

10. RESOURCE REQUIREMENT

10.1 PHYSICAL RESOURCES

(A) Space requirement

Norms and standards laid down by All India Council for Technical Education (AICTE) are to be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

(B) Equipment requirement:

Following Laboratories are required for Diploma Programme in Electronics and Communication Engineering:

1. Measurement Laboratory
2. Electrical Engineering Laboratory
3. Microwave Engineering Laboratory
4. Television Engineering Laboratory
5. Communication System Laboratory - I
6. Communication System Laboratory – II (Advanced)
7. Power Electronics Laboratory
8. Microprocessor Laboratory 8085, 8086 (Demo Kit)
9. Electronics Devices & Circuits and Network Laboratory
10. Digital Electronics and Digital Circuits Laboratory
11. Electronics and Instrumentation Laboratory

Note: Some of the laboratories can be clubbed keeping in mind best utilisation of space and equipment, the above mentioned 14 laboratories after clubbing reduce to 10 laboratories which are given below:

EQUIPMENT REQUIRED FOR ELECTRONICS AND COMMUNICATION ENGINEERING

| Sr. No. | Detail of Instrument | Qty. | Approximate Cost (in Rs) (per item) |
|----------------------------------|---|--------|-------------------------------------|
| 1. ELECTRONICS LABORATORY | | | |
| 1. | DC regulated low voltage variable power supply | 10, | 25,000 |
| 2. | DC regulated multiple output power supply | 4 | 12,000 |
| 3. | Audio oscillator | 4 | 16,000 |
| 4. | Wide band RC Oscillator | 4 | 10,000 |
| 5. | RF Signal Generator | 2 | 8,000 |
| 6. | Pulse Generator | 2 | 10,000 |
| 7. | Function Generator | 4 | 20,000 |
| 8. | Single trace CRO with accessories | 4 | 60,000 |
| 9. | Dual trace CRO with accessories | 4 | 1,00,000 |
| 10. | Electronic Multimeter DC and AC with different ranges | 8 | 30,000 |
| 11. | Electronics digital Multimeter three and a half digit | 8 | 25,000 |
| 12. | Digital LCR- Q meter | 2 | 20,000 |
| 13. | Transistor tester type 911 | 1 | 5,000 |
| 14. | Audio output power meter | 2 | 6,000 |
| 15. | Mains Voltage stabilizer(3 KVA) | 1 | 10,000 |
| 16. | AC Millivoltmeters | 4 | 16,000 |
| 17. | DC Millivoltmeters | 2 | 6,000 |
| 18. | Voltmeter | 5 | 3,000 |
| 19. | DC Ammeter | 5 | 3,000 |
| 20. | Battery of different voltage and Ampere hour | 2 | 3,000 |
| 21. | Single Phase variac | 3 | 6,000 |
| 22. | Rheostat of different wattage and resistance | 5 | 3,000 |
| 23. | Servo stabilizer power supply | 1 | 8,000 |
| 24. | IC Bread Boards | 20 | 10,000 |
| 25. | Distortion factor meter | 1 | 10,000 |
| 26. | Decade resistance, capacitance and inductance (four each) | 12 | 12,000 |
| 27. | Transducers: Pressure type, thermocouple, LVDT, opto Pick-up, electromagnetic pick-up, ultrasonic pick-up and potentiometer etc | LS | 30,000 |
| 28. | Thyristor control experimental kits Instrumentation/Transducer experimental kit. Basic electronic experiment kit | LS | 2,50,000 |
| 29. | Strip chart recorder | 1 | 10,000 |
| 30. | Digital Panel meters | 6 | 3,000 |
| 31. | Digital thermometer | 1 | 4,000 |
| 32. | Stroboscope cum motor drive disc | 1 | 10,000 |
| 33. | Digital load indicator with load Cells | 1 | 10,000 |
| 34. | Digital Lux meter | 1 | 8,000 |
| 35. | CROs 20 MHz (Scientific Make) | 6 Nos. | 22,000 |
| 36. | Function Generators Audio Frequency | 6 Nos. | 7,500 |

| Sr. No. | Detail of Instrument | Qty. | Approximate Cost (in Rs) (per item) |
|--|---|---------|-------------------------------------|
| 37 | Regulated Power Supply | 6 Nos. | 3,600 |
| 38 | Multimeter (Digital) | 10 Nos. | 20,000 |
| 39 | Rectifier Kits | 6 Nos. | 20,200 |
| 40 | Filter Circuit Kit | 6 Nos. | 2,200 |
| 41 | Bread Boards | 12 Nos. | 4,800 |
| 42 | Transistor Kits | | |
| | (a) CB | 6 Nos. | 2,400 |
| | (b) CE | 6 Nos. | 2,400 |
| 43 | FETs | 6 Nos. | 5,400 |
| 44. | Operational Amplifier Kits | 6 Nos. | 33,000 |
| 45. | Raw Materials | LS | 20,000 |
| 2. COMMUNICATION ENGINEERING LABORATORY(Basic) | | | |
| 1. | DC regulated low voltage variable Power Supply | 6 | 12,000 |
| 2. | *RF Signal Generator | 3 | 15,000 |
| 3. | Electronic Multimeter with different voltage ranges | 6 | 22,000 |
| 4. | Electronic Digital Multimeter | 6 | 20,000 |
| 5. | Standard Signal Generator | 2 | 50,000 |
| 6. | Facsimile(Fax)-transmitter receiver | 1 | 20,000 |
| 7. | Radio Receiver Trainer Kits/Deconstruction Models | LS | 10,000 |
| 8. | AM/FM signal generator | 2 | 20,000 |
| 9. | Super heterodyne Receiver radio Demonstration model | 1 | 4,000 |
| 10. | Communication receiver | 1 | 5,000 |
| 11. | Optical fibre bench | 1 | 25,000 |
| 12. | CRO 25 MHz | 3 | 80,000 |
| 13. | Digital frequency meter | 1 | 10,000 |
| 14. | 50 MHz CRO | 1 | 50,000 |
| 15. | Modems, opto coupler different types of microphones and other accessories | LS | 10,000 |
| 16. | Advanced Communication Trainer | LS | 1,00,000 |
| 17. | EPFAX, 56 lines including | LS | 60,000 |
| 18. | Cellular Mobile Kit, Pager etc | 2 each | 10,000 |
| 19. | Pulse Modulation and Demodulation | 6 | 20,000 |
| 20. | Pulse Amplitude Modulation and Demodulation | 6 | 18,000 |
| 21. | Pulse Width Modulation and Demodulation | 6 | 18,000 |
| 22. | Data Formatting and Carrier Modulation Transistor Trainer Model (ST 2106) | 6 | 25,000 |
| 23. | Carrier Demodulation of Data Reformatting Receiver Trainer Kit (ST 12107) | 6 | 25,000 |
| 24 | Audio Input Module Trainer Model (ST 2108) | 6 | 12,000 |

| Sr. No. | Detail of Instrument | Qty. | Approximate Cost (in Rs) (per item) |
|---|--|--------|-------------------------------------|
| 25. | Audio Output Model Trainer Model (ST 2109) | 6 | 48,000 |
| 26. | AM Transmitter Trainer Model (ST 2201) Scientech | 6 | 80,000 |
| 27. | AM Receiver Trainer Model (ST 2202) Scientech | 6 | 80,000 |
| 28. | FM Communication Trainer Model (ST 2203) Scientech | 6 | 85,000 |
| 29.. | Sampling Reconstruction Trainer (ST 2101) | 6 | 31,000 |
| 30. | Pulse Code Modulation Transmitter (ST 2103) | 6 | 1,25,000 |
| 31. | Pulse Code Modulation Receiver (ST 2104) | 6 | 85,000 |
| 32. | Delta Adaptive Delta Sigma Modulation and Demodulation Trainer (ST 2105) | 6 | 80,000 |
| 3. COMMUNICATION SYSTEM LABORATORY – II (Advanced) | | | |
| 1. | Kit - IF Amplifier Transistor | 6 Nos. | 1,500 |
| 2. | Kit – Amplitude Modulation Demodulation (DSB) | 6 Nos. | 2,500 |
| 3. | Kit – Double Balanced Modulator/Demodulator | 6 Nos. | 4,500 |
| 4. | Kit – Frequency Modulator Demodulator (Transistorized) | 6 Nos. | 2,200 |
| 5. | Kit – Computer and locking range of PLL | 6 Nos. | 1,600 |
| 6. | Kit – Frequency Demodulation (IC Based) | 6 Nos. | 1,600 |
| 7. | Kit – Sample and Hold (S/H) function for Digital Study | 6 Nos. | 2,600 |
| 8. | IF Amplifier (IC Based) | 6 Nos. | 1,600 |
| 9. | Frequency Synthesizer | 6 Nos. | 1,600 |
| 4. TELEVISION/ AUDIO-VIDEO LABORATORY | | | |
| 1. | DC regulated low voltage variable power supply | 3 | 10,500 |
| 2. | DC regulated low voltage variable power supply | 1 | 6,000 |
| 3. | Audio signal generator | 4 | 16,000 |
| 4. | RF Oscillator | 4 | 20,000 |
| 5. | Electronic multimeter Analog | 6 | 22,000 |
| 6. | Electronic digital multimeter | 4 | 12,000 |
| 7. | AF output power meter | 2 | 6,000 |
| 8. | Signal tracer | 2 | 3,000 |
| 9. | Signal Injector | 2 | 500 |
| 10. | Colour TV training model | 2 | 80,000 |
| 11. | VCR Trainer | 1 | 40,000 |
| 12. | UHF/VHF Convertor | 3 | 3,500 |
| 13. | CCTV System PAL Based | 1 set | 40,000 |
| 14. | Field Strength meter | 1 | 5,000 |
| 15. | Satellite Receiver, Mixer Amplifier | LS | 10,000 |
| 16. | TV receiving antenna-Yagi,Uda turnstile and log periodic | 2 | 1,000 |
| 17. | Dish Antenna with LNB | 1 | 10,000 |

| Sr. No. | Detail of Instrument | Qty. | Approximate Cost (in Rs) (per item) |
|-----------|---|---------|-------------------------------------|
| 18. | Stereo cassette deck with speakers | 1 | 6,000 |
| 19. | RF power meter | 1 | 7,000 |
| 20. | Cassette tape recorder Trainer | 1 | 10,000 |
| 21. | Compact Disc player system | 1 | 10,000 |
| 22. | PA system with microphone | 2 | 5,000 |
| 23. | Mixing pre-amplifier | 2 | 5,000 |
| 24. | Microphone | 4 | 6,000 |
| 25. | Loud Speaker | 2 | 2,000 |
| 26. | Cassette Duplicator | 1 | 2,000 |
| 27. | Audio Test System | 1 | 12,000 |
| 28. | Digital Frequency Counter | 1 | 5,000 |
| 29. | Video Cassette Player | 1 | 15,000 |
| 30. | CRO Dual Trace | 3 | 90,000 |
| 31. | RF Sweep Generator for TV Alignment | 2 | 25,000 |
| 32. | Pattern generator | 2 | 5,000 |
| 33. | Video Projector System | 1 | 2,00,000 |
| 34. | TV Trainer Kit (B/W) | 6 Nos. | 60,000 |
| 35. | TV Trainer Kit (Colour) | 6 Nos. | 1,20,000 |
| 36. | Digital Storage Oscilloscope | 10 Nos. | 3,40,000 |
| 37. | Wobbuloscope (B/W – 250 MHz) | 4 Nos. | 50,000 |
| 38. | Pattern Generators B/W | 6 Nos. | 20,000 |
| 39. | Pattern Generators Colour | 6 Nos. | 48,000 |
| 5. | ELECTRONICS WORKSHOP | | |
| 1. | Hand Tools Set | 5 | 5,000 |
| 2. | Soldering Set | 5, | 5,000 |
| 3. | Hand Drill | 1 | 3,000 |
| 4. | PCB Etching Machine | 2 | 2,500 |
| 5. | Silk Screen Printing | 2 set | 50,000 |
| 6. | Drafting Equipment | 1 set | 15,000 |
| 7. | PCB Drilling Machine | 1 | 10,000 |
| 8. | Sheet metal folding and binding machine | 1 | 20,000 |
| 9. | Sheet metal cutting machine | 1 | 5,000 |
| 10. | Centre Lathe | 1 | 15,000 |
| 11. | Grinder | 1 | 6,000 |
| 12. | Circular saw | 1 | 6,000 |
| 13. | *DC regulated low voltage variable power supply | 2 | 12,000 |
| 14. | *Audio Oscillator | 2 | 6,000 |
| 15. | *RF Signal generator | 2 | 8,000 |
| 16. | *Digital LCR-Q meter | 1 | 10,000 |
| 17. | *Digital multi-meter | 4 | 12,000 |

| Sr. No. | Detail of Instrument | Qty. | Approximate Cost (in Rs) (per item) |
|--|--|--------|-------------------------------------|
| 18. | *Single trace CRO | 2 | 25,000 |
| 19. | *AC Millivoltmeter | 1 | 3,500 |
| 20. | IC Bread boards | 6 | 3,000 |
| 21. | Soldering stations temperature controlled | 7 | 10,500 |
| 22. | Solder suckers with accessories | 10 | 500 |
| 6. DIGITAL ELECTRONICS AND MICROPROCESSORS LABORATORY | | | |
| 1. | *DC regulated low voltage variable power supply | 6 | 15,000 |
| 2. | *DC regulated multiple output power supply | 3 | 9,000 |
| 3. | Digital IC power supply | 8 | 10,000 |
| 4. | *Electronic Digital Multimeter | 6 | 9,000 |
| 5. | CRO Dual trace, 25 MHz | 4 | 1,00,000 |
| 6. | *Digital frequency meter/universal Counter timer | 2 | 20,000 |
| 7. | *Pulse Generator | 2 | 10,000 |
| 8. | Logic probes (TTL and CMOS) | 2 | 2,500 |
| 9. | Digital logic trainer (TTL) | 4 | 20,000 |
| 10. | Logic Trainer Boards | 10 | 10,000 |
| 11. | Microprocessor trainer Kits 8085 | 8 | 50,000 |
| 12. | Microprocessor Trainer Kits 8086 | 6 | 60,000 |
| 13. | Microprocessor Trainer Kits 8051/8031 | 5 | 30,000 |
| 14. | Computer Trainer | 1 | 30,000 |
| 15. | 8085 Micro processor Kit (Vinytics) | 15 | 26000 |
| 16. | 8086 Micro processor Kit (Dyналog) | 15 | 32,500 |
| 17. | Interfacing Cards | 5 | 2,50,000 |
| 18. | Micro-controller Kit 8051 based | 10 | 1,00,000 |
| 19. | Digital IC Tester Model - Nikki | 1 No. | 50,000 |
| 20. | Universal Programmer | 1 No. | 7,000 |
| 21. | Digital Multimeter (Motwane) | 10 No. | 60,000 |
| 22. | EPROM Programme | 1 | 10,000 |
| 23. | EPROM Eraser | 1 | 1,500 |
| 24. | Additional cards | LS | 50,000 |
| 25. | Software | LS | 1,50,000 |
| 26. | Dotmatrix Printers 24 pin 132 col | 2 | 15,000 |
| 27. | Ink jet Printers | 2 | 6,000 |
| 28. | Laser Printers | 2 | 12000 |
| 29. | Scanners | 2 | 5000 |
| 30. | Copier | 1 | 3000 |
| 31. | Scanner, Copier, Printer, Fax | 1 | 4500 |

| Sr. No. | Detail of Instrument | Qty. | Approximate Cost (in Rs) (per item) |
|---|---|--------|-------------------------------------|
| 7. MEASUREMENT LABORATORY | | | |
| 1. | Light Measurement (Photocells) Kit | 8 Nos. | 15,000 |
| 2. | LVDT Kit | 8 Nos. | 8,000 |
| 3. | Pressure Measurement Kit | 8 Nos. | 9,500 |
| 4. | Strain Measurement Kit | 8 Nos. | 14,000 |
| 5. | Water Level Measurement Kit | 8 Nos. | 11,500 |
| 6. | Velocity Measurement Kit | 8 Nos. | 7,500 |
| 7. | RPM Measurement Kit | 8 Nos. | 5,000 |
| 8. | Temperature Measurement Kit | 8 Nos. | 5,000 |
| 9. | Maxwell's Bridge Kit | 8 Nos. | 7,500 |
| 10. | Wein's Bridge Kit | 8 Nos. | 4,500 |
| 11. | Anderson Bridge Kit | 8 Nos. | 5,000 |
| 12. | Flux Meter (Digital) Kit | 8 Nos. | 5,000 |
| 13. | Q. Meter (Digital) Kit | 8 Nos. | 5,000 |
| 8. ELECTRICAL ENGINEERING LABORATORY | | | |
| 1. | Ammeter, Voltmeter, Wattmeter and Energy Meters (3- phase and 1- phase) | 8 each | 40,000 |
| 2. | 3-Phase Resistive load | 4 Nos. | 16,000 |
| 3. | LCR/Q Bridge | 1 | 5,000 |
| 4. | Tong tester | 4 | 12,000 |
| 5. | Transformer (single phase) | 2 | 16,000 |
| 6. | Watt meter, Volt meter, Ammeter, | 2 each | 10,000 |
| 7. | DC Shunt Motor, 2 hp with loading arrangement | 1 | 20,000 |
| 8. | Induction Motor (Single phase) | 2 | 10,000 |
| 9. | Induction Motor (Three phase) | 2 | 10,000 |
| 10. | Slipping Induction Motor 3 HP with loading facility | 1 | 25,000 |
| 11. | Alternator and Load for Alternators | 1 | 25,000 |
| 12. | DC generator with prime-mover motor | 2 | 25,000 |
| 13. | DC Regulated Power Supply | 2 | 6,000 |
| 14. | Starters (DOL and Star Delta) | 2 each | 8,000 |
| 15. | Rheostats | 4 | 12,000 |
| 16. | Tacho meters (digital) | 2 | 15,000 |
| 17. | Megger (Insulation Tester) | 2 | 5,000 |
| 18. | Earth Tester | 2 | 10,000 |
| 19. | Digital Multi-meter | 10 | 32,000 |
| 20. | Rectifier, Inverter Set | 1 | 10,000 |

| Sr. No. | Detail of Instrument | Qty. | Approximate Cost (in Rs) (per item) |
|-----------|--|--------|-------------------------------------|
| 9. | INDUSTRIAL ELECTRONICS LABORATORY (For Electrical, Electronics and Computer Engineering) | | |
| 1. | Morgan Chopper Kit | 6 Nos. | 5,000 |
| 2. | Joner Chopper | 6 Nos. | 5,000 |
| 3. | Series Inverter | 6 Nos. | 8,000 |
| 4. | Parallel Inverter | 6 Nos. | 8,000 |
| 5. | Speed Control of dc motor (Thyristorized) | 6 Nos. | 5,000 |
| 6. | Single Phase Cyclo Converter with Thyristors | 6 Nos. | 20,000 |
| 7. | Kit for study of effect of free wheeling diode on power factor | 6 Nos. | 5,000 |
| 8. | SCR Characteristics | 6 Nos. | 1,500 |
| 9. | Gate Triggering Characteristics of SCR | 6 Nos. | 10,000 |
| 10. | AC Phase Control Trainer Kit | 6 Nos. | 6,000 |
| 11. | Kit to Study 3-phase Control Bridge Converter | 6 Nos. | 17,500 |
| 12. | UJT Characteristics and its Application as Relaxation Oscillator | 6 Nos. | 1,500 |

(C) Furniture Requirement

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

10.2 Human Resources Development:

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE.