entrepreneurship Development and Management
19.	Proficiency in oral and written communication, preparation of projects and technical report writing, managing relationship with juniors, pears and seniors for effective functioning in the world of work	- Entrepreneurship Development and Management - Communication Skills - Human Resource Development
20.	Knowledge of using quality control standards (national and international) for instrumentation and control	- Test and Measuring Instruments - Quality Control

Sr. No.	Competency Profile	Curriculum Area/Subjects
21.	Understanding of basic principles of sciences and foundation for further studies	- Applied Physics - Applied Chemistry - Applied Mathematics
22.	Awareness about environment, pollution and technology advancements in areas of instrumentation and control	- Environmental Education - Robotics and Automation - Virtual Instrumentation - Opto Electronic Devices and their applications

5. ABSTRACT OF CURRICULUM AREAS/ SUBJECTS

a) General Studies

1. Communication Skills I & II
2. Employability Skills – I & 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. Principles of Instrumentation
14. Basics of Control Systems
15. Electrical and Electronics Materials and Components
16. Fundamentals of Digital Electronics
17. Electrical Machines
18. Computer Programming and Applications
19. Linear and Digital Integrated Circuits
20. Electronics and Instrumentation Workshop
21. Communication and Telemetry
22. Microprocessors, Microcontroller and their Applications
23. Transducers and Signal Conditioning
24. Analytical and Environmental Instruments
25. Process Instrumentation
26. Power Electronics
27. Process Control
28. Minor Project Work
29. PLC, DCS and SCADA
30. Biomedical Instrumentation
31. Major Project Work

e) Specialized Courses in Engineering/ Technology

Elective : to choose any one from the following:

(a) Data Communication Networks
(a) Optical Communication
(b) Troubleshooting of Electronic Equipment

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.	English and 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 Electrical Engineering	-	5	-	-	-	-
7.	Analog Electronics	-	6	-	-	-	-
8.	Basic of Information Technology	4	-	-	-	-	-
9.	General Workshop Practice	6	6	-	-	-	-
10.	Basics of Control Systems	-	-	7	-	-	-
11.	Electrical and Electronics Materials and Components	-	-	4	-	-	-
12.	Electronic Instruments and Measurement	-	-	6	-	-	-
13.	Principles of Instrumentation	-	-	6	-	-	-
14.	Electrical Machines	-	-	6	-	-	-
15.	Fundamentals of Digital Electronics	-	-	6	-	-	-
16.	Microprocessors, Microcontroller and their Application	-	-	-	7	-	-
17.	Transducers and Signal Conditioning	-	-	-	6	-	-
18.	Linear and Digital Integrated Circuits	-	-	-	6	-	-
19.	Communication and Telemetry	-	-	-	6	-	-
20.	Electronics and Instrumentation Workshop	-	-	-	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.	Elective	-	-	-	-	-	7
31.	Biomedical Instrumentation	-	-	-	-	-	7
32.	Entrepreneurship Development and Management	-	-	-	-	-	3
33.	Major Project Work	-	-	-	-	-	9
	Student Centred Activities	3	2	5	5	5	5
	Total	**40**	**40**	**40**	**40**	**40**	**40**

Elective :

1. Data Communication Networks
2. Optical Communication
3. Troubleshooting of Electronic Equipment