

**MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION,
MUMBAI - 51**

1	Name of Syllabus	C.C. IN LICENTATE IN ELECTRONICS AND RADIO SERVICING (L.E.R.S.) 301201																																																													
2	Max.Nos of Student	25 Students																																																													
3	Duration	1 year																																																													
4	Type	Full Time																																																													
5	Nos Of Days / Week	6 Days																																																													
6	Nos Of Hours /Days	7 hrs.																																																													
7	Space Required	1) Workshop = 200 sqfeet 2) Class Room = 200 sqfeet TOTAL = 400 sqfeet																																																													
8	Entry Qualification	S.S.C.																																																													
9	Objective Of Syllabus/ introduction	To prepare a student to carry out systematic servicing of AM/FM receivers, audio amplifiers, tape recorders, intercoms and electronic equipments using digital principles, through the study of principles of operations of passive and active some conductor devices, circuit configurations, instruments, equipments and accessory used.																																																													
10	Employment Opportunity	Self Employment / May get job in Establishment																																																													
11	Teacher's Qualification	Diploma in Electronics & Telecommunication NCTVT (Electronics)																																																													
12	Training System	<table><tr><th colspan="7">Training System Per Week</th></tr><tr><td>Theory</td><td colspan="2">Practical</td><td colspan="4">Total</td></tr><tr><td>12 hrs</td><td colspan="2">30 hrs</td><td colspan="4">42 hrs</td></tr></table>						Training System Per Week							Theory	Practical		Total				12 hrs	30 hrs		42 hrs																																						
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13	Exam. System	<table><tr><th>Sr. No</th><th>Paper Code</th><th>Name of Subject</th><th>TH/ PR</th><th>Hrs</th><th>Max Mark</th><th>Mini. Mark</th></tr><tr><td>1</td><td>30120111</td><td>Basic Electronics</td><td>TH-1</td><td>3 Hrs</td><td>100</td><td>35</td></tr><tr><td>2</td><td>30120112</td><td>Applied Electronics</td><td>TH-2</td><td>3 Hrs</td><td>100</td><td>35</td></tr><tr><td>3</td><td>30120113</td><td>Principle of Audio & Radio Equipment Servicing</td><td>TH-3</td><td>3 Hrs</td><td>100</td><td>35</td></tr><tr><td>4</td><td>30120121</td><td>Basic Electronics</td><td>PR-1</td><td>3 Hrs</td><td>100</td><td>50</td></tr><tr><td>5</td><td>30120122</td><td>Applied Electronics</td><td>PR-2</td><td>3 Hrs</td><td>100</td><td>50</td></tr><tr><td>6</td><td>30120123</td><td>Principle of Audio & Radio Equipment Servicing</td><td>PR-3</td><td>3 Hrs</td><td>100</td><td>50</td></tr><tr><td></td><td></td><td>TOTAL</td><td></td><td></td><td>600</td><td>255</td></tr></table>						Sr. No	Paper Code	Name of Subject	TH/ PR	Hrs	Max Mark	Mini. Mark	1	30120111	Basic Electronics	TH-1	3 Hrs	100	35	2	30120112	Applied Electronics	TH-2	3 Hrs	100	35	3	30120113	Principle of Audio & Radio Equipment Servicing	TH-3	3 Hrs	100	35	4	30120121	Basic Electronics	PR-1	3 Hrs	100	50	5	30120122	Applied Electronics	PR-2	3 Hrs	100	50	6	30120123	Principle of Audio & Radio Equipment Servicing	PR-3	3 Hrs	100	50			TOTAL			600	255
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Syllabus

Theory – I Basic Electronics

1. **A. C. CIRCUITS**
Concept of Alternating current relation between frequency, wave length, Relation between peak, Average and RMS values.
Transformer, Principles of transformer working, types of transmitters and chokes. Series Parallel R-L, R-C, RLC Circuits with impedance concept. Series and Parallel Tuned circuits.
(no question of calculation on A.C. CIRCUITS)
2. **A. C. CIRCUITS**
Resistance. Ohm's law. Series circuits. Parallel circuits with simple applications Concept of power. Energy and simple calculations, Types of Resistors Capacitors, their Colours Codes.
(no question to be asked on construction and fabrication)
3. **SEMICONDUCTORS**
German, Silicon, atomic structure, Generation of Electrons, Holes, flow of current, concept of N type, P-type impurities P and N semiconductors, effects of temperature on flow of current. PN junction diode, forward biased and reverse biased characteristics, Introduction to practical application of these characteristics i.e. rectifier, regulator, detector, clamper etc. Zener diode.
4. **TRANSISTORS**
NPN, PNP types, biasing methods, CE, CB, CC configuration. Various practically used. Transistors for low power and high power application.
Field Effect Transistors. Junction FET and MOSFET Construction operation and characteristics and typical (Code. Nos.) Used.
5. **THYRISTORS**
UJT, SCR, Disc, Triad, their principle of working characteristics and their simple applications.
7. **SOUND**
Nature of sound, intensity, pitch and timber, frequency response of human ear, frequency limits of audibility. Definition, unit of measurement Decibel, Conversion of sound to electrical signals, type of microphones and speakers.
8. **DC POWER SUPPLIES**
Batteries – Cell and batteries (rating and types), AC to DC Types – half wave, Full wave, Calculation of Ripple factor, regulation characteristics, types of filter, stabilized power supply (using Zener) Constant voltage type. Battery charger.
(no question to be asked on construction of battery)
9. **TRANSISTOR AMPLIFIERS**
Class A, Class B, Class C type, their operation and application, Various methods of AC coupling phase inverter, feedback in amplifiers, low power amplifiers, single ended, push-pull, complimentary type with ref. To audio frequency

Practical - I Basic Electronics

1. Identification of Basic Electrical & Electronics Component
2. Measurement of voltage current & Resistance using Multimeter
3. Verification of ohms Law In series & Parallel Circuits
4. Measurements of Electrical Power in A.C. & D.C.
5. Transformer Testing
6. Study OF Soldering Techniques
7. Fabrication of P.C.B. Techniques
8. Fabrication of Test Board for 230 volts,

9. Study of Construction of different types of Loud Speakers
10. Assemble half wave, Full Wave & Bridge Rectifier
11. Testing of UJT, SCR, DAG, TRIAC
12. Assemble CE Amplifier for single Transistor
13. Assemble RC Couple Amplifier
14. Assemble Voltage Doublers
15. Assemble regulated Power Supply

Theory - II - Applied Electronics

1. **INTEGRATED CIRCUITS**
Concept of integration, advantages and disadvantages over discrete components, concept of LSI, VLSI, and typical IC code Nos. and their use in circuits. Introduction to SMC and SMD.
2. **DIGITAL ELEMENTS & CIRCUITS**
Number system (Binary, Decimal) Two state Devices, introduction symbol and truth table of flip-flop, (R-S. D. J-K)
Shift register – only S.I.S.O. and S.I.P.O.
Counter – only 4 bit serial forward counter.
3. **OPTO ELECTRONICS & ELECTROMECHANICAL, DEVICES**
L.E.D. Photo diode, photo transistor, opto coupler, seven segment display (L.E.D. & L.C.D.) fiber optics, solenoids, Relays, Micro switches, Band switch as DC motor, AC motor and stepper motor.
4. **OSCILLATORS**
Principles of Oscillation, Tickler, Hartley and colpitt type. R-C phase shift oscillator, crystal oscillator frequency stability. Astable, Bistable and Monostable multivibrator.
5. **Electronics Timer:-**
Charging & Discharging of capacitor, Pin connection, feature & block diagram of IC555, Timer using Transistor & IC 555, Astable & Monostable Multivibrator using IC 555
6. **Op-amp:-**
Comparator, Inverting & Non Inverting Amplifier Adder, Subtracted Advantages & Application & Block Diagram, Characteristics & Parameters of Op – amp
7. **Logic Gates:-**
AND, OR, NOR, NAND, EX-OR, EX-NOR, NOT & BUFFER HALF ADDER & FULL ADDER, DEMORGAN THEOREMS & UNIVERSAL LOGIC GATES, BOOLEAN ALGEBRA
8. **COMBINATIONAL LOGIC CIRCUITS:-**
Multiplexer, Demultiplexer, ENCODER & DECODER
9. **Display Devices:-**
LED, LCD & ALPHA NUMERIC DISPLAY
10. **DIGITAL COUNTER:-**
Display Driver, Common Anode & Common Cathode Display & Decade Counter, parallel Counter, Ring Counter
11. **Remote Control:-**
Basic & Application of Remote Control
12. **Motors:-**
Motor Fundamentals, Types of Motors, Basic Circuits for speed control of motors & Application of motors

Practical - II - APPLIED ELECTRONICS

1. Test AND, NAND & NOT Logic Gates
2. Test OR & NOR Logic Gates
3. Test Ex - OR, EX - NOR, Logic Gates
4. Build AND, OR, NAND Using NOR Gate
5. Build AND, OR, NOR Using Nand Gate
6. Test RS & JK FLIP- FLOP
7. Assemble Decode Counter Using IC 7490
8. Assemble Hartley, Colpitts & RC Phase shift Oscillator
9. Assemble Astable & Monostable Multivibrator using IC 555
10. Assemble Inverting & Non Inverting Amplifier using op-amp(IC741)
11. Assemble Adder using OP-AMP
12. Test Demorgan Theorem 1 & 2
13. Assemble Voltage Doublers
14. Assemble Audio Amplifier using Op- amp
15. Study of 4 bit binary counter

Theory – III - Principle of Audio & Radio Equipment Servicing

1. Introduction to am and fm technique
Block diagram of am and fm transmitter from microphone to transmitting antenna, function of each block and waveform at various stages.
2. PROPAGATION OF RADIO WAVES
Ground waves, sky waves and line of sight propagation. Types of receiving. Aerials dipole, Simple, Ferrite rod, Loop antenna
3. TUNED AMPLIFIER
Principle of operation, single tuned amplifier, and double tuned, amplifier.
4. Am and fm receivers
Block diagram of super heterodyne receiver, circuit theory, RF amplifier, Mixer stage, IF amplifier, Second detector, A.G.C. Audio amplifier, Delayed AGC.
Study of block diagram of FM receiver, ratio detector, limiters, pre-emphasis and de-emphasis. AFC, comparison with AM receiver
Alignment of IF and RF of AM and FM receiver.
5. Audio equipments
Block diagram of P.A. amplifier, stereo amplifier, electronics & mechanical faults, block diagram of two – in-one
6. CD / MP3 Player –
 - I. Compact disk structure.
 - II. Constant linear velocity (CLV) recording system.
 - III. Advantage of Digital Storage
 - IV. CD Encoding Process block diagram
 - V. Block diagram of CD Player
 - VI. Optional Pickup unit Components
 - VII. Idea about servo system and their purpose only
(No theory question on block diagram & circuit explanation to be asked)
 - a. Tracking servo
 - b. Carriage Servo

- c. Spindle Servo
 - VIII. Different motors used in CD player & their functions only.
 - a. Tray or loading motor (Carriage Motor)
 - b. Slide or sled or feed motor
 - c. Spindle or Disc or Turn table Motor
 - IX. Different sensors used in CD player.
 - X. Different types of CDs
 - XI. Various parts of CD Mechanism & their function
 - XII. Various functions carried out by system control processors.
7. Faults in AM and FM transistor radio
Systematic fault finding method. Alignment of IF and RF for AM receiver and FM receiver. Fault finding in Radio Receiver. Tape Recorder, CD/ MP3 Player and electronic application circuit.
Use of instruments
 8. Multimeter, A.F. signal Generator, oscilloscope, AM/FM generator, and frequency counter, Digital Multimeter.
 9. Electronics Applications –
 - i) Token (Blank) Indicator
 - ii) Temperature Control Circuit
 - iii) Water level indicator
 - iv) Audio level indicator
 - v) Whistle Control
 - vi) LDR Street light.
 - vii) Fire Alarm
 - viii) Staircase light timer
 - ix) Running light.
 - x) Organ
 - xi) Frequency synthesizer
 - xii) Audio Equalizer
 - xiii) Graphic Equalizer
 - xiv) Audio Mixer.

Practical - III Principle of Audio & Radio Equipment Servicing

1. Assemble Token (Bank) Indicator
2. Assemble Temperature Control Circuit.
3. Assemble Water level indicator
4. Assemble Audio Level Indicator
5. Assembler Whistle Control
6. Assemble LDR Street light
7. Assemble Fire Alarm
8. Assemble Staircase light timer
9. Assemble Running light
10. Assemble 1 Band & 2 Band Radio Receiver
11. Study & Faults in different sections of Radio Receiver Like - converter, IF, Detector, AVC & Audio Amplifier
12. Study & Faults in different Sections of Two in One like pre amplifier, Stereo Amplifier Cassette Mechanism, Equaliser & Level Indicator
13. Study & Faults in different Sections of Audio CD / MP3 player like power supply, Pick up unit & mother board mechanism (control circuit)

14. Study of Microwave Oven
15. Study of Collar ID Electronics Telephone

List of Tools & Equipment:-

Sr. No.	Description of Tools / Equipment	No. required
1	2	3
1.	Transistor Recover (5 multi-band and simple band)	10
2.	Multimeter (Two of these should be 20 K/v. sensitivity)	10
3.	R.F. Signal generator	1
4.	A.F. Signal generator	1
5.	Panel meter	3
6.	Audio amplifier (stereo)	3
7.	Intercom	1
8.	Tape – recorder (cassette type)	1
9.	D / MP3	2
10.	Other material for table experiments	1
11.	Data sheets and manual	
12.	Two in one (Radio – Cassette recorder)	1
13.	Oscilloscope	1
14.	Digital simple applications (ready projectors) using 2-4 Ics. Transistors etc. like two tone bell. Event counter Timer etc.	6

Reference

Books, Audio, Video Cassettes, Transparencies, films etc.

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|-----|-------------------------------------|----------------|
| 1. | Basic Radio and Television | By S.P. Sharma |
| 2. | Servicing Transistor Radio | By R.C. Vijay |
| 3. | Radio Transistors Theory | By Phillips |
| 4. | Tape Recorder Servicing | By R.C. Vijay |
| 5. | Principle of Digital Electronics | By Malvino |
| 6. | Radio / Transistor servicing | By Philips |
| 7. | Fundamental of electronic devices | By David Bell |
| 8. | Operational Amplifier | By Botkar |
| 9. | Electronic measuring Instruments | By Shahane |
| 10. | Electronic devices and applications | By Motor shed |
| 11. | Electronic devices and applications | By G.K. Mithal |
| 12. | Servicing transistor radio (Hindi) | By R.C. Vijay |
