

MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI - 51

1	Name of Course	Certificate Course in Servicing of Medical Instruments																																															
2	Course Code	301209																																															
3	Max. Nos. of Student	25 Students																																															
4	Duration	1 Year																																															
5	Type	Full Time																																															
6	Nos. of Days / Week	6 Days																																															
7	Nos. of Hours /Days	7 Hrs																																															
8	Space Required	Theory Class Room – 200 sqft Practical – 800 sqft																																															
9	Entry Qualification	S.S.C. Passed																																															
10	Objective of Syllabus/ introduction	<ul style="list-style-type: none">• To develop professional competence in the field of electronics.• To train the students to acquire skills and mastery in the use of electronic circuits.• To train the students to test the medical electronic instruments required in the medical field.• To prepare for self and wage employment.• To prepare competent electronic technicians for the Medical field.																																															
11	Employment Opportunity	(a) Wage Employment: <ul style="list-style-type: none">• Junior Technician• Circuit Assembler• Electronic Instructor (b) Self Employment: <ul style="list-style-type: none">• Electronic spares shop• Electronic gadget repairing centre.• Medical Instrument sales and repairing centre.• Medical Instrument authorized dealer																																															
12	Teacher’s Qualification	Diplôme in Médical Electronics.																																															
13	Training System	<table><tr><th colspan="6">Training System Per Week</th></tr><tr><td colspan="2">Theory</td><td colspan="2">Practical</td><td colspan="2">Total</td></tr><tr><td colspan="2">18 Hours</td><td colspan="2">24 Hours</td><td colspan="2">42 Hours</td></tr></table>						Training System Per Week						Theory		Practical		Total		18 Hours		24 Hours		42 Hours																									
Training System Per Week																																																	
Theory		Practical		Total																																													
18 Hours		24 Hours		42 Hours																																													
14	Exam. System	<table><tr><th>Sr.</th><th>Paper Code</th><th>Name of Subject</th><th>TH/PR</th><th>Hours</th><th>Max. Marks</th><th>Min. Marks</th></tr><tr><td>1</td><td>30120911</td><td>Electronic Material and Components & Electronic Devices and Circuits</td><td>TH-I</td><td>3 hrs.</td><td>100</td><td>35</td></tr><tr><td>2</td><td>30120912</td><td>Digital Electronics & Bio-Medical</td><td>TH-II</td><td>3 hrs.</td><td>100</td><td>35</td></tr><tr><td>3</td><td>30120921</td><td>Electronic Material and Components & Electronic Devices and Circuits</td><td>PR-I</td><td>6 hrs.</td><td>200</td><td>100</td></tr><tr><td>4</td><td>30120922</td><td>Digital Electronics & Bio-Medical</td><td>PR-II</td><td>6 hrs.</td><td>200</td><td>100</td></tr><tr><td></td><td></td><td>Total</td><td></td><td></td><td>600</td><td>270</td></tr></table>						Sr.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Min. Marks	1	30120911	Electronic Material and Components & Electronic Devices and Circuits	TH-I	3 hrs.	100	35	2	30120912	Digital Electronics & Bio-Medical	TH-II	3 hrs.	100	35	3	30120921	Electronic Material and Components & Electronic Devices and Circuits	PR-I	6 hrs.	200	100	4	30120922	Digital Electronics & Bio-Medical	PR-II	6 hrs.	200	100			Total			600	270
Sr.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Min. Marks																																											
1	30120911	Electronic Material and Components & Electronic Devices and Circuits	TH-I	3 hrs.	100	35																																											
2	30120912	Digital Electronics & Bio-Medical	TH-II	3 hrs.	100	35																																											
3	30120921	Electronic Material and Components & Electronic Devices and Circuits	PR-I	6 hrs.	200	100																																											
4	30120922	Digital Electronics & Bio-Medical	PR-II	6 hrs.	200	100																																											
		Total			600	270																																											

SYLLABUS

Theory - I

Electronic Material and Components & Electronic Devices and Circuits

Electronic Material and Components

Sr. No.	Unit	Scope and Limitation
1	Resistors	1.1 Types of resistors, specifications. 1.2 Colour code. 1.3 Comparison of wire wound, metal film and carbon film resistors Carbon and wire wound Potentiometers. 1.4 Applications of above types of resistors. 1.5 Ohm's law. 1.6 Specific Resistance, factors affecting the value of resistance. 1.7 Resistors in Series and parallel. 1.8 Kirchoff's laws.
2	Capacitors	2.1 Define capacitance. 2.2 Factors affecting the capacitance of a capacitor. 2.3 Define Dielectric constant and Dielectric Strength of a material. 2.4 Classify the types of capacitors. 2.5 Colour code of capacitor. 2.6 Capacitors in Series and parallel. 2.7 Applications.
3	Inductors and Transformers	3.1 Electro Magnetic Induction, Faradays laws, Lenz's law. 3.2 Self Inductance. 3.3 Factors affecting the value of inductance. 3.4 Mutual Inductance. 3.5 Coefficient of coupling. 3.6 Inductances in Series and parallel. 3.7 Applications. 3.8 Constructional details and working of Power, AF and RF Transformers. 3.9 Specifications of a Transformer.
4	A.C. Circuits	4.1 Fundamental Principles. 4.2 Production of sinusoidal AC voltage-cycle, frequency, Instantaneous, maximum, average, RMS Values, Form Factor. 4.3 A.C. Circuits containing RL, RC and RLC elements in series and parallel 4.4 Define the term resonance. 4.5 Understand the concept of resonance in A.C. circuits. 4.6 Current and impedance at resonance of series and parallel resonant circuit. 4.7 Define bandwidth, 'Q' Factor & selectivity. 4.8 Distinguish between series and parallel resonance. 4.9 Applications of Resonant Circuits.

5	Filters	<p>5.1 Symmetrical and asymmetrical networks.</p> <p>5.2 T type and TT type networks.</p> <p>5.3 Types of filter circuits.</p> <p>5.4 Construction of constant K-type filters, L.P.F., H.P.F. and B.P.F. using T and TT networks attenuation, impedance VS frequency characteristics.</p> <p>5.5 Applications of Filters.</p>
6	Microphones and Loud Speakers	<p>6.1 Familiarize different types of microphones.</p> <p>6.2 List the different types of Microphones based on impedance, Polar characteristics and principle of working.</p> <p>6.3 Explain the constructional details and working of carbon, condenser, crystal, dynamic and ribbon microphones and their ratings.</p> <p>6.4 Explain the constructional features and principle of operation of PMMC Loud Speaker and its ratings.</p> <p>6.5 Necessity of a baffle for a Loud Speaker.</p> <p>6.6 Types of baffles and their constructional details.</p> <p>6.7 Compare loudspeakers and head phones.</p>
7	Switches, Relays,	<p>7.1 Familiarize with different types of Switches SPST, SPDT, DPST, DPDT.</p> <p>7.2 Different types of switches and their ratings.</p> <p>7.3 Sketch the ISI symbols of the above switches.</p> <p>7.4 Applications of the switches.</p> <p>7.5 Define a Relay.</p> <p>7.6 Classify different relays.</p> <p>7.7 Explain the construction and working of general purpose Electromagnetic Relay.</p> <p>7.8 Mention specifications and applications of relays.</p>
8	PCB'S	<p>8.1 Explain the need of PCB in electronic equipment.</p> <p>8.2 Classify Printed Circuit Boards.</p> <p>8.3 List types of laminates used in PCB.</p> <p>8.4 Mention the methods of layout preparation of PCB.</p> <p>8.5 List the methods of transferring layout on the copper clad sheet</p> <p>Mention the methods of etching, cleaning and drilling of PCB.</p> <p>8.6 List the soldering methods of PCB.</p> <p>8.7 Give the standard PCB Specification.</p>
9	Batteries	<p>9.1 Elementary treatment of Batteries primary cells and secondary cells.</p> <p>9.2 Comparison of primary and secondary cells.</p> <p>9.3 Constructional details of Lead Acid cell nickel cadmium, nickel iron and working.</p> <p>9.4 Applications of the above cells.</p> <p>9.5 Comparison lead acid, nickel cadmium, Nickel iron cells.</p>

Electronic Devices and Circuits

Sr. No.	Unit		Scope and Limitation
1	Semiconductor Devices	1.1	Introduction to the Semiconductor Devices, Atomic Structure, K,L,M,N, energy levels, valence Electrons, Inter atomic bonds
		1.2	Energy band diagrams of conductors, insulators, and semiconductors with example.
		1.3	Electrical properties of Semiconductor materials Intrinsic and Extrinsic Semiconductors.
		1.4	P type and N type materials.
		1.5	PN Junction diode, Zener diode, Photo diode, LED, Varactor diode, characteristics and applications.
		1.6	Introduction to Transistors.
		1.7	Formation working and properties of PNP and NPN transistor
		1.8	Transistor configurations, input and output characteristics. Define alpha, beta, I_{co} , Relation between alpha and beta.
		1.9	Working of FET & MOSFET, characteristics and applications Special devices SCR, UJT, TRIAC, DIAC, their characteristics and their applications.
2	Power Supplies	2.1	Introduction to the power supply circuits. Types of Rectifier circuits.
		2.2	Draw & explain the working of Half wave, Full wave and Bridge Rectifier Circuits.
		2.3	Define RMS, DC Value, Ripple factor and efficiency of above Circuits.
		2.4	Necessity of a Filter-different filter circuits.
		2.5	Concept of voltage regulation, working of Zener diode as regulator.
		2.6	List the IC Regulators.
3	Small Signal Amplifiers	3.1	Introduction.
		3.2	Basic concept of amplifier circuits by CB, CE, CC Amplifiers using transistors, compare their characteristics.
		3.3	Biasing and stabilization of BJT amplifiers.
		3.4	Classification of amplifiers according to frequency, mode of operation, type and methods of coupling i.e. R C , L.C, R L coupled, Transformer coupled and direct coupled.
		3.5	Know frequency response, gain of the above amplifiers.
4	Power Amplifiers	4.1	Introduction to the AF and RF power amplifiers.
		4.2	Distinguish between Voltage and Power Amplifiers.
		4.2	Explain working of Single ended class A power Amplifier.
		4.2	Explain working of class B push-pull Amplifier.
		4.2	Explain working of complementary symmetry push pull amplifier.
		4.2	List the applications of power Amplifier

5	Feed back Amplifiers	5.1	Introduction to feed back amplifier, types of feedback.
		5.2	Principle of negative feed back amplifiers and their advantages.
		5.3	Different types of negative feedback.
		5.4	Explain the working of Emitter follower circuit and mention its Advantages.
6	Oscillators	6.1	Introduction to positive feed back.
		6.2	List the requisites of an oscillator.
		6.3	Explain the working of Hartley, Colpitts, Crystal, Tuned Collector oscillators.
		6.4	Explain the working of RC Phase Shift oscillator. List the different types of Multivibrators.
		6.5	Explain with circuit diagram, Astable Multivibrator.
		6.6	Explain the principle of Bistable and Monostable Multivibrators.
7	Pulse Shaping circuits	7.1	Distinguish between linear wave shaping and non linear wave shaping circuits.
		7.2	Integrating and differentiating circuits.
		7.3	Clipping and Clamping circuits.
		7.4	Applications of above circuits.
8	Integrated Circuits	8.1	Introduction to Microelectronics.
		8.2	Advantages of IC'S.
		8.3	Various IC packages.
		8.4	IC Pin Identification.
		8.5	Scale of Integration SSI, MSI, LSI, VLSI.
		8.6	Mention the precautions to be taken while handling IC'S.

Practical - I

Electronic Material and Components & Electronic Devices and Circuits

Practical Paper – 1 [A]

1. Safety precaution to be observed while working with electronic equipments and systems.
2. Drawing electrical symbols as per ISI specifications.
3. Verification of Ohm's law, using resistors in series and in parallel.
4. Measurement of electrical power consumption in simple AC/DC circuit by VI method.
5. Identification of various materials tools and devices.
6. Testing of resistor, capacitors, & semiconductors by Multimeter & colour coding method.
7. Testing of resistors, capacitors, & Inductors by LCR meter / Bridge.
8. Testing of RELAYS verifying conditions, such as normally "ON" and "OFF" etc.
9. Verification of Kirchhoff's Laws.
10. To study the different types of Cable and connectors.
11. Characteristics of Thermistor
12. Characteristics of LDR.
13. To study the Loudspeaker and Microphone.
14. Study of AC and DC sources (power suppliers) available in the laboratory with their specifications.
15. Series & Parallel resonance circuit, determination of its resonant frequency, bandwidth.
16. Testing a transformer, continuity, installation and turn ratio.
17. Measurement of I/P and O/P resistance of power supply & verification of maximum power transfer theorem.
18. Prepare PCB art work and etching using any simple circuit
19. Study of different types of batteries.
20. Study of soldering practice.

List of Recommended Books

1. Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Sons, New Delhi
2. Electronics Instrumentation by Cooper, Prentice Hall of India, New Delhi
3. Electronics Test and Instrumentation by Rajiv Sapra, Ishan Publications, Ambala
4. Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi
5. Electronic components and Materials by SM Dhir, Tata McGraw Hill, New Delhi
6. Electronic Engineering Materials by ML Gupta, Dhanpat Rai and Sons, New Delhi.
7. Electrical Technology, Fifth Edition by Edward Hughes, Longman Publishers
8. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Sons, New Delhi
9. Electrical Technology by BL Theraja, S Chand and Co, New Delhi

Practical Paper – I [B]

1. To study the semiconductor devices.
2. P-N Diode and Zener diode Characteristics.
3. Transistor characteristics - CE and CB.
4. Study of half wave rectifier with or without filters.
5. Study of full wave rectifier with or without filters.
6. Study of bridge rectifier with or without filters.
7. FET Characteristics.
8. SCR Characteristics.
9. UJT Characteristics.
10. Line & Load regulation and measurement of percentage of regulation.
11. Study of single stage CE amplifier with potential divider biasing. Measure the voltages and hence calculate the gain.
12. RC coupled amplifier: obtain the frequency response and calculate the gain.
13. Study of Push pull power Amplifier.
14. OP-AMP Characteristics.
15. OP-AMP in an Inverting and Non-Inverting mode.
16. OP-AMP as Adder and Subtractor.
17. Demonstration experiment of negative and positive feedback concept.
18. Measurement of frequency of Hartley oscillators.
19. Measurement of frequency of Colpitts oscillators.
20. Measurement of frequency of R-C Phase shift oscillators.

Recommended Books

1. Basic Electronics and Linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
3. Electronic Components and Materials by SM Dhir, Tata McGraw Hill, New Delhi
4. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
5. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill, New Delhi
6. Electronic Devices and Applications Nair, Prentice-hall, New- Delhi,
7. Electronic Devices and Circuit Theory Boylestad & Nashelsky, Prenticehall, New- Delhi, 8th Edition
8. Electronic Devices and Circuits Bell, Prentice-hall, New- Delhi, 4th Edition
9. Functional Electronics K.V. Ramanan
10. Engineering Electronics John D. Dyder
11. Electronic Devices & circuits Mottershead, Allen, Prentice Hall, India, New Delhi
12. Integrated Electronics Millian & Halikyas
13. Electronic devices & circuits, volume- I G.K. Mittal, Khanna Publishers, New Delhi, 22nd 1999
14. Laboratory manual for electronic devices and circuits Bell, Prentice-hall, New- Delhi, 4th Edition
15. Electrical Devices & Circuits Bogart, T.F., Universal Book Staff, New Delhi, 1st , 1991

Theory - II

Digital Electronics & Bio-Medical

Digital Electronics

Sr. No.	Unit		Scope and Limitation
1	Operational Amplifiers	1.1 1.2 1.3 1.4 1.5 1.6	Distinction between analog and digital signal. Applications and advantages of digital signals. Operational Amplifiers: Characteristics of an ideal operational amplifier and its block diagram. Definition of differential voltage gain, CMRR, PSRR, slew rate and input offset current Operational amplifier as an inverter, scale changer, adder, Subtractor, differentiator, and integrator. Concept of Schmitt triggers circuit and sample/hold circuit using operational amplifier and their applications.
2	Number System	2.1 2.2	Binary and hexadecimal number system: conversion from decimal and hexadecimal to binary and vice-versa BCD representation. Binary addition, subtraction, multiplication and division including binary points. BCD addition. 1's and 2's complement method of addition/subtraction.
3	Logic Gates	3.1 3.2 3.3 3.4 3.5	Concept of negative and positive logic. Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EXOR Gates, NAND and NOR as universal gates. Boolean algebra, DE Morgan's Theorems. Various identities. Formulation of truth table and Boolean equation for simple problem. Implementation of Boolean (logic) equation with gates. Logic family classification: Definition of SSI, MSI, LSI, VLSI,. TTL and MOS families and their sub classification. Codes: a) Concept of code, weighted and non-weighted codes, examples of 8421, BCD, excess-3 and Gray code. b) Concept of parity, single and double parity and error detection c) Alpha numeric codes: ASCII and EBCDIC.

4	Arithmetic circuits and Latches and flip flops	4.1	Half adder and Full adder circuit, design and implementation.
		4.2	Half and Full Subtractor circuit, design and implementation.
		4.3	4-bit adder/Subtractor.
		4.4	Concept and types of latch with their working and applications.
		4.5	Operation using waveforms and truth tables of RS, T, D, JK, and Master/Slave JK flip-flops.
		4.6	Difference between a latch and a flip-flop.
5	Shift Register & Memories	5.1	Introduction and basic concepts including shift left and shift right.
		5.2	Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out.
		5.3	Universal shift register.
		5.4	Basic RAM cell, $N \times M$ bit RAM, Expansion of word length and capacity, static and dynamic RAM, basic idea of ROM, PROM, EPROM and EEPROM.
6	A/D and D/A Converters	6.1	General principle of A/D and D/A conversion and brief idea of their applications. Binary resistor network and resistor ladder network methods of D/A conversion. Dual slope and successive approximation types of ADCs.
7	Introduction to Microprocessor	7.1	Introduction: Microprocessors – evolution, importance and different Application.

Bio-Medical

Sr. No.	Unit		Scope and Limitation
1	Fundamentals of Medical Instrumentation.	1.1	Physiological system of the body the cardiovascular system, the respiratory system, the nervous system, sources of biomedical signals.
2	Biomedical Electrodes	2.1	Study of bioelectrical potential & bio electric theory, recording electrodes silver chloride electrodes, electrodes for ECG electrodes for EEG, electrodes for EMG, & micro electrodes.
3	Diagnostic Instruments	3.1	Block diagram and explanatory study of: Electrocardiography (ECG), Electroencephalography (EEG), Electromyography (EMG) Ultrasonic imaging systems, Pacemaker defibrillators, CAT SCAN, MRI, and SONOGRAPHY.
4	Blood Cell Counters	4.1	Chemical sensors, bio sensors, smart sensors, methods of blood cell counting, blood pressure measurement, blood flow measurement.
5	Recording Systems	5.1	Basic recording systems, sources of noise in low level measurement signal processing technique, direct writing recorders, ink jet recorders potentiometric recorders, digital recorders, instrumentation tape recorders.

6	Concept of Biomedical Electronics	6.1	Biomedical Engineering, Biometrics, Components of man instrument system, Physiological system of the Body, cells & their structure, Resting & Action, Bioelectric Potential, The heart & cardiovascular system, Physiological.
		6.2	System for the Heart, Mechanical activity of Heart, Electrocardiography lead system, The Electrocardiogram, Electrocardiography, ECG instrumentation, other Physiological systems.
7	Transducers Signal Conditioning and Recorders	7.1	Display devices and recorders, Biomedical signal conditioning Devices, Amplifiers, Electrodes, Electrode theory, Chemical Electrodes, signal conditioning devices, medical preamplifier design, Biopotential recorders, Characteristics, ECG Recording Setup, Electroencephalography (EEG), EEG Recording setup & Analysis, Electromyography, (EMG) Recording Setup, Introduction of Electoretinography (ERG) and Electroculogram (EOG)
8	Radiology	8.1	Introduction, Generation of ionizing Radiation, X-Ray System, Radiography, X-Ray Diagnostic, Special techniques in X-Ray, Angiography, Radio Isotope, Imaging, Radiation therapy, Ultra Sonics, properties of Ultra Sound, Ultrasonic Imaging systems, Ultrasonic setup, Echocardiography
9	Biotelemetry & Impartibly	9.1	Instrumentation Biotelemetry, Introduction, Physiological parameters, Biotelemetry system, Radio telemetry system, Problems in implant telemetry, Application of telemetry in patient care, EEG measurements, EMG measurement, PACE MAKERS, Methods of stimulation, types of pacing modes, power sources in Pacemaker, types of Defibrillators, Kinds of Defibrillators, stimulator, other types of stimulators.
10	Patient Monitoring System	10.1	Medical Diagnosis and information systems. Patient monitoring systems: Intensive care operating room, recovery, room monitoring, Ambulatory patient monitoring, Tomography, Principles of computer assisted tomography.

Practical - II

Digital Electronics & Bio-Medical

Practical Paper – II [A]

1. Logic gates - AND, OR, NOT, NAND, NOR, EX-OR, and EX-NOR (Using IC's).
2. NAND or NOR gates as an Universal gates.
3. Study Characteristics of OP-Amp.
4. IC 741 (op-amplifier) as Inverter and non-inverter.
5. IC 741 (op-amplifier) as Adder and Subtractor.
6. Verification of truth tables of RS flip flop using NOR and NAND gates.
7. JK and Master Slave JK Flip Flop.
8. Half Adders - Subtractor (Using IC Logic gates)
9. Full adder - Subtractor (Using IC Logic gates)
10. To study details of counters IC's like 7490
11. Observe the output of decade counter 7490 on a seven segment display using a decoder
12. To construct and test 4/8 bit A/D converter using IC.
13. To construct and test 4/8 bit D/A converter using IC.
14. To study shift register IC's like 7495.
15. Study of different types of Memories.

List of Recommended Books

1. Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill, New Delhi
2. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
3. Digital Fundamentals by Thomas Floyds, Universal Book Stall
4. Digital Electronics by RP Jain, Tata McGraw Hill, New Delhi
5. Microprocessor Architecture, Programming and Applications with 8085 by RS Gaonkar
6. Operational Amplifiers and Linear Integrated Circuits by Ramakant A. Gaykwad

Practical Paper – II [B]

List of Experiments:

1. Study the panel controls and its functions and study the operation and trace the circuit diagram of the ECG, Echo Cardiograph, Bedside Monitor, Pacemaker, Defibrillator, EMG, EEG.
2. Study the panel controls and its functions and study the operation and trace the circuit diagram of the x-ray equipment.
3. Study the panel controls and its functions and study the operation and trace the circuit diagram of the Short-wave, Microwave and Ultrasonic diathermy, tense stimulator.
4. Wax bath, physiotherapy with IR and UV Radiation.
5. Skeletal System.
6. Cardiovascular System & Lymphatic System.
7. Nervous System and sense organs.
8. Measurement of blood pressure.
9. Study of various electrodes used in bio medical engineering.
10. Measurement and observation of BP and recording data on PC.

Visit to medical labs and ICU of different hospitals.

List of Recommended Books

1. Biomedical Instrumentation & Measurement by L. Cromwell, F.J. Weibell and E.A. Pfeiffer, 2nd Ed., PHI
2. Principles of Medical Electronics & Biomedical Instrumentation, C Raja Rao & S.K Guha, University Press
3. Electronics in Medicine and Biomedical Instrumentation – Nandini K. Jog, PHI
4. Biomedical Instrumentation – Dr. A. Arumugam, Anuradha Agencies, Chennai.
5. Handbook of Biomedical Instrumentation by R.S. Khandpur, TMH Pub. Co.
6. Introduction to Biomedical Engineering, Domach, Pearson Education
- 7 Bio medical instruments Chrompbell
- 8 Handbook of medical instruments R S Khandpur
- 9 Biomedical instruments M.E. Van Valkenburg

List of Materials and Instruments for Bio-Medical Equipment Servicing Lab

Sr. No.	Name of the equipment with Specifications	Quantity
1	Combination Pliers 15 Cms insulated	10
2	Long nose insulated pliers 15 Cms	10
3	Side cutter 15 Cms	10
4	End Cutting nipper insulated 15 Cms	10
5	Tweezers 10 Cms	10
6	Neon glow tester	10
7	Screw driver set of 6	10
8	Watch maker screw	05
9	Allen Key	01
10	Drill beat set	01
11	Hacksaw 20-25cm (adjustable)	01
12	Junior saw 20cm	01
13	File flat 20cm 2nd cut	01
14	Soldering iron 25 Watt	10
15	Temperature controlled soldering station 15 Watt	01
16	De-soldering pump	10
17	Wire gauge set	01
18	Tweezers 10 Cms	10
19	Adjustable spanner/slide wrench (15-20cis)	01
20	Wire stripper	10
21	Electric drill machine 10mm	01
22	Digital multimeter	10
23	Analog multimeter	10
24	Voltmeters 0-1V / 0-10V / 0-50V / 0-100V	02 Each
25	Ammeters 0-10 mA / 0-100 mA / 0-500 mA / 0 – 1 A	02 Each
26	Watt meter 5/250V	01
27	Regulated power supply 30V/1A	10
28	Oscilloscopes 20 MHZ	04
29	Digital Storage CRO	01
30	Digital frequency counters / Meters	02
31	Function Generator	01
32	Digital LCR meters	02

33	Digital trainers	02
34	Digital IC Tester	01
35	Logic Probes	05
36	Dimmerstat, 2 Amps	02
37	Servo Motor	01
38	DC Motor	02
39	Tachometer	01
40	Different types of displays	02 each
41	Work table/Bench	01
42	Microprocessor kit (8085)	02

List of Equipment for Bio-Medical Equipment Servicing Lab

Sr. No.	Name of the equipment with Specifications	Quantity
1	Water Bath	01
2	Hot Air Oven and Incubator	01
3	Conductivity meter,	01
4	Gas Analyzer.	01
5	Colorimeter. pH meter,	01
6	Flame Photometer, Blood	01
7	Gas Analyzer.	01
8	Short-wave diathermy,	01
9	Microwave diathermy	01
10	Ultrasonic diathermy.	01
11	ECG	01
12	Echo Cardiograph	01
13	Bedside Monitor	01
14	BP measurement with sphygmomanometer and stethoscope	01
15	Pacemaker, Defibrillator	01
16	Mobile x-ray and 300 mA x-ray equipment	01
17	Dark Room Accessories	01
18	Ultrasonic Scanning equipment.(U/S scanner)	01
19	Surgical diathermy, Pulse Oximeter.	01
