

# ENGINEERING AND TECHNOLOGY GROUP

## 1: ELECTRONICS TECHNOLOGY (J1, J2, J3)

### Scheme of Examination

#### Std. XI

Paper	Title of the Paper	Theory		Practical		Term work	Project work	I.V.*	Total Marks
		Marks	Time (Hrs)	Marks	Time (Hrs)				
1	Basic Electricity	80	3	80	3	20	10	10	200
2	Basic Electronics	80	3	80	3	20	10	10	200
3	Digital Electronics	80	3	80	3	20	10	10	200

\* IV = Industrial Visits

#### Std. XII

Paper	Title of the Paper	Theory		Practical		Term work	Project work	I.V.*	OJT**	Total Marks
		Marks	Time (Hrs)	Marks	Time (Hrs)					
1	Applied and Industrial Electronics	80	3	80	3	10	10	10	10	200
2	Modern Instruments & Communication systems	80	3	80	3	10	10	10	10	200
3	Computer Hardware & Networking	80	3	80	3	10	10	10	10	200

\* IV = Industrial Visits

\*\* OJT = On Job Training

## **Introduction**

Electronics Technology is one of the important Higher Secondary vocational course under Engineering and Technological group introduced by the state government from the academic year 1988-1989. The state board revised syllabus as per NVEQF (National Vocational Education Qualification Policy). This policy is decided by National Skill Development Corporation (NSDC) under HRD ministry of Government of India to nurture technological advancement & Skill development for job opportunities in various Electronic sectors.

The syllabus of Electronics Technology sector has been evolved in such a way that after completion of the course of two years (Std. XI) [L3] and (Std. XII) [L4] The student would acquire good working skills suited to work as a skilled person in industry. He would also gain knowledge for electronic technician, electronics sales & service.

## **Objectives**

On completion of the course, the student will gain.

- Knowledge of working & operating principles of electronic circuits & equipments.
- Skills for fault analysis and diagnosis of electronic equipment, repair & replacement of faulty parts.
- Skills on assembly, testing, repair, maintenance and installation of electronic equipment.
- Ability to examine schematic layouts wiring diagrams and product details.
- Knowledge of entrepreneurship activities.
- Awareness of safety precautions.

## **Job Opportunities**

After successful completion the course the student can have opportunities in the following fields with acquiring professional skills.

- Audio & TV technician.
- Computer hardware technician.
- Electronics servicing sector.
- Electronic technician.
- Sales & service in consumer electronics.
- Service person in telecom sector.
- Entrepreneur.

## **Future Education**

If student desires he can take admission to direct second year diploma course and also go for higher education.

**Std. XI**  
**Paper I: Basic Electricity (J1)**  
**Theory**

<b>Sr. No.</b>	<b>Unit</b>	<b>Sub-Unit</b>	<b>Periods</b>
1.	Electrical Safety and Tools	1.1 Electrical Symbols	<b>22</b>
		1.2 Electrical safety	
		1.3 Tool Kit	
2.	Introduction to Electricity	2.1 Basic Electrical Terms	<b>25</b>
		2.2 Basic Networks	
		2.3 Electrical Laws	
3.	Study of Electronic Components	3.1 Passive Components	<b>25</b>
		3.2 Active Components	
		3.3 PCB and Soldering	
4.	Electrostatics	4.1 Electrostatics	<b>10</b>
5.	Magnetism and Electromagnetism	5.1 Magnetism	<b>14</b>
		5.2 Electromagnetism	
6.	A C Circuits	6.1 AC fundamentals	<b>12</b>
		6.2 Resonance	
7.	Electrical Measurements	7.1 Meters	<b>12</b>
<b>Total Marks</b>			<b>120</b>

**Practical**

<b>Sr. No.</b>	<b>List of Practicals</b>	<b>Periods</b>
1.	Prepare drawing sheet of electrical symbols.	9
2.	Enlist the Safety precautions to be taken in the Electronics Laboratory.	9
3.	Prepare drawing sheet of tools used in the electronics lab.	9
4.	Enlist different voltage sources in the laboratory and note their specifications.	9
5.	Prepare drawing sheet of Active and passive components.	9
6.	Familiarization and use of Ammeter, Voltmeter and Multimeter	9
7.	Verification of Ohm's Law	9
8.	Verification of Kirchhoff's Current Law.	9
9.	Verification of Kirchhoff's Voltage Law.	9

10.	Identification and testing of Passive components.	9
11.	Study of different types of Switches, relays and Connectors.	9
12.	Identification and testing of Active components.	9
13.	Identify and draw Pin Configuration of IC's 555,741, 74XX, etc.	9
14.	Prepare layout and PCB of simple circuit like bridge rectifier.	9
15.	Study charging and discharging of capacitor through resistor.	9
16.	Study of series and parallel resistive circuits.	9
17.	Demonstrate solenoid as Electro-magnet.	9
18.	Prepare chart for typical sinusoidal waves for Amplitude, frequency, time period, Peak value, Average value, RMS value.	9
19.	Study of PMMC galvanometer	9
20.	Conversion of PMMC into Ammeter	9
21.	Conversion of PMMC into Voltmeter.	9
22.	Project, Industrial Visit	51
<b>Total</b>		<b>240</b>

## Paper II: Basic Electronics (J2) Theory

Sr. No.	Unit	Sub-Unit	Periods
1.	Semiconductors	1.1 Atomic structure	15
		1.2 Semiconducting material	
2.	Special semiconductor diodes	2.1 P-N Junction	15
		2.1 Special Diodes	
3.	Power Supplies	3.1 Rectifiers	25
		3.2 Filters	
		3.3 Characteristics	
		3.4 Regulators	
4.	Amplifiers	4.1 Transistor	25
		4.2 Amplifiers	
		4.3 Multistage amplifiers	
		4.4 Feed backs in Amplifier	
		4.5 Differential Amplifier	
5.	Oscillators	5.1 Basic of oscillator	20
		5.2 LC oscillator	
		5.3 RC oscillator	
		5.4 Crystal	
6.	Special Semiconductor devices	6.1 FET	20
		6.2 UJT	
		6.3 SCR, Diac, Triac	
<b>Total Marks</b>			<b>120</b>

## Practical

Sr. No.	List of Practicals	Periods
1.	Identification of different types of diodes (LED, PHOTO, PN-junction, ZENER, etc)	9
2.	Testing of diode using analog and digital multimeter.	9
3.	Study of V-I characteristics of PN junction diode.	9
4.	Construct and test Halfwave rectifier.	9
5.	Construct and test Fullwave rectifier.	9
6.	Construct and test Bridge rectifier.	9
7.	Study of LC filter and its ripple factor.	9
8.	Find Line and Load regulation of unregulated power supply.	9
9.	Construct and test Zener diode as voltage regulator.	9
10.	Study of Fixed voltage regulator (using IC-7805/7809/7912 etc)	9
11.	Construct adjustable voltage regulator using IC-LM317).	9
12.	Identification of different types of transistors (UJT, BJT, FET, Power)	9
13.	Study input characteristics of CE transistor configuration.	9
14.	Study output characteristics of CE transistor configuration.	9
15.	Construct Hartley oscillator using transistor.	9
16.	Construct Colpitt's oscillator using transistor.	9
17.	Construct phase shift oscillator using transistor.	9
18.	Study of crystal oscillator.	9
19.	Study of diac, triac, SCR.	9
20.	Study VI characteristics of UJT transistor.	9
21.	Demonstration of FET Amplifier.	9
22.	Project, Industrial Visit	51
<b>Total</b>		<b>240</b>

## Paper III: Digital Electronics (J3) Theory

Sr. No.	Unit	Sub-unit	Periods
1.	Number Systems and Binary Arithmetic	1.1 Number Systems and conversions	10
		1.2 Binary Arithmetic	
		1.3 Codes	
2.	Logic Gates	2.1 Basic Gate	15
		2.2 Derived Gates	
		2.3 Boolean Algebra	

		2.4 Applications of Ex-OR gate	
3.	Logic Families	3.1 Introduction of Logic Families	10
		3.2 TTL Logic Circuits	
		3.3 CMOS Logic Circuits	
4.	Combinational Logic Circuits	4.1 Multiplexer	20
		4.2 De multiplexer	
		4.3 Encoder	
		4.4 Decoder	
5.	Flip-flops	5.1 Introduction to Flip-flop	20
		5.2 S-R flip flop	
		5.3 D flip flop	
		5.4 J-K Flip flop	
		5.5 JK-MS	
		5.6 T Flip flop	
6.	Registers	6.1 Introduction and types of register	10
		6.2 Left shift register	
		6.3 Right shift register	
7.	Counters	7.1 Types of counters	25
		7.2 Ripple counter	
		7.3 Decade counter	
		7.4 Down counter	
		7.5 Up/down counter	
		7.6 Ring counter	
8.	Data conversion	8.1 Need of Data conversion	10
		8.2 DAC	
		8.3 ADC	
<b>Total</b>			<b>120</b>

## Practical

Sr. No.	List of Practicals	Periods
1.	Convert binary number to decimal number and vice versa.	9
2.	Convert Hexadecimal number to decimal number and vice versa.	9
3.	Convert octal number to decimal number and vice versa.	9
4.	Subtract binary numbers using 1's compliment method and 2's	9

	compliment method.	
5.	Draw logic diagram for Boolean equation, simplify it by boolean algebra and draw simplified diagram.	9
6.	Identify IC 7404, 7408, 7432 and verify truth table of all basic gates.	9
7.	Identify IC 7400, 7402, 7486 and verify truth table of all derived gates.	9
8.	Construct and verify Ex-OR gate using basic gates only.	9
9.	Construct and Prove Demorgan's theorem.	9
10.	Construct basic gates using NAND gate.	9
11.	Construct basic gates using NOR gate.	9
12.	Study of half adder circuit.	9
13.	Study of Full adder circuit.	9
14.	Construct Ex-OR as 4 bit controlled invertors.	9
15.	Construct 4:1 Multiplexer using IC74153 and verify its truth table.	9
16.	Construct 1:4 De-multiplexer using IC74139 and verify its truth table.	9
17.	Construct BCD to seven segment display using IC7447 and verify its truth table.	9
18.	Construct Encoder using IC74147 and verify its truth table.	9
19.	Construct decade counter using IC7490 and verify its truth table.	9
20.	Construct R-2R ladder for 4 bit DAC and test it.	9
21.	Construct and test simultaneous ADC using OPAMP.	9
22.	Project, Industrial Visit	51
	<b>Total</b>	<b>240</b>

**Std. XII**  
**Paper I: Applied and Industrial Electronics (J1)**  
**Theory**

Sr. No.	Unit	Sub-unit	Periods
1.	Operational Amplifier	1.1 Need of OPAMP	30
		1.2 Block diagram OPAMP	
		1.3 Ideal Characteristics	
		1.4 OPAMP Parameter	
		1.5 Linear Applications	
		1.6 Non Linear Applications	
2.	Electronic Timers	2.1 Introduction to IC-555	28
		2.2. Astable multi vibrator	
		2.3 Monostable multi vibrator	
		2.4 Bistable multivibrator	
		2.5 FSK Using 555	
		2.6 Introduction to PWM.PPM,PAM application	

3.	Optoelectronic Devices	3.1 Photo diode	15
		3.2 Photo transistor	
		3.3 LDR	
		3.4 FOC	
4.	Motors	4.1 Motor fundamentals	11
		4.2 Speed control of Motor	
		4.3 Applications	
5.	Modern Electronic Machine	5.1 Copier (Xerox)	14
		5.2 Scanner	
		5.3 Lamination machine	
		5.4 I-card making	
		5.5 Emergency Light	
		5.6 FAX	
6.	Remote Control	6.1 Introduction.	10
		6.2 Ground Station	
		6.3 Remote Station	
		6.4 Applications	
7.	Solar Systems	7.1 Solar Cell	12
		7.2 Applications	
		7.3 Maintenance	
		7.4 Introduction to Solar Power station	
<b>Total</b>			<b>120</b>

## Practical

Sr. No.	List of Practicals	Periods
1.	Determination of gain of Inverting amplifier.	9
2.	Determination of gain of Non-Inverting amplifier.	9
3.	Study of Op amp as Adder.	9
4.	Study of Op amp as Subtractor.	9
5.	Study of Op amp as Integrator.	9
6.	Study of Op amp as differentiator.	9
7.	Study of Op amp as Buffer.	9
8.	Study of Op amp as Comparator.	9
9.	Study of Op amp as Schmitt's Trigger.	9
10.	Study of IC 555 in Monostable mode.	9
11.	Study of IC 555 in Astable mode.	9
12.	Study of Optocoupler circuit.	9
13.	Demonstration of solar cells and solar appliances.	9
14.	Demonstration of copier Machine.	9
15.	Demonstration of scanning of document.	9
16.	Construct a circuit of speed control of DC motor.	9
17.	Construct and study FSK using IC 555.	9
18.	Study V- I characteristics of Photo Diode.	9



19.	Demonstration of infra red remote control circuit.	9
20.	Demonstration of FAX machine.	9
22.	Project, Industrial Visit, O.J.T	60
<b>Total</b>		<b>240</b>

**Paper II: Modern Instruments and Communication Systems  
(J2)  
Theory**

<b>Sr. No.</b>	<b>Unit</b>	<b>Sub-unit</b>	<b>Periods</b>
1.	Transducers	1.1 Introduction	25
		1.2 Resistive Transducers	
		1.3 Capacitive Transducers	
		1.4 Inductive Transducers	
		1.5 Optical Transducers	
		1.6 Active Transducers	
2.	Electronic Instruments	2.1 Introduction	25
		2.2 PMMC	
		2.3 CRO	
		2.4 DMM	
		2.5 Frequency generator	
3.	Electronic Communication	3.1 Analog Communication	25
		3.2 Modulations Satellite Communication	
		3.3 Digital Communication	
		3.4 Fibre –optic Communication	
		3.5 Cell-Phones	
4.	Communication Devices	4.1 Wireless communication devices	08
5.	TV receivers	5.1 TV receivers	22
6.	Consumer Electronic Appliances	6.1 Home Appliances, Commercial Appliances	15
<b>Total Marks</b>			<b>120</b>

## Practical

Sr. No.	List of Practicals	Periods
1.	Study of Themistor NTC, PTC.	9
2.	Use of condenser microphone as a sound transducer.	9
3.	Study and re-coning of the load speaker.	9
4.	Study V-I characteristic of photo cell.	9
5.	Study and use of Optocoupler in any circuit.	9
6.	Construct multirange ammeter using galvanometer.	9
7.	Construct multirange voltmeter using galvanometer.	9
8.	Study the front panel controls of CRO.	9
9.	Measure frequency time period and AC/ DC Voltage using CRO.	9
10.	Measure phase difference using lissageous patterns of CRO.	9
11.	Construct and study AM Modulator circuit.	9
12.	Construct simple diode detector circuit.	9
13.	Construct and study FM transmitter circuit.	9
14.	Installation of DTH.	9
15.	Downloading of various Android Applications for cell phones.	9
16.	Demonstration of Fibre optic communication.	9
17.	Study of television controls.	9
18.	Demonstration of working of LED and LCD TV.	9
19.	Study the working of MP3 music system, Mixer-Juicers.	9
20.	Study the working of Microwave, Washing machine, Air conditioner.	9
21.	Project, Industrial Visit, O.J.T.	60
<b>Total</b>		<b>240</b>

## Paper III: Computer Hardware and Networking (J3) Theory

Sr. No.	Unit	Sub-unit	Periods
1.	Introduction to Microprocessor and Organization of 8085	1.1 Introduction and Evolution of microprocessor	18
		1.2 Basic Blocks of microprocessor	
		1.3 Architecture of 8085 microprocessor	
		1.4 Functional pin diagram of 8085	
2.	Instruction Set and programming of 8085	2.1 Addressing modes of 8085	23
		2.2 Instruction set of 8085	
		2.3 Interrupts in 8085	
		2.4 Assembly language Programming	
3.	Microprocessor X-86 Family	3.1 Introduction to advance microprocessor	12
		3.2 Introduction to X-86 microprocessor	
		3.3 Attributes of X-86 family	

		3.4 Programming model of X-86	
4.	Microcontrollers	4.1 Introduction to Microcontroller	12
		4.2 Advantages over microprocessor	
		4.3 Architecture of 8051	
		4.4 Overview of other microcontrollers	
		4.5 Applications of microcontrollers	
5.	Networking Technology	5.1 Study of transmission Lines	20
		5.2 Network topologies	
		5.3 Protocols	
		5.4 Introduction to connectivity devices	
6.	Fundamentals of Computer	6.1 Basic blocks of computer	20
		6.2 Memories in Computers	
		6.3 Overview of motherboard	
		6.4 Specifications of Computer	
7.	Operating Systems	7.1 Introduction to operating systems	15
		7.2 Services in OS	
		7.3 Overview of windows-98, windows-NT	
		7.4 Access and Security aspects of OS	
<b>Total Marks</b>			<b>120</b>

## Practical

Sr. No.	List of Practicals	Periods
1.	Drawing Sheet of Architecture and pin diagram of 8085 microprocessor.	9
2.	Drawing Sheet of microprocessor Kit.	9
3.	Introduction to operate microprocessor 8085 kit	9
4.	Write a program to store data by different instructions.	9
5.	Draw flow chart and write a program of simple addition (direct addressing mode).	9
6.	Draw flow chart and write a program of simple addition (indirect addressing mode).	9
7.	Draw flow chart and write a program of simple subtraction (direct addressing mode).	9
8.	Draw flow chart and write a program of simple subtraction (indirect addressing mode)	9
9.	Write simple program to study Logical and branch instructions.	9
10.	Write a program to find largest number.	9
11.	Write a program to find Block Move.	9
12.	Write a program to find smallest number.	9
13.	Write a program to exchange that contains two blocks.	9
14.	Write a program to multiply two numbers.	9
15.	Write a program to study PUSH-POP instructions.	9
16.	Write a program to study SIM-RIM instructions.	9

17.	Drawing Sheet of Architecture of 8051 microcontroller.	9
18.	Draw the sheets of different connectivity devices like Modem, Hub, Repeaters and Routers.	9
19.	Draw the sheets of LAN,MAN, WAN	9
20.	Draw the sheets of Network topologies (Star, Bus, Ring)	9
21.	Project, Industrial Visit, O.J.T.	60
	<b>Total</b>	<b>240</b>

**List of Reference Books (XI and XII)**  
**Electronics Technology**

<b>Sr. No.</b>	<b>Author</b>	<b>Title</b>	<b>Publisher</b>
1.	V. K. Mehta	Principles of Electronics	S. Chand & Co.
2.	B. L. Theraja	Basic Electronics	
3.	Madhuri Joshi	Electronic Components and Materials	Shroff Publishers & Distributors Private Ltd.
4.	Walter C. Bosshart	Printed Circuit Boards	Tata McGraw Hill
5.	Paul Malvino	Electronic Principles	Tata McGraw Hill
6.	R.S. Sedha	Applied Electronics	S. Chand & Co.
7.	Allen Mottershed	Electronics Devices & Circuits	Prantice Hall India Ltd
8.	A. K. Sawhney	Electrical & Electronic Measurements & Instrumentations	Dhanpat Rai & Co.
9.	W.D. Cooper	Modern Electronic Instrumentation & Measurement Techniques	Pearson Education, New Delhi
10.	N.N. Bhargava, D.C. Kulashreshtha, S.C.	Basic Electronics & Linear Circuits	Tata McGraw Hill
11.	David J. Bell	Electronics Devices & Circuits	Prentice Hall of India
12.	Malvino & Leach	Digital Principles and Applications	TMH
13.	R. P. Jain	Modern Digital Electronics	TMH

14.	Malvino	Digital Principles	Tata McGraw Hill (TMH)
15.	Ramakant A. Gaikwad	O-Amp & Linear Integrated Circuits	Prentice-Hall of India, New Delhi
16.	K. R. Botkar	Integrated Circuits	Khanna Publisher, New Delhi
17.	D. Balasubramanian	Computer Installation & Servicing	Tata McGraw Hill
18.	J. Millman and H. Taub	Pulse Digital & Switching Waveforms	Tata McGraw Hill
19.	Floyd	Digital Fundamentals	Universal Book Stall New Delhi
20.	M. Morris Mano	Digital Logic and Computer Design	PHI
21.	Ramesh S. Gaonkar	Microprocessor Architecture, Programming and Applications with 8085	Penram International
22.	B. Ram	Fundamentals of Microprocessors and Microcomputers	Dhanpat Rai Publications
23.	Albertr Malvino	Electronic Principles	Tata McGraw Hill
24.	Grob Bernard	Basic Electronics	Tata McGraw Hill
25.	G. K. Mithal	Industrial Electronics	Khanna Publications
26.	S. Ramabhadran	Principles of Communication	Khanna Publications
27.	A. M. Dhake	Television Engineering	Tata McGraw Hill
28.	J. Kennady	Principles of Communication	
29.	A. P. Mathur	Introduction of Microprocessor	Tata McGraw Hill
30.	Frenzel	Communication Electronics, Principles and application	Tata McGraw Hill
31.	B. Grob	Basic T.V. and Video Systems	Tata McGraw Hill
32.	R.R. Gulati	Modern TV Practice	New-Age International
33.	Govind Rajalalu	IBM-PC and clones	
34.	Jeff Heeth	Understanding fibre optics	BPB New Delhi

<b>TOOLS AND EQUIPMENTS</b>		
<b>Sr. No.</b>	<b>Specification</b>	<b>Quantity</b>
1	Neon Tester 500V	10
2	Soldering iron 25 W. 240 V.	10
3	Screw driver set (set of 5)	5
4	Insulated side cutting pliers 150 mm	5
5	Insulated combination pliers 150 mm	5
6	Long nose pliers 150 mm	5
7	Tweezers 100 mm	5
8	Digital Multimeter	10
9	Analog Multimeter	10
10	Electrician Knife	10
11	Soldering Iron Changeable bits 25 W	2
12	Soldering Iron 10 W	2
13	IC plucker	2
14	Server Computer (Tower Model)	1
15	Desktop Computer Latest Configuration	5
16	Printers: Laser	1
17	5KVA online UPS	1
18	LAN Cards	5
19	LCD/DLP Projector	1
20	Pen Drives	3
21	External Hard Disk	1
22	Card Reader	2
23	Router	1
24	CRO (Minimum 20MHz Dual Trace with CT)	3
25	Function Generator (Up to MHz with all Functions)	3
26	Dimmerstat (0-300 V)	2
27	Audio Amplifier systems with Equalizer, Speaker and microphone	2
28	Galvanometer	5
29	DVD player	1
30	Digital Frequency Meter	1
31	A.F. Signal Generator	3
32	Solar panel for light/heat	1
33	RPM counter	1
34	Digital IC trainer kits	1
35	DC regulated power supply (0-30) V, 1A	10
36	Mobile Android	1
37	Microprocessor 8085 Kit	5
38	Emergency Lamp	2
39	Lamination M/c	1
40	Computer Speaker, Head phone, Webcam	1
41	PCB drill machine with drill bit	1

42	DTH setup	1
43	LED/LCD TV with remote	1
44	MP3 music system	1
45	DC-Volmeters (range 0-1/10/25)	Each – 2
46	DC-Ammeters (range 0-1/10/100/500mA)	Each – 2
47	Breadboard	5
48	De toy motor	2
49	Rheostat	3
50	Allen Key Set	2

Note: Raw material/consumable material required as per practicals can be purchased.

## List of Electronic Components

1. Passive components
  - a. Various carbon resistors of different wattages
  - b. Wire wound resistors
  - c. Metal film resistors
2. Variable resistors (Pots) Lin, Log carbon and Wire wound resistors
3. Thermistor (NTC, PTC)
4. Photo resistors
5. Active components Power diode, Photodiode, semiconducting diode, Zener diode, LED  
Transistors – NPN = BC147, BC148, BF194, 2N3055  
PNP = AC126, AC176
6. Integrated Circuit – IC 555, IC 741, IC 74XX Series, IC 317, IC 340, IC 78XX, IC 79XX
7. Switches as per required
8. Relays
9. Connectors
10. Connecting Wires
11. Soldering Material
12. Flux
13. Electric board
14. Banana pins
15. Copper Clad
16. General purpose PCB



17.  $\text{FeCl}_3$
18. Capacitors Ceramic Electrolytic
19. Inductors – As per requirement
20. Transformers – As per requirement
21. Resistance box
22. Electromagnet
23. Crystals
24. Diac
25. Traic
26. SCR (Silicon Controlled Rectifier) SN 100
27. UJT (Uni junction transistor) 2N2646
28. FET (Field Effect Transistor) BFT10/11
29. Loud speakers
30. Fiber Optic cable
31. Microphone
32. Photocell
33. Optocoupler