Three Years Diploma Programme in MEDICAL ELECTRONICS
(For the State of Haryana)

1. SALIENT FEATURES OF THE PROGRAMME

1)	Name of the Programme	:	Diploma Programme in **Medical Electronics**
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	:	60
5).	Pattern of the Programme	:	Semester Pattern
6)	Ratio between theory and Practical	:	45 : 55(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 MEDICAL ELECTRONICS

An exercise, to have first hand information about employment opportunities and activity profile of diploma engineers in the field of Medical Electronics, was done by Curriculum Development Centre of National Institute of Technical Teachers' Training and Research, Chandigarh. The feedback from hospitals, medical industries and other organizations has revealed that diploma holders in Medical Electronics find employment in the following organizations:

Employment Opportunities

Various Departments/ organizations

1) Super specialty hospitals
2) Manufacturing units for Medical Electronics
3) Hospitals and Nursing Homes
4) Diagnostic Centres
5) Instrumentation and Control Industry
6) Pathology Centres
7) National Laboratories – R&D centres including atomic and Defence Laboratories
8) Medical Equipment Dealers
9) Electronic service centers
10) Educational Institutions
11) Fitness Centres

Self Employment

- Marketing and Sales (Distributors - wholesale and retailers)
- Service Sector (Repair and Maintenance; job work)

Activity Profile

The diploma holders in Medical Electronics generally get employed in manufacturing or assembly industries of medical equipment, hospitals, marketing and servicing organizations etc. The activities they generally perform are listed below:

1) Reading, interpreting drawings and circuits in medical electronics and related fields

2) Selecting instrument and devices for simple applications

3) Making layout of printed circuit boards and chassis

4) Testing the materials used in assembly work.

5) Supervising fabrication and assembly work at sub-assembly and final assembly

6) Preparing estimates of men and material required for different jobs of installation and maintenance

7) Assisting the engineer in quality control of the product being assembled or manufactured

8) Supervise utility services in hospitals (Air/Gas/Water/ Electricity/ Sterilization /Disposal of waste incineration etc.)

9) Assistance to the engineers/scientist doing research/development work by fabricating and testing different medical electronic equipment

10) Marketing and sale service division of medical electronics equipment

11) Maintenance and repairing of medical electronic equipment in hospitals and its supervision, fabrication and production of medical electronics equipment like ECG, EEG, blood pressure monitor unit, X-ray units etc

12) As a self employed person he has to perform multifarious activities such as designing PCBs, procuring raw material and components, assemble, manufacture, repair and maintenance, testing and fault diagnosis, sale and service, marketing etc.

3. COMPETENCY PROFILE OF DIPLOMA HOLDERS IN MEDICAL ELECTRONICS

Keeping in view the job opportunities, activity profile and various domains of learning, the diploma holders in Medical Electronics should have following competency profile in terms of knowledge and skills in the students:

1) Skills in reading and interpreting drawings pertaining to circuits in medical electronics and related fields, instruments, and equipment

2) Understanding of basic principles of electrical and electronics engineering

3) Understanding of basic principles of digital electronics; communication engineering and telemetry systems;

4) Knowledge of different electronic devices, components, materials and principles of instruments used in circuits

5) Skills in fabrication and testing of different types of electronic circuits and devices by making use of testing and measuring instruments

6) Understanding of operation, testing, use and calibration of various clinical laboratory equipment

7) Awareness about technological advancements and newer areas of biomedical instrumentation

8) Competency in solving simple problems related to various functional areas of electronics engineering e.g. prototype development, installation, diagnostic and fault finding or repair and maintenance of plant and equipment pertaining to:

   - Electronic measuring instruments
   - Medical electronics equipment

9) Knowledge of various human organs and their functioning from the view point of measurement of different biological variables and signals

10) Knowledge and skills in using information technology tools for information storage, retrieval and dissemination, and making use of computer application software related to hospital Management and diagnostic centre.

11) Knowledge of digital devices microprocessors and micro controllers and their applications in electronic instrumentation system

12) Understanding of various relevant standards for testing and quality control in electronics

13) Knowledge of basic principles of management and entrepreneurship to manage men, material and machines optimally and efficiently, awareness about the environment, use of non-conventional energy sources, external financial and technical support system, adopting energy conservation techniques

14) Knowledge of imaging techniques and their safety aspects equipment used for diagnostic application in radiotherapy.

15) Proficiency in oral and written communication, technical report writing, managing relationship with juniors, peers and seniors for effective functioning in the world of work

4. DERIVING CURRICULUM AREAS FROM COMPETENCY PROFILE

Keeping in view various domains of learning viz professional development, continued learning, human relations and personal development in addition to developing necessary knowledge and skills in diploma holders in the field of Medical Electronics, following curriculum areas have been identified:

Sr No	Competency Profile	Curriculum Area/Subjects
1.	Skills in reading and interpreting drawings pertaining to circuits in medical electronics and related fields, instruments, and equipment	- Analog Electronics-I - Digital Electronics - Electronic Instruments and Measurement
2.	Understanding of basic principles of electrical and electronics engineering	- Analog Electronics-I - Basic Electrical Engineering - Electrical Machines
3.	Understanding of basic principles of digital electronics; communication engineering and telemetry systems;	- Digital Electronics - Communication System and Telemetry
4.	Knowledge of different electronic devices, components, materials and principles of instruments used in circuits	- Electronic Instruments and Measurement
5.	Skills in fabrication and testing of different types of electronic circuits and devices by making use of testing and measuring instruments	- Engineering Drawing - Medical Laboratory Instruments
6.	Understanding of operation, testing, use and calibration of various clinical laboratory equipment	- Analytical Instruments- (Bio-medical)
7.	Awareness about technological dvancements and newer areas of biomedical instrumentation	- Physiotherapy and O.T Equipment - Biomedical Instrumentation - Radiology and Imaging
8.	Competency in solving simple problems related to various functional areas of electronics engineering e.g. prototype development, installation, diagnostic and fault finding or repair and maintenance of plant and equipment pertaining to: - Electronic measuring instruments - Medical electronics equipment	- Electronic Instruments and Measurement - Installation, Maintenance of Medical Equipment - Major Project Work - Hospital Management and Clinical Practice - Medical Laboratory Instruments

Sr No	Competency Profile	Curriculum Area/Subjects
9.	Knowledge of various human organs and their functioning from the view point of measurement of different biological variables and signals	- Instrumentation - Anatomy and Physiology
10.	Knowledge and skills in using information technology tools for information storage, retrieval and dissemination, and making use of computer application software related to hospital Management and diagnostic centre.	- Computer Programming and Applications - Hospital Management and Clinical Practices
11.	Knowledge of digital devices microprocessors and micro controllers and their applications in electronic instrumentation system	- Digital Electronics-II - Microprocessor and Peripheral Devices - Microcontrollers and Embedded System
12.	Understanding of various relevant standards for testing and quality control in electronics	- Electronic Instruments and Measurement
13.	Knowledge of basic principles of management and entrepreneurship to manage men, material and machines optimally and efficiently, awareness about the environment, use of non-conventional energy sources, external financial and technical support system, adopting energy conservation techniques	- Entrepreneurship Development and Management - Environmental Education
14.	Knowledge of imaging techniques and their safety aspects equipment used for diagnostic application in radiotherapy.	- Radiology and Imaging
15.	Proficiency in oral and written communication, technical report writing, managing relationship with juniors, peers and seniors for effective functioning in the world of work	- Employability Skills - Communication Skills I & II - Project Work

5. ABSTRACT OF CURRICULUM AREAS/ SUBJECTS

The subjects have been divided in four different categories:

1. Basic Sciences

(1) Communication Skills - 1 & II

(2) Employability Skills - 1 & II

(3) Environmental Education

(4) Entrepreneurship Development and Management

2. Applied Sciences

(5) Applied Physics - I & II

(6) Applied Chemistry - I & II

(7) Applied Mathematics - I and II

3. Basic Courses in Engineering/ Technology

(8) Engineering Drawing-I

(9) General Workshop Practice - I & II

(10) Basics of Information Technology

4. Area Specific Engineering/ Technology Subjects

(11) Basic Electrical Engineering

(12) Optical Fibre Communications

(13) Analog Electronics

(14) Computer Programming and Application

(15) Anatomy and Physiology

(16) Digital Electronics

(17) Electronic Instruments and Measurement

(18) Biomedical Instrumentation

(19) Hospital Management and Clinical Practices

(20) Physiotherapy and Operation Theatre Equipment

(21) Microprocessor and Peripheral Devices

(22) Medical Laboratory Instruments

(23) Instrumentation

(24) Electrical Machines

(25) Microcontrollers and Embedded System

(26) Installation and Maintenance of Medical Equipment

(27) Radiology and Imaging

(28) Communication System and Telemetry

(29) Major Project Work

In addition:

1. Industrial training of 12 weeks in semester 5th from mid August to mid November will be organized
2. HIV and AIDS Awareness Camp will be organized in 4th Semester
3. *Personality Development Camp will be organized in 5th semester*

6. HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS (Medical Electronics)

Sr. No.	Subject	Distribution of time 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	6	-	-	-	-	-
6.	General Workshop Practice	6	6	-	-	-	-
7.	Basics of Information Technology	4	-	-	-	-	-
8.	Basic Electrical Engineering	-	5	-	-	-	-
9.	Analog Electronics	-	6	6	-	-	-
10.	Computer Programming and Application	-	-	6	-	-	-
11.	Anatomy and Physiology	-	-	6	-	-	-
12.	Digital Electronics	-	-	6	6	-	-
13.	Electronic Instruments and Measurement	-	-	6	-	-	-
14.	Biomedical Instrumentation	-	-	5	-	-	-
15.	Hospital Management and Clinical Practices	-	-	-	4	-	-
16.	Physiotherapy and Operation Theatre Equipment	-	-	-	7	-	-
17.	Microprocessor and Peripheral Devices	-	-	-	6	-	-
18.	Medical Laboratory Instruments	-	-	-	7	-	-
19.	Instrumentation	-	-	-	5	-	-
20.	Employability Skills – I	-	-	-	-	2	2
21.	Electrical Machines	-	-	-	-	7	-
22.	Environmental Education	-	-	-	-	3	-
23.	Microcontrollers and Embedded System	-	-	-	-	6	-
24.	Installation and Maintenance of Medical Equipment	-	-	-	-	-	6
25.	Radiology and Imaging	-	-	-	-	-	7
26.	Communication System and Telemetry	-	-	-	-	-	7
27.	Entrepreneurship Development and Management	-	-	-	-	-	3
28.	Major Project Work	-	-	-	-	-	10
29.	Student Centered Activities	3	2	5	5	5	5
	Total	**40**	**40**	**40**	**40**	*	**40**

* There is 12 week Industrial/Practical Training of students during 5th Semester (Mid August to Mid November)