GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

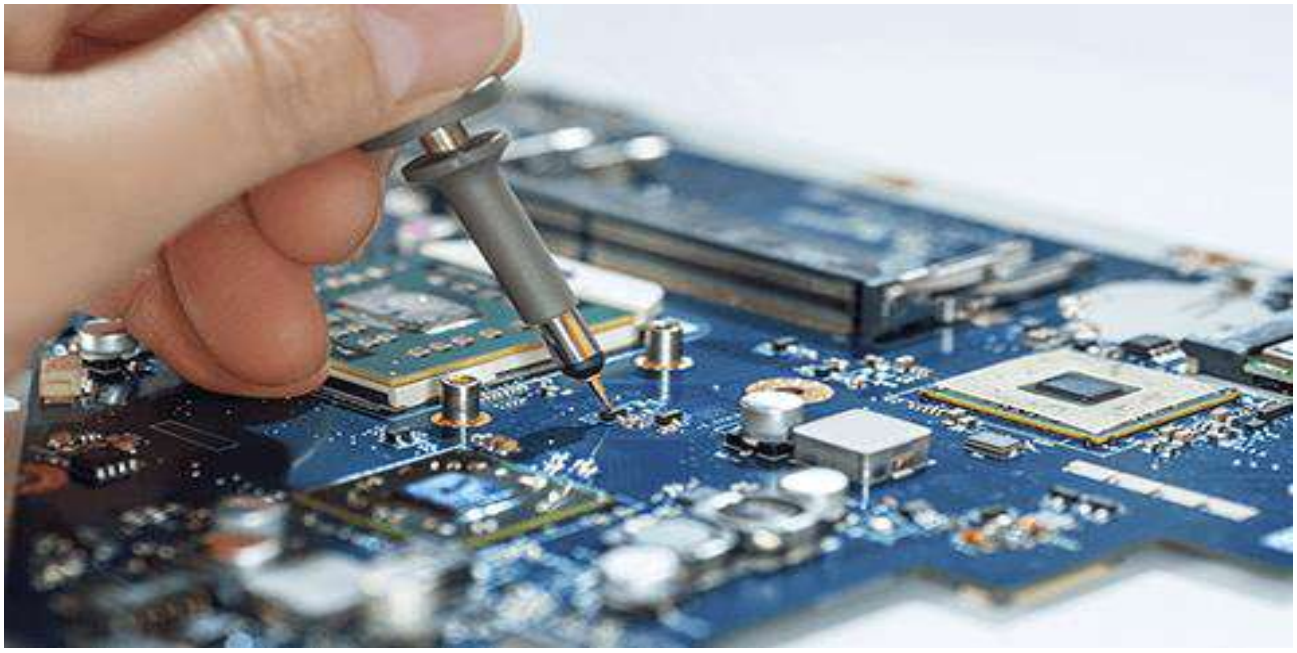
**COMPETENCY BASED CURRICULUM**

# TECHNICIAN ELECTRONICS SYSTEM DESIGN AND REPAIR

**(Duration: Two Years)**

## CRAFTSMEN TRAINING SCHEME (CTS)

## NSQF LEVEL- 5



## SECTOR – ELECTRONICS & HARDWARE

Directorate General of Training

# TECHNICIAN ELECTRONICS SYSTEM DESIGN AND REPAIR

**(Engineering Trade)**

**(Designed in 2021)**

**Version: 1.0**

## CRAFTSMEN TRAINING SCHEME (CTS)

## NSQF LEVEL- 5

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

**Sectoral Trade Course Committee of Electronics & Hardware Sector**

**&**

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# CONTENTS

# 1. COURSE INFORMATION

During the two-year duration of Technician Electronics System Design and Repair trade a candidate is trained on professional skill, professional knowledge, Engineering Drawing, Workshop Calculation & Science and Employability skill related to job role. In addition to this a candidate is entrusted to undertake project work and extracurricular activities to build up confidence. The Broad components covered professional skill, subjects are as below: -

During the two-year duration of Technician Electronics System Design and Repair trade a candidate is trained on professional skill, professional knowledge, Engineering Drawing, Workshop Calculation & Science and Employability skill related to job role. In addition to this a candidate is entrusted to undertake project work, On Job Training (OJT) and extracurricular activities to build up confidence. The Broad components covered professional skill, subjects are as below: -

**FIRST YEAR:** In this year the trainee learns about safety and environment, use of fire extinguishers, artificial respiratory resuscitation to begin with. He gets the idea of trade tools & its standardization, Familiarize with basics of electricity, test the cable and measure the electrical parameter. Skilling practice on different types & combination of cells for operation and maintenance of batteries being done. Identify and test passive and active electronic components. Construct and test unregulated and regulated power supplies. Practice soldering and de-soldering of various types of electrical and electronic components on through hole PCBs. Able to achieve the skill on SMD Soldering and De-soldering of discrete SMD components. Trainees will learn and acquire handful skill of PCB designing using software and able to develop PCB. Assemble a computer system, install OS, Practice with MS office. The candidate will be able to construct and test amplifier, oscillator and wave shaping circuits. Testing of power electronic components. Verifying the truth tables of various digital ICs by referring Data book. Practice circuit simulation software to simulate and test various circuits. Identify various types of LEDs, LED displays and interface them to a digital counter and test. Construct and test various circuits using linear ICs 741 & 555. Trainee will be able to operate DSO and perform various functions Electronics Measuring instruments. They can construct and test analog and digital IC based application circuits as a part of project work.

**SECOND YEAR:** In this year trainees will learn Embedded C Programming. Identify various Pins and familiar with the pin function of 8051. Programming and debug applications using Embedded „C" on 8051 platform i.e. following the complete system architecture including memory, memory blocks, timers, interrupts and power management, Configuring Timers on 8051 Microcontrollers, Configuring Interrupts on 8051 Microcontrollers, Configuring Serial Port on 8051, Interfacing LCD with 8051 Microcontrollers, Interfacing key board with 8051 Microcontrollers, Interfacing stepper motor with 8051 Microcontrollers, Demonstrate the ability to apply Knowledge on PIC Architectural Concepts, Programming and debug applications using Embedded „C" on PIC platform, Configuring Timers of PIC Microcontrollers, Configuring Interrupts on PIC Microcontrollers, Configuring Serial Port on PIC Microcontroller, Interfacing LCD with PIC Microcontrollers, Interfacing stepper motor with PIC Microcontrollers, Gain Knowledge on various sensors and Actuators application in embedded system and skill to incorporated and interface with

Embedded system and IoT based system application. Finally Trainees will acquire knowledge and skill IoT application and its Components, IoT Protype Boards, ARM controller & Its programming with C/C++, Micro Python (Node MCU, Arduino, Raspberry Pi, IoT Protocol & Gateway, IoT Cloud platform & Application development (BLYNK, Thing speak, AWS/Azure)

# 2. TRAINING SYSTEM

## 2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer programmes of DGT for propagating vocational training.

Technician Electronics System Design and Repair trade under CTS is one of the most popular courses delivered nationwide through network of ITIs. The course is of two years duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) impart professional skills and knowledge, while Core area (Workshop Calculation and science, Engineering Drawing and Employability Skills) impart requisite core skill & knowledge and life skills. After passing out the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

### Candidates need broadly to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional knowledge, core skills & employability skills while performing the job and repair & maintenance work.
- Check the job with circuit diagrams/components as per drawing for functioning, diagnose and rectify faults in the electronics components/module.
- Document the technical parameters in tabulation sheet related to the task undertaken.

## 2.2 PROGRESSION PATHWAYS:

- Can join industry as Technician Electronics system design and will progress further as Junior Embedded Engineer, Specialist in Arduino based Embedded System Design, can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can appear in 10+2 examination through National Institute of Open Schooling (NIOS) for acquiring higher secondary certificate and can go further for General/ Technical education.
- Can take admission in diploma course in notified branches of Engineering by lateral entry.
- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.

- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

## 2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years: -

| S No. | Course Element | Notional Training Hours | |
|---|---|---|---|
| | | 1st Year | 2nd Year |
| 1 | Professional Skill (Trade Practical) | 1000 | 1000 |
| 2 | Professional Knowledge (Trade Theory) | 280 | 360 |
| 3 | Workshop Calculation & Science | 80 | 80 |
| 4 | Engineering Drawing | 80 | 80 |
| 5 | Employability Skills | 160 | 80 |
| | **Total** | **1600** | **1600** |

## 2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment** (Internal) during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in.

b) The final assessment will be in the form of summative assessment. The All India trade Test for awarding NTC will be conducted by **Controller of examinations**, DGT as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

### 2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%. There will be no Grace marks.

## 2.4.2 ASSESSMENT GUIDELINE:

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration to be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitive to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examination body. The following marking pattern to be adopted while assessing:

| Performance Level | Evidence |
|---|---|
| (a) Weightage in the range of 60 -75% to be allotted during assessment | |
| For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship. | • Demonstration of good skill in the use of hand tools, machine tools and workshop equipment<br>• 60-70% accuracy achieved while undertaking different work with those demanded by the component/job.<br>• A fairly good level of neatness and consistency in the finish<br>• Occasional support in completing the project/job. |
| (b)Weightage in the range of above75% - 90% to be allotted during assessment | |
| For this grade, the candidate, with little guidance and showing due regard for safety | • Good skill levels in the use of hand tools, machine tools and workshop equipment |

| | |
|---|---|
| procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship. | • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job.<br>• A good level of neatness and consistency in the finish<br>• Little support in completing the project/job |
| (c) Weightage in the range of above 90% to be allotted during assessment | |
| For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship. | • High skill levels in the use of hand tools, machine tools and workshop equipment<br>• Above 80% accuracy achieved while undertaking different work with those demanded by the component/job.<br>• A high level of neatness and consistency in the finish.<br>• Minimal or no support in completing the project. |

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## 3. JOB ROLE

**Electronics Mechanic;** Electronic Equipment Mechanic repairs electronic equipment, such as computers, industrial controls, transmitters, and telemetering control systems following blueprints and manufacturer's specifications and using hand tools and test instruments. Tests faulty equipment and applies knowledge of functional operation of electronic units and systems to diagnose cause of malfunction. Tests electronic components and circuits to locate defects, using instruments, such as oscilloscopes, signal generators, ammeters and voltmeters. Replaces defective components and wiring and adjusts mechanical parts, using hand tools and soldering iron. Aligns, adjusts and calibrates testing instruments. Maintains records of repairs, calibrations and test.

**Electronics Fitter, General;** fits, assembles and repairs various kinds of electronic equipment in factory or workshop or at place of use. Examines drawings and wiring diagrams; checks parts for accuracy of fit and minor adjustments; assembles parts or mounts them on chassis or panels with aid of hand tools; installs and connects wiring, soldering joints equipment, diagnoses faults with aid of electronic testing equipment; dismantles equipment if required and replaces faulty parts or wiring.

**Electronic, Technician;** applies electronic theory, principles of electrical circuits, electrical testing procedures, engineering mathematics, physics and related subjects to layout, build, test, troubleshoot, repair and modify developmental and production electronic equipment. Draws sketches to clarify design details and functional criteria of electronic units. Assembles experimental circuitry (bread board) or complete prototype model according to engineering instructions, technical manuals and knowledge of electronic systems and components and their functions. Recommends changes in circuitry or installation specifications to simplify assembly and maintenance. Sets up standard test apparatus or contrives test equipment and circuit, and conducts functional, operational, environmental and life tests to evaluate performance and reliability of prototype or production model. Analyses and interprets test data. Adjusts, calibrates, aligns and modifies circuit and components and records effects on unit performance. Writes technical reports and develops charts, graphs and schematics to describe and illustrate systems operating characteristics, malfunctions, deviations from design specifications and functional limitations for consideration by professional engineering personnel in broader determinations affecting systems design and laboratory procedures. May operate bench lathes, drills and other machine tools to fabricate non-procurable items, such as coils, terminal boards and chassis. May check out newly installed equipment in airplanes, ships and structure to evaluate system performance under actual operating conditions. May instruct and supervise lower grade technical personnel.

**Embedded Software Developer;** the Embedded Software developer is responsible for developing software module for the embedded system. The individual at work assesses the embedded systems' specification requirement, develops software, tests and validates the software in co-ordination with Design Engineers for system integration.

Electronic Hardware Designer; receives new product specifications from the customer and develops the PCB design based on the specifications. The individual at work is responsible for undertaking research on new products, work with R&D on developing the schematics, converting

them to PCB layout using CAD and other software and generating the Gerber file to pass on to PCB manufacturers

**Reference NCO-2015:**

a) 7421.0300 – Electronics Mechanic
b) 7421.0100 – Electronics Fitter, General
c) 3114.0100 – Electronics Technician
d) 2512.0501 – Embedded Software Developer

## 4. GENERAL INFORMATION

| | |
|---|---|
| **Name of the Trade** | **Technician Electronics System Design and Repair** |
| **Trade Code** | DGT/2018 |
| **NCO - 2015** | 7421.0300, 7421.0100, 3114.0100, 2512.0501 |
| **NSQF Level** | Level-5 |
| **Duration of Craftsmen Training** | Two Years (3200 Hours) |
| **Entry Qualification** | a) 10th Class Passed<br>b) Lateral Entry: Direct 2nd Year admission for NTC Passed Out (Two Years Courses) In Electronics & Hardware Sector or IoT Group of trades. |
| **Minimum Age** | 16 years as on first day of academic session. |
| **Eligibility for PwD** | LD, LC, DW, AA, LV, DEAF, AUTISM, SLD |
| **Unit Strength (No. Of Student)** | 24 (There is no separate provision of supernumerary seats) |
| **Space Norms** | 70 Sq. Mtr. |
| **Power Norms** | 3.5 KW |
| **Instructors Qualification for** | |
| **1. Technician Electronics System Design and Repair Trade** | B.Voc/Electronics / Electronics and Telecommunication/ Electronics and communication Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field.<br>**OR**<br>03 Years Diploma in Electronics / Electronics and telecommunication/ Electronics and communication from AICTE/ recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field.<br>**OR**<br>NTC/NAC passed in the Trade of "Technician Electronics System Design and Repair" With three years' experience in the relevant field.<br><br>**Essential Qualification:**<br>Relevant National Craft Instructor Certificate (NCIC) in any of the variants under DGT.<br><br>**NOTE:** Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants. |
| **2. Workshop Calculation &** | B.Voc/Degree in Engineering from AICTE/ UGC recognized Engineering |

| | |
|---|---|
| **Science** | College/ university with one-year experience in the relevant field.<br>**OR**<br>03 years Diploma in Engineering from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field.<br>**OR**<br>NTC/ NAC in any one of the engineering trades with three years experience.<br><br>**<u>Essential Qualification:</u>**<br>National Craft Instructor Certificate (NCIC) in relevant trade<br>**OR**<br>NCIC in RoDA or any of its variants under DGT |
| **3. Engineering Drawing** | B.Voc/Degree in Engineering from AICTE/ UGC recognized Engineering College/ university with one-year experience in the relevant field.<br>**OR**<br>03 years Diploma in Engineering from AICTE/recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field.<br>**OR**<br>NTC/ NAC in any one of the Electrical groups (Gr-II) trades categorized under Engg. Drawing'/ D'man Mechanical / D'man Civil' with three years' experience.<br><br>**<u>Essential Qualification:</u>**<br>National Craft Instructor Certificate (NCIC) in relevant trade.<br>OR<br>NCIC in RoDA / D'man (Mech /civil) or any of its variants under DGT. |
| **4. Employability Skill** | MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills from DGT institutes.<br>(Must have studied English/ Communication Skills and Basic Computer at $12^{th}$ / Diploma level and above)<br><br>**OR**<br>Existing Social Studies Instructors in it is with short term ToT Course in Employability Skills from DGT institutes. |
| **5. Minimum age for Instructor** | 21 years |
| **List of Tools and Equipment** | As per Annexure – I |

| **Distribution of training on Hourly basis: (Indicative only)** | | | | | | |
|---|---|---|---|---|---|---|
| **Year** | **Total Hrs. /week** | **Trade Practical** | **Trade Theory** | **Workshop Cal. & Sc.** | **Engg. Drawing** | **Employability Skills** |
| 1st | 40 Hours | 25 Hours | 7 Hours | 2 Hours | 2 Hours | 4 Hours |
| 2nd | 40 Hours | 25 Hours | 9 Hours | 2 Hours | 2 Hours | 2 Hours |

# 5. LEARNING OUTCOME

***Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.***

## 5.1 LEARNING OUTCOMES (TRADE SPECIFIC)

**FIRST YEAR:**

1. Perform & Maintain safety operation in workshop.
2. Perform basic Workshop operations using suitable tools for fitting, riveting, drilling etc.
3. Plan and execute soldering & de-soldering of various electrical components like Switches, PCB & Transformers for electronic circuits.
4. Manipulate voltages, currents resistances, capacitance inductance and other special purpose components in electronic circuits. Demonstrate familiarity with basic electronic components and use them to design simple electronic circuits as well troubleshooting.
5. Prepare, crimp, terminate and test various cables used in different electronics industries.
6. Test & service different batteries used in electronic applications.
7. Select and perform electrical/ electronic measurement of single range meters and calibrate the instrument. Test various electronic components using proper measuring instruments and compare the data using standard parameter. Measure the various parameters by DSO and execute the result with standard one.
8. Construct, test and verify the input/ output characteristics of various analog and power electronics circuits.
9. Assemble, test and troubleshoot various digital circuits.
10. Plan and carry out the selection of a project, assemble the project and evaluate performance for a domestic/commercial application.
11. Install, configure, interconnect given computer system(s) and demonstrate & utilize application packages for different application.
12. Identify, place, solder and de-solder and test different SMD discrete components and ICs package with due care and following safety norms using proper tools/setup.

**SECOND YEAR:**

13. Develop code by using C programming language following proper syntax.
14. Identify and test Architecture, Pin description programming model and programming of 8051 Microcontroller.
15. Select and Test Architecture, Pin description programming model and programming of real time PIC Microcontroller.

16. Select various sensors/ actuators and construct different circuits used in embedded system.
17. Plan and Carry out embedded project development cycle.
18. Install, configure and check the architecture of IoT, various IoT applications & its components from real time IoT environments.
19. Position appropriate control boards of various type used in application development and its programming.
20. Execute different principles of sensors used in IoT and its programming
21. Test and verify the principles of different IoT gateways & Protocols and its programming.
22. Select and check architecture of IoT open source platforms and communicate with cloud from IoT boards.

## 6. ASSESSMENT CRITERIA

| LEARNING OUTCOMES | ASSESSMENT CRITERIA |
|---|---|
| **FIRST YEAR** | |
| 1. Perform & Maintain safety operation in workshop. | Plan work in compliance with standard safety norms. |
| | Identify Personal Productive Equipment (PPE) and use the same as per related working environment. |
| | Identify basic first aid and use them under different circumstances |
| | Identify different fire extinguisher and use the same as per requirement. |
| | |
| 2. Perform basic Workshop operations using suitable tools for fitting, riveting, drilling etc. | Identify basic hand tools for fitting, riveting, drilling etc. with due care and safety. |
| | Able to use hand tools as per application. |
| | Able to perform basic fitting riveting drill work. |
| | |
| 3. Plan and execute soldering & desoldering of various electrical components like Switches, PCB & Transformers for electronic circuits. | Mounting and soldering wire links. |
| | Desoldering wire links. |
| | Bending, mounting, terminating, and soldering resistors. |
| | Properly located, correct components/wires with correct polarity. |
| | Mounting and soldering components in the PCB. |
| | Safe, sensible approach to work with hand tools and solder. |
| | |
| 4. Manipulate voltages, currents resistances, capacitance inductance and other special purpose components in electronic circuits. Demonstrate familiarity with basic electronic components and use them to design simple electronic circuits as well troubleshooting. | Measure the resistance, Voltage, Current through series and parallel connected networks using multi meter. |
| | Identify different inductors and measure the values using LCR meter. |
| | Identify the different capacitors and measure capacitance of various capacitors using LCR meter. |
| | Ascertain and select tools and materials for the job and make this available for use in. |
| | |
| 5. Prepare, crimp, terminate and test various cables used in different electronics industries. | Plan and work incompliance with standard safety norms. |
| | Prepare, terminate and test various electronics cable using proper crimping tools. |

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| 6. Test & service different batteries used in electronic applications. | Identify Tools and instruments for testing of batteries. |
| | Observe safety procedure during testing of batteries and work as per standard norms and company guidelines. |
| | Identify the primary and secondary cells. |
| | Measure and test the voltages of the given cells/battery using analog / digital multimeter. |
| | Charging and discharging the battery. |
| | Use a hydro meter to measure the specific gravity of the secondary battery. |
| | |
| 7. Select and perform electrical/ electronic measurement of single range meters and calibrate the instrument. Test various electronic components using proper measuring instruments and compare the data using standard parameter. Measure the various parameters by DSO and execute the result with standard one. | Plan work in compliance with standard safety norms. |
| | Identify the type of electronic instruments. |
| | Determine the measurement errors while measuring resistance by voltage drop method. |
| | Extend the range of MC voltmeter and ammeter |
| | Measure the value of resistance, voltage and current using digital multimeter. |
| | Calibrate analog multimeter |
| | Identify the control and functional switches in CRO and measure the D.C. &A.C. voltage, frequency and time period. |
| | Identify various digital ICs, test IC using digital IC tester and verify the truth table. |
| | |
| 8. Construct, test and verify the input/ output characteristics of various analog and power electronics circuits. | Ascertain and select tools and instruments for carrying out the jobs. |
| | Plan and work in compliance with standard safety norms. |
| | Construct and test a half & full wave rectifier with and without filter circuits |
| | Construct and test a bridge rectifier with and without filter circuits. |
| | Construct and test a Zener based voltage regulator circuit. |
| | Construct and test the transistor based switching circuit |
| | Construct and test CB, CE & CC amplifier circuit |
| | Ascertain the performance of different oscillator circuits. |
| | Construct and test of Transistor and FET amplifiers. |
| | Construct and test a UJT as relaxation oscillator. |
| | Construct and test lamp dimmer using TRIAC/DIAC with safety. |
| | Construct and test MOSFET, IGBT test circuit and apply for suitable operation with proper safety. |
| | Construct and test the universal motor speed controller using |

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| | SCR with safety. |
| | |
| 9. Assemble, test and troubleshoot various digital circuits. | Identify various digital ICs, test IC using digital IC tester and verify the truth table. |
| | Construct and verify the truth table of all gates using NOR and NAND gates. |
| | Construct an adder cum substractor circuits and verify the truth table. |
| | Construct a decoder and encoder, multiplexer and de-multiplexer circuits and verify the truth table. |
| | Construct a multiplexer and de-multiplexer and verify the truth table. |
| | Construct and verify the truth table of various flip flop, counter and shift register circuits. |
| | |
| 10. Plan and carry out the selection of a project, assemble the project and evaluate performance for a domestic/ commercial applications. | Plan, analyze and estimate the cost of the particular project. |
| | Identify the various tools required for the job. |
| | Prepare the simple digital/ analog electronic circuit. |
| | Simulate and test the prepared circuit. |
| | Assemble and test the circuit. |
| | |
| 11. Install, configure, interconnect given computer system(s) and demonstrate & utilize application packages for different application. | Plan, work in compliance with standard safety norms. |
| | Select hardware and software component. |
| | Install and configure operating systems and applications. |
| | Integrate IT systems into networks. |
| | Deploy tools and test programmes. |
| | Work with MS Office viz word, excel etc. |
| | Use internet for finding out various data pertaining to the trade. |
| | Avoid e-waste and dispose the waste as per the procedure. |
| | |
| 12. Identify, place, solder and desolder and test different SMD discrete components and ICs package with due care and following safety norms using proper tools/setup. | Plan the work in compliance with standard procedure. |
| | Make the necessary setting on SMD soldering station to solder and de-solder various IC's of different packages by following the safety norms. |
| | Identify SMD components, de-solder and solder the SMD components on the PCB. |
| | Check the cold continuity, identify loose/dry solder and broken track on printed wired assemblies and rectify the defects. |
| **SECOND YEAR:** | |
| 13. Develop code by using C programming language | Understand the nitty-gritty details of the C programming language. |

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| following proper syntax. | Write C program on different problems. |
| | Use operators, branch statements, and create loops to control the flow of data. |
| | Create and use variables by understanding their scope of existence. |
| | Implement data structures including arrays, stacks, queues, linked list, and trees for optimized control over operations. |
| | Understand the special features of C including pointers, structures, pre-processor directives, and storage classes. |
| | Create macros and use. |
| | Work with file handling concepts. |
| | |
| 14. Identify and test Architecture, Pin description programming model and programming of 8051 Microcontroller. | Identify various Pins and familiar with the pin function of 8051. |
| | Programming and debug applications using Embedded „C" on 8051 platform. |
| | Configuring Timers on 8051 Microcontrollers. |
| | Configuring Interrupts on 8051 Microcontrollers. |
| | Configuring Serial Port on 8051. |
| | Interfacing LCD with 8051 Microcontrollers. |
| | Interfacing key board with 8051 Microcontrollers. |
| | Interfacing stepper motor with 8051 Microcontrollers. |
| | |
| 15. Select and Test Architecture, Pin description programming model and programming of real time PIC Microcontroller. | Demonstrate the ability to apply Knowledge on PIC Architectural Concepts. |
| | Programming and debug applications using Embedded „C" on PIC platform. |
| | Configuring Timers of PIC Microcontrollers. |
| | Configuring Interrupts on PIC Microcontrollers. |
| | Configuring Serial Port on PIC Microcontroller. |
| | Interfacing LCD with PIC Microcontrollers. |
| | Interfacing key board with PIC Microcontrollers |
| | Interfacing stepper motor with PIC Microcontrollers |
| | |
| 16. Select various sensors/ actuators and construct different circuits used in embedded system. | Be able to determine the required sensor and actuator criteria for a Electronics system design & Repair. |
| | Understand the operation of commonly employed sensors and actuators. |
| | Be able to analyze and select the most appropriate sensors or actuator for an application. |
| | Be able to design and construct the appropriate interface circuits for the sensors and actuators. |
| | Develop interfacing circuits and code for various sensors |

| | |
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| | commonly used in Embedded applications. |
| | |
| 17. Plan and Carry out embedded project development cycle. | Develop Concept of Embedded System Components |
| | Identify Embedded System Classifications and Components |
| | How to use Processors and other Elements of Embedded System |
| | Use of Embedded System's Software and its applications |
| | Develop & integrate complete Embedded application using 8051/PIC microcontroller. |
| | |
| 18. Install, configure and check the architecture of IoT, various IoT applications & its components from real time IoT environments. | Able to understand IoT Based system. |
| | Identify various IoT Applications. |
| | Identify and explore different functional building blocks of IOT enabled system / application. |
| | Explore signal flow into IOT enabled system/application as per the IOT architecture. |
| | Identify assemble & disassemble various IoT application modules. |
| | Identify assemble & disassemble various IoT application modules. |
| | |
| 19. Position appropriate control boards of various type used in application development and its programming. | What is Node MCU. |
| | Hardware Used for Node MCU Project. |
| | Setting up Arduino IDE. |
| | Turning on the LDE light – on nodeMCU. |
| | Recognize Arduino Board and its component. |
| | Create Arduino Standard Library. |
| | Create Arduino Development Environment. |
| | Use concepts for writing Arduino Sketches. |
| | Identify Architecture of ARM Family of Microcontrollers, Memory map peripherals Register Configuration, Configure Timers on ARM Family of Microcontrollers. |
| | Apply IoT application development using Raspberry Pi. |
| | Implement an IoT application using Raspberry Pi. |
| | Understand the environment and features of Python Programming Language. |
| | Know the history, versions and applications of Python Programming Language. |
| | Learn to create and execute program in Python. |
| | Learn to install and use Python. |
| | Understand the concepts of variables, data types, keywords and operators of python. |
| | Configure control boards, Develop simple circuits and coding for |

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| | basic input & output devices control with the help of NodeMCU, Arduino, & Raspberry Pi. |
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| 20. Able to understand different principles of sensors used in IoT and its programming | How to Connect and Work With different sensors such as: Humidity, Heat/Temperature, proximity, IR Motion, Accelerometer, Sound , Light, distance, Pressure, Thermal, Infrared, LDR etc. to<br>1.Arudino Board<br>2. NodeMCU<br>3. RPi |
| | Reading Various Sensor data on Serial Monitor and LCD Display |
| | Reading Data from Analog and Digital Sensors on Serial Monitor/LCD monitor. |
| | Develop and interface given sensors with IoT control boards (NodeMCU/Arduino/RPi). |
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| 21. Test and verify the principles of different IoT gateways & Protocols and its programming. | Develop & program communication circuits between given control boards by using IoT Gateways, Protocols. (NodeMCU-NodeMCU/NodeMCU-Arduino/Arduino-RPI, etc). |
| | Apply the concepts of UART I2C, SPI, Wireless Communication Protocol: Bluetooth, Wifi. |
| | Implement IoT security features to secure the network. |
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| 22. Select and check architecture of IoT open source platforms and communicate with cloud from IoT boards. | Develop complete IoT application by using open source cloud platforms. |
| | Identify for connecting Arduino with Internet. |
| | Connecting Arduino with WiFi. |
| | Concepts of Cloud Computing. |
| | Sending data on Cloud Platform. |
| | Develop complete IoT application by using open source cloud platforms. |
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## 7. TRADE SYLLABUS

| Syllabus for Technician Electronics System Design & Repair Trade | | | |
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| **FIRST YEAR** | | | |
| **Duration** | **Reference Learning Outcome** | **Professional Skills (Trade Practical) With Indicative Hours** | **Professional Knowledge (Trade Theory)** |
| Professional Skill 12 Hrs.;<br><br>Professional Knowledge 3 Hrs. | Perform & Maintain safety operation in workshop. | **Trade and Orientation:**<br>1. Visit to various sections of the institute and identify location of various installations. (2 Hrs)<br>2. Identify safety signs for danger, warning, caution & personal safety message. (2 Hrs)<br>3. Use of personal protective equipment (PPE). (2 Hrs)<br>4. Practice elementary first aid. (2 Hrs)<br>5. Preventive measures for electrical accidents & steps to be taken in such accidents. (2 Hrs)<br>6. Use of Fire extinguishers. (2 Hrs) | **Trade and orientation:**<br>Familiarization with the working of Industrial Training Institute system.<br>Importance of safety and precautions to be taken in the industry/shop floor.<br>Introduction to PPEs.<br>Introduction to First Aid.<br>Response to emergencies e.g. power failure, fire, and system failure.<br>Importance of housekeeping & good shop floor practices.<br>Occupational Safety & Health: Health, Safety and Environment guidelines, legislations & regulations as applicable. |
| Professional Skill 16 Hrs.;<br><br>Professional Knowledge 6 Hrs. | Perform basic workshop operations using suitable tools for fitting, riveting, drilling etc. | **Hand tools and their Uses :**<br>7. Identify the different hand tools. (4 Hrs)<br>8. Selection of proper tools for operation and precautions in operation. (3 Hrs)<br>9. Care & maintenance of trade tools. (3 hrs)<br>10. Practice safety precautions while working in fitting jobs. (2 Hrs)<br>11. Workshop practice on filing and hacks awing. (4 | **Electrical Principles &Measurement**<br>**Hand tools and their Uses:**<br>Identification, specifications, uses and maintenance of commonly used hand tools: Tweezers Screwdriver (Combination Set), Pliers, Wire Cutters, Wire Strippers, Crimping Tools, Sockets & Hex drivers, Clamps, Files, Vises, Rotary Tools, Grinders, Portable Drill Machine, Small Hand Saws, Magnifiers. |

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| | | Hrs) | State the correct shape of files for filing different profiles.<br>Riveting of tags and lugs, cutting and bending of sheet metals, chassis and cabinets. |
| Professional Skill 35 Hrs.;<br><br>Professional Knowledge 5 Hrs. | Plan and execute soldering & desoldering of various electrical components like Switches, PCB & Transformers for electronic circuits. | 12. Practice soldering on different electronic components, small transformer and lugs. (4 Hrs)<br>13. Practice soldering on IC bases and PCBs. (8 Hrs)<br>14. Practice de-soldering using pump and wick (8 Hrs)<br>15. Join the broken PCB track and test. (4 Hrs)<br>16. Identify and use SPST, SPDT, DPST, DPDT, tumbler, push button, toggle, piano switches used in electronic industries. (3 Hrs)<br>17. Make a panel board using different types of switches for a given application. (8 Hrs) | **Soldering / DE soldering:**<br>Different types of soldering guns, related to Temperature and wattages, types of tips.<br>Solder materials and their grading. Use of flux and other materials.<br>Selection of soldering gun for specific requirement. Soldering and De-soldering stations and their specifications.<br>Different switches, their specification and usage. |
| Professional Skill 105 Hrs.;<br><br>Professional Knowledge 29 Hrs. | Manipulate voltages, currents resistances, capacitance inductance and other special purpose components in electronic circuits.<br>Demonstrate familiarity with basic electronic components and use them to design simple electronic circuits as well troubleshooting. | 18. Identify the Phase, Neutral and Earth on power socket, use a testers to monitor AC power. (4 Hrs)<br>19. Measure the voltage between phase and ground and rectify earthing. (4 Hrs)<br>20. Measure AC and DC voltages using multi meter. (4 Hrs)<br>21. Identify the different types of active electronic components. (4 Hrs)<br>22. Measure the resistor | **Basic Electrical Quantities:**<br>Atom& Electrons, Charge, Conductors and Insulators, Semi-Conductors, Current & Voltage, Power.<br>Single phase and Three phase supply. Terms like Line and Phase voltage/ currents.<br>Resistance, Resistors in Series Ckt, Resistors in Parallel.<br>Ohms Laws & Kirchhoff Laws.<br>Resistor Color coding, Specification of various types of Resistor and their application.<br>Special Purpose Resistors: LDR, |

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| | | value by colour code and verify the same by measuring with multimeter. (4 Hrs)<br>23. Identify resistors by their appearance and check physical defects. (3 Hrs)<br>24. Identify the power rating of carbon resistors by their size. (3 Hrs)<br>25. Practice on measurement of parameters in combinational electrical circuit by applying Ohm's Law for different resistor values and voltage sources. (8 hrs)<br>26. Measurement of current and voltage in electrical circuits to verify Kirchhoff's Law. (10 Hrs)<br>27. Verify laws of series and parallel circuits with voltage source in different combinations. (10 Hrs)<br>28. Measure the resistance, Voltage, Current through series and parallel connected networks using multi meter. (7 Hrs)<br>29. Identify different inductors and measure the values using LCR meter. (7 Hrs)<br>30. Identify the different capacitors and measure capacitance of various capacitors using LCR meter. (5 Hrs)<br>31. Construct and test RC time constant circuit. (5 Hrs)<br>32. Construct a RC | Thermistor.<br>Capacitor and capacitances, Series & Parallel connection of capacitors, Different types of Capacitors and their construction & application. Testing of Capacitors.<br>Capacitor behavior with AC and DC. Concept of Time constant of a RC circuit. Principles of induction, inductive reactance.<br>Types of inductors, construction, specifications, applications and energy storage concept.<br>Self and Mutual induction. Behavior of inductor at low and high frequencies.<br>Series and parallel combination, Q factor.<br>Concept of Resonance and its application in RC, RL &RLC series and parallel circuit. |

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| | | differentiator circuit and convert triangular wave into square wave. (9 Hrs)<br>33. Construct and test series and parallel resonance circuit. (9 Hrs)<br>34. Identify different types of transformers and test. (5 Hrs)<br>35. Identify the primary and secondary transformer windings and test the polarity. (4 Hrs) | |
| Professional Skill 25 Hrs.;<br><br>Professional Knowledge 10 Hrs. | Prepare, crimp, terminate and test various cables used in different electronics industries | 36. Prepare terminations, skin the electrical wires /cables using wire stripper and cutter. (4 Hrs)<br>37. Measure the gauge of the wire using SWG and outside micrometer. (4 Hrs)<br>38. Refer table and find current carrying capacity of wires. (3 Hrs)<br>39. Crimp the lugs to wire end. (3 Hrs)<br>40. Identify various types of cables viz. RF coaxial feeder, screened cable, ribbon cable, RCA connector cable, digital optical audio, video cable, RJ45, RJ11, Ethernet cable, fibre optic cable splicing, fibre optic cable mechanical splices, insulation, gauge, current capacity, flexibility etc. used in various electronics products, different input output sockets. Identify suitable connectors, solder/crimp /terminate & | **Electrical & Electronics Cables and Connector :**<br>Different type of electrical cables and their Specifications.<br>Types of wires &cables.<br>Standard wire gauge (SWG).<br>Classification of cables according to gauge (core size), number of conductors, material, insulation strength, flexibility etc.<br>Ethernet 10 Base cross over cables and pin out assignments, UTP and STP, SCTP, TPC, coaxial, types of fibre optical Cables and Cable trays.<br>Different types of connector:<br>USB Connector<br>Modular Type : RJ 45 , RJ 12 , RJ11<br>Power Connector<br>Audio & Video Connector: Banana, RCA, XLR<br>BNC, HDMI, DVI, S- Video, DVI, VGA Centronics. |

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| | | test the cable sets. (8 Hrs)<br>41. Check the continuity as per the marking on the connector for preparing the cable set. (3 Hrs) | |
| Professional Skill 12 Hrs.;<br><br>Professional Knowledge 6 Hrs. | Test & service different batteries used in electronic applications | 42. Identify the rated output voltage and Ah capacity of given battery. (2 Hrs)<br>43. Measure the voltages of the given cells/battery using analog/ digital multimeter. (2 Hrs)<br>44. Charge and discharge the battery through load resistor. (2 Hrs)<br>45. Maintain the secondary cells. (2 Hrs)<br>46. Measure the specific gravity of the electrolyte using hydrometer. (2 Hrs)<br>47. Test a battery and verify whether the battery is ready for use of needs recharging. (2 Hrs) | **Batteries and its Maintenance**<br>**Knowledge about types of Batteries**<br>Battery types, Primary Cell, Secondary Cell, Wet charged, Dry-charged, Low maintenance, Construction of Battery, Case Cover plates, Separator, Cells, Electrolyte, etc.<br>**Understanding working principles of Batteries**<br>Lead Acid battery, Electrochemical reaction, NI-CD Battery, Capacity rating, CCA, RC, AH & Power(watt)<br>Silver-Oxide Batteries<br><br>Zinc-Carbon Batteries<br>**Diagnostics and Testing**<br>Factor affecting charging, Cause of battery failure, diagnosis and testing, visual inspection, Heavy load test |
| Professional Skill 70 Hrs.;<br><br>Professional Knowledge 16 Hrs. | Select and perform electrical/ electronic measurement of single range meters and calibrate the instrument.<br>Test various electronic components using proper measuring instruments and compare the data using standard parameter. | 48. Identify the type of meters by dial and scale marking / symbols. (4 Hrs)<br>49. Demonstrate various analog measuring Instruments. (4 Hrs)<br>50. Find the minimum and maximum measurable range of the meter. (4 Hrs)<br>51. Carryout mechanical zero setting of a meter. (4 Hrs)<br>52. Check the continuity of wires, meter probes and fuse etc. (4 Hrs) | **Electronics Measuring Instrument**<br>Familiarization with operation of following electronics measuring instrument :<br>Ammeter<br>Voltmeter<br>RPS<br>DMM<br>CRO<br>DSO<br>Signal Generator<br>Function Generator<br>Megger<br>Insulation Tester |

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| | Measure the various parameters by DSO and execute the result with standard one. | 53. Identify the different types of meter for measuring AC & DC parameters. (4 Hrs)<br>54. Identify the different controls on the CRO front panel and observe the function of each control. (4 Hrs)<br>55. Measure DC voltage, AC voltage, time period using CRO sine wave parameters. (8 Hrs)<br>56. Identify the different controls on the function generator front panel and observe the function of each controls. (4 Hrs)<br>57. Identify the different front panel control of a DSO. (6 Hrs)<br>58. Measure the Amplitude, Frequency and time period of typical electronic signals using DSO. (6 Hrs)<br>59. Take a print of a signal from DSO by connecting it to a printer and tally with applied signal. (6 Hrs)<br>60. Construct and test function generator using IC 8038. (6 Hrs)<br>61. Use digital IC tester to test the various digital ICs (TTL and CMOS). (6 Hrs) | IC Tester |
| Professional Skill 203 Hrs.;<br><br>Professional Knowledge 40 Hrs. | Construct, test and verify the input/ output characteristics of various analog and power electronics circuits. | 62. Identify different types of diodes, diode modules and their specifications. (3 Hrs)<br>63. Test the given diode using multi meter and determine forward to | **Analog Electronics**<br>Atomic Structure<br>Semiconductor Material<br>P N Junction<br>Special Diodes<br>Power Supply – Rectifier, Filter, Regulators |

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| | | reverse resistance ratio. (4 Hrs)<br>64. Measure the voltage and current through a diode in a circuit and verify its forward characteristic. (6 Hrs)<br>65. Identify different types of transformers and test. (4 Hrs)<br>66. Construct and test a half wave, full wave and Bridge rectifier circuit. Measure ripple voltage, ripple frequency and ripple factor of rectifiers for different load and filter capacitors. (8 Hrs)<br>67. Identify and test Zener diode. (4 hrs)<br>68. Construct and test Zener based voltage regulator circuit. (6 Hrs)<br>69. Calculate the percentage regulation of regulated power supply. (5 Hrs)<br>70. Construct and test a +12V fixed voltage regulator. (10 Hrs)<br>71. Identify the different types of fixed +ve and –ve regulator ICs and the different current ratings (78/79 series). (4 Hrs)<br>72. Observe the output voltage of different IC 723 metal/ plastic type and IC 78540 regulators by varying the input voltage with fixed load. (8 Hrs)<br>73. Construct and test a 1.2V – 30V variable output regulated power supply | Zener Diode<br>IC power regulator<br>Transistor, Amplifier, Multistage Amplifier, Feedback Amplifier & Differential amplifier<br>Basic of Oscillator – LC Oscillator, RC Oscillator, Crystal Oscillator<br>Special Semiconductor Devices – FET, MOSFET, IGBT, SCR, TRIAC, DIAC, UJT |

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| | | using IC LM317T. (8 Hrs)<br>74. Identify different transistors with respect to different package type, B-E-C pins, power, switching transistor, heat sinks etc. (6 Hrs)<br>75. Test the condition of a given transistor using ohm-meter. (05 hrs)<br>76. Measure and plot input and output characteristics of a CE amplifier. (07 hrs)<br>77. Construct and test a transistor based switching circuit to control a relay (use Relays of different coil voltages and Transistors of different β. (6 Hrs)<br>78. Construct and test fixed bias, emitter-bias and voltage devider-bias transistor amplifier. (6 Hrs)<br>79. Construct and Test a common emitter amplifier with and without bypass capacitors. (6 Hrs)<br>80. Construct and Test common base amplifier. (6 Hrs)<br>81. Construct and Test common collector/emitter follower amplifier. (6 Hrs)<br>82. Construct and test a Class B complementary push pull amplifier. (6 Hrs)<br>83. Construct and test class C Tuned amplifier.(6 Hrs)<br>84. Demonstrate Colpitts oscillator, Hartley oscillator circuits and | |

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| | | compare the output frequency of the oscillator by CRO. (9 Hrs)<br>85. Construct and test a RC phase shift oscillator circuits. (6 Hrs)<br>86. Construct and test a crystal oscillator circuits. (6 Hrs)<br>87. Construct and test a FET Amplifier. (6 Hrs)<br>88. Construct MOSFET test circuit with a small load. (6 Hrs)<br>89. Construct IGBT test circuit with a small load. ( 6 Hrs)<br>90. Construct a test circuit of SCR using UJT triggering. (6 Hrs)<br>91. Identify different heat sinks used in SCRs. (4 Hrs)<br>92. Construct a snubber circuit for protecting SCR use freewheeling diode to reduce back emf. (6 Hrs)<br>93. Construct a jig circuit to test DIAC. (6 Hrs)<br>94. Construct a simple dimmer circuit using TRIAC. (6 Hrs)<br>95. Construct UJT based free running oscillator and change its frequency. (6 Hrs) | |
| Professional Skill 136 Hrs.;<br><br>Professional Knowledge 51 Hrs. | Assemble, test and troubleshoot various digital circuits. | 96. Identify different Logic Gates (AND, OR, NAND, NOR, EX-OR, EX-NOR, NOT ICs) by the number printed on them. (2 Hrs)<br>97. Verify the truth tables of all Logic Gate ICs by connecting switches and LEDs. (8 Hrs) | **Digital Electronics**<br>Digital number system and Base conversation.<br>Boolean algebra – Laws Rules Properties and operation<br>Binary Athematic- Rules and Operation<br>Sequential and Combinational logic circuit – Types of Logic |

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| | | 98. Construct and verify the truth table of all the gates using NAND and NOR gates. (8 Hrs)<br>99. Construct Half Adder circuit using ICs and verify the truth table. (6 Hrs)<br>100. Construct Full adder with two Half adder circuit using ICs and verify the truth table. (6 Hrs)<br>101. Construct the adder cum subtractor circuit and verify the result. (6 Hrs)<br>102. Construct and Test a 2 to 4 Decoder. (6 Hrs)<br>103. Construct and Test a 4 to 2 Encoder. (6 Hrs)<br>104. Construct and Test a 4 to 1 Multiplexer. (6 hrs)<br>105. Construct and Test a 1 to 4 De Multiplexer. (6 Hrs)<br>106. Verify the truth tables of Flip-Flop ICs (RS, D, T, JK, MSJK) by connecting switches and LEDs. (8 Hrs)<br>107. Construct and test four bit latch using 7475. (6 Hrs)<br>108. Construct and test R-S flip-flop using IC7400 with clock and without clock pulse. (6 Hrs)<br>109. Construct and test a four bit asynchronous binary counter using 7493. (6 Hrs)<br>110. Construct and test a four bit Synchronous binary counter using 74163. (6 Hrs)<br>111. Construct and test synchronous Decade counter. (6 Hrs) | circuit<br>Logic Gates using NAND and NOR universal gates<br>Half adder Full Adder Half Subtractor and Full Subtractor<br>Comparator- Designing 1 bit, 2 bit and 4-bit comparator using logic gate<br>Multiplier – Designing 2 bit and 3 bit binary multiplier circuits<br>4 bit Parallel adder and 4 bit parallel subtractor – Logic diagram & Designing<br>Carry look -Ahead adder - Working Circuit and truth table<br>Multiplexer and Demultiplexer<br>Code Converter – Binary to Excess 3 ., Excess 3 to Binary , Binary to Gray , Gray to Binary<br>Priority Encoder , Encoder and Decoder – Explanation & Designing<br>Flip Flop & Latches – Truth table and Designing<br>Shift Register – Parallel & Serial PIPO PISO SISO SIPO<br>Counters – Synchronous ,Asynchronous ,Up and Down and JHONSON Ring counter<br>Parity Generator and Parity Checker<br>Memories in Digital Electronics<br>Programmable Logic Devices – A summary of all types of PLD<br>Difference between TTL, CMOS, ECL BiCMOS Logic families. |

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| | | 112. Identify and test common anode and common cathode seven segment LED display using multi meter. (6 Hrs)<br>113. Display the two digit count value on seven segment display using decoder/driver ICs. (6 Hrs)<br>114. Construct a shift register using RS/D/JK flip flop and verify the result. (6 Hrs)<br>115. Construct and test four bit SIPO register. (6 Hrs)<br>116. Construct and test four bit PIPO register. (6 Hrs)<br>117. Construct and test bidirectional shift registers. (8 hrs) | |
| Professional Skill 120 Hrs.;<br><br>Professional Knowledge 20 Hrs. | Plan and carry out the selection of a project, assemble the project and evaluate performance for a domestic/commercial applications. | 118. Make simple projects/ Applications using ICs 741, 723, 555, 7106, 7107<br>Sample projects:<br>• Laptop protector<br>• Mobile cell phone charger<br>• Battery monitor<br>• Metal detector<br>• Mains detector<br>• Lead acid battery charger<br>• Smoke detector<br>• Solar charger<br>• Emergency light<br>• Water level controller<br>• Door watcher<br>(Instructor will pick up any five of the projects for implementation). (60 Hrs)<br>119. Make simple projects/Applications using various digital ICs | **Applied Electronics**<br>Discussion on the identified projects with respect to data of the concerned ICs. Components used in the project.<br>Discussion on the identified projects with respect to data of the concerned ICs<br>Components used in the project. |

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| | | (digital display, event counter, stepper motor driver etc)<br>• Duty cycle selector<br>• Frequency Multiplier<br>• Digital Mains Resumption Alarm · Digital Lucky Random number generator<br>• Dancing LEDs<br>• Count down timer<br>• Clap switch<br>• Stepper motor control<br>• Digital clock<br>• Event counter<br>• Remote jammer<br>(Instructor will pick up any five of the projects for implementation). (60 Hrs) | |
| Professional Skill 112 Hrs.;<br><br>Professional Knowledge 48 Hrs. | Install, configure, interconnect given computer system(s) and demonstrate & utilize application packages for different application. | 120. Identify various indicators, cables, connectors and ports on the computer cabinet. (8 Hrs)<br>121. Demonstrate various parts of the system unit and motherboard components. (8 Hrs)<br>122. Identify various computer peripherals and connect it to the system. (8 Hrs)<br>123. Disable certain functionality by disconnecting the concerned cables SATA/ PATA. (8 Hrs)<br>124. Replace the CMOS battery and extend a memory module. (8 Hrs)<br>125. Test and Replace the SMPS. (8 Hrs)<br>126. Replace the given DVD | **Computer Hardware, 8086MP and Networking**<br>**Computer Hardware, OS, MS office and Networking**<br>Basic blocks of a computer, Components of desktop and motherboard.<br>Hardware and software, I/O devices, and their working.<br>Various ports in the computer.<br>Windows OS<br>MS word – Menu bar, standard tool bar, editing, formatting, printing of document etc. Excel – Worksheet basics, data entry and formulae. Moving data in worksheet using tool bars and menu bars, Formatting and calculations, printing worksheet, creating multiple work sheets, creating charts. Introduction to power point Basics of preparing slides, different design aspects of |

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| | | and HDD on the system. (8 Hrs)<br>127. Dismantle and assemble the desktop computer system. (8 Hrs)<br>128. Boot the system from Different options. (4 Hrs)<br>129. Install OS in a desktop computer. (4 Hrs)<br>130. Install a Printer driver software and test for print outs. (4 Hrs)<br>131. Install antivirus software, scan the system and explore the options in the antivirus software. (4 Hrs)<br>132. Install MS office software. (4 Hrs)<br>133. Identify different types of cables and network components e.g. Hub, switch, router, modem etc. (8 Hrs)<br>134. Prepare terminations, make UTP and STP cable connectors and test. Connect network connectivity hardware and check for its functioning. (8 Hrs)<br>135. Configure a wireless Wi-Fi network. (8 Hrs) | slides, animation with slides etc. Concept of Internet, Browsers, Websites, search engines, email, chatting and messenger service. Downloading the Data and program files etc.<br>**Computer Networking:-** Network features - Network medias Network topologies, protocols- TCP/IP, UDP, FTP, models and types. Specification and standards, types of cables, UTP, STP, Coaxial cables. Network components like hub, Ethernet switch, router, NIC Cards, connectors, media and firewall. Difference between PC & Server.<br>Introduction to 8086 Microprocessor<br>Microprocessor Architecture and operation<br>Microprocessor Instruction set & Programing Language<br>Memory and I/O Interfacing |
| Professional Skill 154 Hrs.;<br><br>Professional Knowledge 46 Hrs. | Identify, place, solder and desolder and test different SMD discrete components and ICs package with due care and following safety norms using proper tools/setup. | **Electronic Circuit Simulation**<br>136. Introduction to Circuit Simulation Software. (2 Hrs)<br>137. Project Creation & configuration in Simulation Software. (6 Hrs)<br>138. Work on various tool bars, Identification of parts from different Libraries. (6 | **PCB Design and Fabrication**<br>Introduction to PCB Design Concept<br>Trends in PCB Designing<br>Introduction to development tools (PCB DESIGN SOFTWARE)<br>Hands on practice on available library of components<br>Working through wiring and schematic designing<br>Selecting the Components |

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| | | Hrs)<br>139. Prepare a Schematic of simple digital electronic circuits using the software. (6 Hrs)<br>140. Simulate & Test the digital circuit. (6 Hrs)<br>141. Prepare a Schematic of simple Analog electronic circuits using the software. (6 Hrs)<br>142. Simulate and test the analog Circuit. (6 Hrs)<br>143. Processing a Design- Cross Reference, Bill of Material, Design Rule Check. (6Hrs)<br>144. Design and simulation of Electronic system Application. (6 Hrs)<br>**PCB Design and Fabrication**<br>145. Getting familiar with PCB editor Design Environment. (6 hrs)<br>146. Schematic design modification for PCB design and netlist creation. (6 Hrs)<br>147. Design of Simple Board. (6 Hrs)<br>148. Perform Component placement & Routing plans. (6 Hrs)<br>149. Generate the 3D Mechanical CAD View for Board Design. (8 Hrs)<br>150. Gerber file Generation for the Electronic System Application. (8 hrs)<br>151. Prepare PCB for transferring the track of application developed using simple etching process. (6 Hrs) | Footprints as per design<br>Picking and placing the Component<br>Making New Footprints<br>Assigning Footprint to components<br><br>Introduction to Board design: Board Basics, Basic building blocks of PCB, Overview of design flow<br>Introduction of PCB: Definitions of PCB, PCB design, PCB design tools, Introduction to basic electronic components, Process of PCB designs<br>PCB Basic Principle: Specification and classification of PCBs Techniques of layout design Artwork generation<br>Methods - manual and CAD General design factor for digital and analog circuits , Layout and Artwork making<br>Schematic<br>Starting a project Working of design tools Schematic drawing from circuit Placing, editing, and connecting parts and electrical symbols, Symbol Creation<br>Layout Design<br>Components placing Details of layers Routing guidelines, Gerber file generation<br>PCB Fabrication Techniques- Chemical and Mechanical |

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| | | 152. Perform Component mounting, soldering and Testing the final product in PCB. (6 Hrs)<br>153. Identification of 2, 3, 4 terminal SMD components. (4 Hrs)<br>154. De-solder the SMD components from the given PCB. (4 Hrs)<br>155. Solder the SMD components in the same PCB. (4 Hrs)<br>156. Check for cold continuity of PCB. (4 Hrs)<br>157. Identify various connections and setup required for SMD Soldering station. (4 Hrs)<br>158. Identify crimping tools for various IC packages. (4 Hrs)<br>159. Make the necessary settings on SMD soldering station to solder various ICs of different packages (at least four) by choosing proper crimping tools. (4 Hrs)<br>160. Make the necessary settings on SMD soldering station to de-solder various ICs of different packages (at least four) by choosing proper crimping tools. (4 Hrs)<br>161. Checked and Repair Printed Circuit Boards single, Double layer, and important tests for PCBs. (4 Hrs)<br>162. PCB Designing of Basic and Analog Electronic | |

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| | | Circuits. (4 Hrs)<br>163. PCB Designing of Power Supplies. (4 Hrs)<br>164. PCB Designing of Different Sensor modules. (4 Hrs)<br>165. PCB Designing of Electronics Projects. (4 Hrs)<br>166. PCB Designing of Embedded Projects. (6 Hrs)<br>167. Printing the Design. (2 hrs)<br>168. Eaching. ( 4 Hrs)<br>169. Drilling. (4 Hrs)<br>170. PCB file Generation. (4 Hrs)<br>171. Soldering and Desoldering. (4 Hrs)<br>172. Component Mounting. (2 Hrs)<br>173. PCB and Hardware Testing. (2 Hrs) | |
| **Project work / Industrial visit/Revision/Examination** | | | |

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| **SECOND YEAR** | | | |
| **Duration** | **Reference Learning Outcome** | **Professional Skills (Trade Practical) With Indicative Hours** | **Professional Knowledge (Trade Theory)** |
| Professional Skill 90 Hrs.;<br><br>Professional Knowledge 30 Hrs. | Develop code by using C programming language following proper syntax. | 174. Execute simple C programme to convert the temperature in degree Celsius to degree Fahrenheit. (7 Hrs)<br>175. Execute a C program to perform addition, subtraction, multiplication and division of two numbers. (7 Hrs)<br>176. Execute To interchange the numeric values of two variables. (7 Hrs)<br>177. Execute To find the sum and average of 3 real numbers. (7 Hrs)<br>178. Execute To check a given number is Even or Odd. (7 Hrs)<br>179. Execute To find the sum of digits of a number. (7 Hrs)<br>180. Execute To reverse the given integer and check whether it is a palindrome or not. (7 Hrs)<br>181. Write a program to play with patterns. (7 Hrs)<br>182. To accept 10 numbers and make the average of the numbers using one dimensional array. (7 Hrs)<br>183. To arrange N numbers in ascending order and descending order. (7 Hrs)<br>184. Find out the length of a string. (7 Hrs) | **C- Programming**<br>Introduction to C language and advantages<br>Program structure, basic syntax, data types, variables constants storage classes, arithmetic and logical operators, Control statements and loops Functions and Arrays. Strings, input, output, pre-processor directives, header file. |

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| | | 185. To find the summation of three numbers using the function. (7 Hrs)<br>186. To find the maximum among N numbers using the function. (functions with arguments and return value). (6 Hrs) | |
| Professional Skill 104 Hrs.;<br><br>Professional Knowledge 42 Hrs. | Identify and test Architecture, Pin description programming model and programming of 8051 Microcontroller. | 187. Identify various ICs & their functions on the given Microcontroller Kit. (7 hrs)<br>188. Practice various functions of Keil software. (7 Hrs)<br>189. Write an assembly language program to add, subtract, multiply, divide 16 bit data by microcontroller. (10 Hrs)<br>190. Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status. (10 Hrs)<br>191. Perform the initialization of timer register, load & turn on a LED with delay using Timer. (10 hrs)<br>192. Write a Program for interfacing seven segment LED display and test it. (10 Hrs)<br>193. Write a program to transmit a character to a serial window at given baud rate. (10 Hrs)<br>194. Demonstrate for interfacing of Matrix keyboard and test it. (10 Hrs)<br>195. Demonstrate for interface a LCD display. (10 Hrs)<br>196. Demonstrate for interfacing 8 bit ADC and | **8051 Microcontroller**<br>Introduction to micro controller, comparison of micro processor and micro controller, Evaluation of Microcontroller. Different variants of 8051 & their resources.<br>8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.<br>8051 Instruction Set: Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions.<br>8051 Stack, I/O Port Interfacing and Programming: 8051 Stack, Stack and Subroutine instructions.<br>8051 Timers and Counters – Operations.<br>8051 Serial Communication- Basics of Serial Data Communication, RS-232 standard, 9 pin RS232 signals, 8051 Interrupts.<br>8051 Interfacing Applications: LED, 7-segment display, LCD, Keyboard, ADC and DAC. |

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| | | test it. (10 Hrs)<br>197. Demonstrate for interfacing 8 bit DAC and test it. (10 Hrs) | |
| Professional Skill 64 Hrs.;<br><br>Professional Knowledge 20 Hrs. | Select and Test Architecture, Pin description programming model and programming of real time PIC Microcontroller | 198. Identify various ICs & their functions on the given PIC Microcontroller Kit. (6 hrs)<br>199. Practice various functions of MPLAB simulation software. (8 Hrs)<br>200. Write an assembly language program to add, subtract, multiply, divide 16 bit data by microcontroller. (6 Hrs)<br>201. Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status. (8 Hrs)<br>202. Perform the initialization of timer register, load & turn on a LED with delay using Timer. (6 hrs)<br>203. Write a Program for interfacing seven segment LED display and test it. (6 Hrs)<br>204. Write a program to transmit a character to a serial window at given baud rate. (6 Hrs)<br>205. Demonstrate for interface a LCD display. (6 Hrs)<br>206. Write a program to Interface stepper motor with PIC18. (6Hrs)<br>207. Write a program to Interface DC motor with PIC18. (6 Hrs) | **PIC Microcontroller History, Features and Architecture**<br>Overview of the PIC18 Family.PIC18 PIN connection.PIC18 Configuration Registers. The WREG Register in PIC18.The PIC18 File Register and access Bank. Use of Instructions with the Default Access Bank. PIC18 Status Register. PIC18 Data Format and Directives. The Program Counter and Program ROM Space in the PIC18. RISC Architecture in the PIC18<br>Classification of Instructions set Arithmetic Instructions. Arithmetic Operations, Logic and Compare Instructions. Rotate Instruction and Data Serialization. Branch Instructions and Looping. Call Instructions and Stack PIC18 Time Delay and Instruction Pipeline.<br>PIC Timers and Counters – Operations. PIC Serial Communication, PIC Interrupts.<br>PIC18 Interfacing Applications: LCD, Keyboard, ADC, DAC, DC motor, Stepper Motor |
| Professional Skill 62 Hrs.; | Select various sensors/ actuators and construct | 208. Identification of various sensors (Proximity Sensors, inductive sensor, capacitive | **Sensors & actuators**<br>Basics of passive and active transducers. Role, selection |

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| Professional Knowledge 18 Hrs. | different circuits used in embedded system. | sensor, magnetic sensor etc.,) (06 hrs)<br>209. Construct simple control circuit using Proximity sensor and reed switch and limit switch. (04 hrs)<br>210. Test the working of various sensors (Reflex Photoelectric Sensors, ultrasonic sensor. reed switch limit switch Temperature Sensors, Level Control( 6 Hrs)<br>211. Perform Logical operation of sensors (06 hrs)<br>212. Interface Sensors and Electrical Actuators. (06 hrs)<br>213. Practice Measurement of Load using Load cell. (02 hrs)<br>214. Measure Displacement using LVDT. (03 hrs) ( 8 Hrs)<br>215. Construct an open loop control system for pressure, temperature, flow and level. (12 hrs)<br>216. Construct closed loop control system for pressure, temperature, flow and level. (12 hrs) | and characteristics. Sensor voltage and current formats.<br>Thermistors/ Thermocouples - Basic principle, salient features, operating range, composition, advantages and disadvantages.<br>Strain gauges/ Load cell – principle, gauge factor, types of strain gauges.<br>Inductive/ capacitive transducers - Principle of operation, advantages and disadvantages.<br>Principle of operation of LVDT, advantages and disadvantages.<br>Proximity sensors – applications, working principles of eddy current, capacitive and inductive proximity sensors |
| Professional Skill 64 Hrs.;<br><br>Professional Knowledge 20 Hrs. | Plan and Carry out embedded project development cycle | 217. Write an Assembly Language Program for interfacing Traffic light control and test it.<br>218. Design a calculator to perform a arithmetic operations.<br>219. Perform DC motor speed control using PWM with PIC18.<br>220. Perform the use of a Timer as an Event counter to | **Embedded System Design**<br>Embedded systems, processor embedded into a system, embedded hardware units and devices in a system,<br>Embedded software in a system, examples of embedded systems<br>Design process in embedded system, design process and design examples<br>Classification of embedded |

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| | | count external events.<br>221. Develop a project work by interfacing various sensor and relay with PIC Microcontroller.<br>(Trainers may encourage the trainees to develop any two project using Microcontroller/PIC other than the above like Smart Dustbin, Water level controller, weather monitoring, irrigation controller etc.,) ( 64 Hrs) | systems, skills required for an embedded system designer. |
| Professional Skill 48 Hrs.;<br><br>Professional Knowledge 20 Hrs | Install, configure and check the architecture of IoT, various IoT applications & its components from real time IoT environments | 222. Study and identify different of IoT Applications in Smart City. (6 Hrs)<br>223. Study and identify different of IoT Applications in Smart Agriculture. (6 Hrs)<br>224. Study and identify different of IoT Applications in Smart Healthcare. (6 Hrs)<br>225. Study and identify different of IoT Applications in Smart Automotive. (6 Hrs)<br>226. Identify & study IoT components in Smart Home System. (6 Hrs)<br>227. Identify &study IoT components in smart wearables. (6 Hrs)<br>228. Identify &study IoT components in smart Power Management. (6 Hrs)<br>229. Identify &study IoT components in Industrial IoT. (6 Hrs) | **IoT Applications & its Components**<br>What is IoT, How does IoT works, Difference between Embeded device and IoT device, IoT Architecture & its Components, IoT applications in various fields like Retail, Manufacturing, Healthcare, Logistics, infrastructure etc. |
| Professional Skill 260 Hrs.;<br><br>Professional Knowledge | Position appropriate control boards of various type used in application | 230. Identify & study of pin configuration of Node MCU. (5 Hrs)<br>231. Installing software (Arduino IDE) for | **IoT Controllers &its Programming**<br>Concept of Prototype Boards, List of open source prototype boards (IoT controllers) |

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| 96 Hrs. | development and its programming | NodeMCU, adding nodeMCU board in IDE (6 Hrs)<br>232. Installing serial drivers, Connecting Node MCU with PC and selecting NodeMCU in IDE. (5 Hrs)<br>233. Understanding setup & loop functions of Arduino. (5 Hrs)<br>234. Writing sample Hello world code for NodeMCU in Arduino IDE, uploading to NodeMCU& using serial monitor of IDE. (6 Hrs)<br>235. Write a code and upload to NodeMCU to blink on board LED with 1 sec duration. (4 Hrs)<br>236. Write a code and upload to NodeMCU to blink external LED with 1 sec duration. (4 Hrs)<br>237. Write a code and upload to NodeMCU to generate a pattern on LED bank of four number and run application as standalone (4 Hrs)<br>238. Building light intensity reader circuit with NodeMCU. (4 Hrs)<br>239. Build and operate a relay circuit with NodeMCU. (4 Hrs)<br>240. Connecting Arduino Uno with PC and configuring for Arduino board. (3 Hrs)<br>241. Hello World display on serial monitor from Arduino. (3 Hrs)<br>242. Arduino basic functions: pinMode, digitalRead, | available in the market, Features, specifications & applications of Node MCU.<br>Arduino Boards: Types, specifications, features, applications of each.<br>Arduino Uno: GPIO- analog pins & digital pins<br>Arduino IDE, Arduino Program structure, Arduino variables, operators, Conditional statements, Loops, Arrays, Functions. Arduino Libraries.<br>Python Programming Language: Introduction, installation, programming tools, applications.<br>Linux OS: Introduction, Tools, Commands.<br>ARM processors: Introduction, versions, architecture, specifications, applications.<br>Raspberry Pi Boards: Types of RPi, features, specifications &applications. And GPIO<br><br>Overview of other boards: CHIP, Adafruit Flora, Beagle Boards, Banana Pi, Intel Edison. |

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| | | analogRead. (4 Hrs)<br>243. (LED blinking using Arduino digital pin. (4 Hrs)<br>244. Switch-LED interfacing with Arduino. (4 Hrs)<br>245. Seven Segment display interfacing with Arduino. (4 Hrs)<br>246. Arduino Library and Adding external libraries to IDE. (4 Hrs)<br>247. LCD interfacing with Arduino. (3 Hrs)<br>248. DC motor interfacing with Arduino. (3 Hrs)<br>249. Stepper motor interfacing with Arduino. (3 Hrs)<br>250. Servo motor interfacing with Arduino. (3 Hrs)<br>251. Potentiometer interfacing with Arduino. (3 Hrs)<br>252. Interface LDR with Arduino. (3 Hrs)<br>253. Interface LM35 with Arduino. (3 Hrs)<br>254. Interface Relay with Arduino. (3 Hrs)<br>255. Python SW Installation on windows. (3 Hrs)<br>256. Python path setup in windows. (3 Hrs)<br>257. Python Hello world Program & execution. (3 Hrs)<br>258. Exercises on Python Variables & data types. (3 Hrs)<br>259. Exercises on Python operators. (8 Hrs)<br>260. Exercises on python Inputs & Outputs. (8 Hrs)<br>261. Exercises on Python numbers &srtings. (8 Hrs) | |

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| | | 262. Exercises on python conditional statements. (10 Hrs)<br>263. Exercises on python Loops. (10 Hrs)<br>264. Exercises on python Lists. (5 Hrs)<br>265. Exercises on python tuples & Dictionaries. (8 Hrs)<br>266. Exercises on python Functions. (12 Hrs)<br>267. Exercises on python Classes. (8 Hrs)<br>268. Exercises on Date Time Class. (6 Hrs)<br>269. Install Ubuntu in PC. (3 Hrs)<br>270. Linux Commands: TTY,UNAME, DATE, CAL, WHOAMI,MAN, PWD, LS, TOUCH, MKDIR, CAT, RM, RMDIR, CP, MV, WC, ECHO, CLEAR, ALIAS, SUDO, CHMOD, UMASK, ADDUSER, PING, HOSTNAME. (14 Hrs)<br>271. Installation & setup of Raspbian OS on Raspberry Pi. (9 Hrs)<br>272. Install python on Raspberry Pi. (3 Hrs)<br>273. Working with Python on Raspberry Pi. (12 Hrs)<br>274. Exercises on RPi GPIO programming with LEDs & switches. (6 Hrs)<br>275. Exercises on RPi Relay & motor interfacing. (3 Hrs)<br>276. Exercises on display(s) (LCD, OLED) interfacing with RPi. (8 Hrs) | |
| Professional Skill 32 Hrs.; | Execute different principles of sensors used in IoT | 277. Arduino/Raspberry Pi programming of following sensors: | **IoT Sensors**<br>Sensors: Introduction, principles and applications of |

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| Professional Knowledge 12 Hrs. | and its programming | • Ultrasonic (3 Hrs)<br>• PIR & IR (3 Hrs)<br>• Alcohol (3 Hrs)<br>• LDR (3 Hrs)<br>• Gas (3 Hrs)<br>• DHT11, DHT22 (3 Hrs)<br>• Rain drop (3 Hrs)<br>• Soil moisture (3 Hrs)<br>• LM35 (3 Hrs)<br>• C02, Air pollution (3 Hrs)<br>• Photo detector (2 Hrs) | following sensors: Ultrasonic, PIR, IR, Alcohol, LDR, Gas, DHT11/22, rain drop, soil moisture, LM35, CO2, Air pollution & photo detector. |
| Professional Skill 160 Hrs.;<br><br>Professional Knowledge 60 Hrs. | Test and verify the principles of different IoT gateways & Protocols and its programming. | 278. Exercises on NodeMCU, Arduino & RPi with USART/UART protocol. (10 Hrs)<br>279. Exercises on Arduino & RPi with SPI interfacing protocol. (7 Hrs)<br>280. Exercises on Arduino &RPi with I2C protocol. (7 Hrs)<br>281. Configure ESP8266 with PC. (5 Hrs)<br>282. Setup ESP8266 as webserver. (7 Hrs)<br>283. Setup ESP8266 as access point. (4 Hrs)<br>284. Interface ESP8266 module with Arduino Uno. (5 Hrs)<br>285. Configure Bluetooth Module with PC. (7 Hrs)<br>286. Interface Bluetooth module with Node MCU. (4 Hrs)<br>287. Interface Bluetooth with Arduino Uno. (4 Hrs)<br>288. Pair & Transfer data between Node MCU and Arduino by using Bluetooth devices. (7 Hrs)<br>289. Pair & Transfer LM35 output temperature data | **IoT Protocols & Gateways**<br>IoT networks, protocol stacks<br>Wired Communication ( 8Hrs)<br>Protocols – UART, USART, I2C, SPI<br>Wireless Communication Protocols – Bluetooth, WiFi, Overview of LPWAN (LoRa, NBIoT)<br>Networking Protocols – OSI Reference Model, TCP/IP<br>Application Protocols – HTTP, MQTT, XMPP, AMQP.<br>IoT network architecture – Client-Server vs Publish-Subscribe<br><br>Concepts of IoT security features. |

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| | | between RPi and Arduino by using Bluetooth devices. (6 Hrs)<br>290. Configure Zigbee with PC. (4 Hrs)<br>291. Configure Zigbee modules as Master & slave. (7 Hrs)<br>292. Transmit raw data from Master to slave using zigbee modules. (7 Hrs)<br>293. Interface zigbee module to Arduino. (6 Hrs)<br>294. Interface Zigbee and configure Arduino Uno as master and Arduino mega as slave and transmit the light intensity. (6 Hrs)<br>295. Transmit LDR data from Arduino to RPi. (6 Hrs)<br>296. Construct 3 stage network (wifi to Bluetooth network) by using NodeMCU-RPi-Arduino and transmit Humidity and temperature information from NodeMCU to Arduino via RPi. (15 Hrs)<br>297. Construct 3 stage network (wifi to zigbee network) by using NodeMCU-RPi-Arduino and transmit Humidity and temperature information from NodeMCU to Arduino via RPi. (15 Hrs)<br>298. Configure NodeMCU as MQTT publisher. (5 Hrs)<br>299. Configure NodeMCU as MQTT subscriber. (5 Hrs)<br>300. Configure RPi as MQTT publisher. (5 Hrs)<br>301. Configure NodeMCU as MQTT subscriber. (6 Hrs) | |

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| | | 302. Control NodeMCU GPIO`s from webpage using MQTT protocol. (6 Hrs)<br>303. Control RPi GPIO`s from webpage using MQTT protocol. (6 Hrs)<br>304. Implement IoT security features to secure the network. | |
| Professional Skill 116 Hrs.;<br><br>Professional Knowledge 42 Hrs. | Select and check architecture of IoT open source platforms and communicate with cloud from IoT boards. | 305. Installing & configuring BLYNK on mobile. (4 Hrs)<br>306. Installing BLYNK libraries in Arduino IDE. (4 Hrs)<br>IoT with Node MCU:<br>307. Updating LED status on BLYNK by Node MCU. (3 Hrs)<br>308. Controlling of LED from mobile app through BLYNK-NodeMCU. (4 Hrs)<br>309. Monitor % of Garbage level in Garbage bin(smart Dustbin) in Blynk mobile application with gauge. (5 Hrs)<br>310. Control 3-5 home appliances by using switches in Blynk mobile application (smart home) . (6 Hrs)<br>IoT with Arduino:<br>311. Connect LED-Arduino-ESP8266 circuit to Blynk and control bank of 4 LEDs. (6 Hrs)<br>312. Control the intensity of LED from your Blynk mobile application. (4 Hrs)<br>313. Read Temparature, Humidity, soil moisture from field and display in Blynk mobile application through Arduino- | **IoT Cloud Platforms & Application Development (BLYNK, Thing speak, AWS/Azure)**<br>IoT Cloud stack, IoT Cloud computing and platforms<br>● Public, Private and Hybrid cloud platforms and deployment strategy<br>● IaaS, SaaS, PaaS models<br>● Example platforms: BLYNK, Thing speak, AWS IoT, Microsoft Azure<br>● Exploring AWS IoT Tools<br>● Exploring Azure IoT Tools<br>● Exploring IBM Cloud IoT Tools<br>● Exploring other third party cloud IoT Tools |

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| | | WiFi.(smart agriculture). (6 Hrs)<br>314. Get notification to your mobile via Blynk when your IoT device goes offline. (6 Hrs)Tweet about air pollution & CO2 level from Your IoT device to your Twitter Account. (smart City) . (6 Hrs)<br>315. Creating & configuring Thingspeak account. (3 Hrs)<br>316. Monitor Temparature & Humidity in Blynk and Thingspeak IoT platforms from your hardware. (6 Hrs)<br>317. Control home appliances from google assistant with Blynk and IFTTT. (5 Hrs)<br>318. IoT with Raspberry Pi:<br>319. Controlling LED bank form RPi-3 and Blynk. (5 Hrs)<br>320. Temperature, pulse, and ECG monitoring of a patient on Things peak mobile application. (smart Health) . (13 Hrs)<br>321. CCTV monitoring of a Campus by using RPi. (Smart Campus). (30 Hrs) | |
| **Project work / Industrial visit/Revision/Examination** | | | |

| SYLLABUS FOR CORE SKILLS |
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| 1. Workshop Calculation & Science is common for 1st & 2nd year for all engineering courses (80 Hrs + 80 Hrs) |
| 2. Engineering Drawing of first year is common for all engineering trades. (80 Hrs) |
| 3. Engineering Drawing of second year (Common for Group-II of Engineering Drawing) (Electrical, Electronics & IT Trade Group) (80 Hrs) |
| 4. Employability Skills is common for all CTS trades (160 Hrs + 80 Hrs) |

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in

**ANNEXURE-I**

| List of Tools & Equipment | | | |
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| **Technician Electronics System Design and Repair (for batch of 24 candidates)** | | | |
| **S No.** | **Name of the Tools and Equipment** | **Specification** | **Quantity** |
| **A. TRAINEES TOOL KIT** (For each additional unit trainees tool kit Sl. 1-16 is required additionally) | | | |
| 1. | Connecting screwdriver | 10 X 100 mm | 12 Nos. |
| 2. | Neon tester 500 V. | 500 V | 24+1 Nos. |
| 3. | Screw driver set | Set of 7 | 12 Nos. |
| 4. | Insulated combination pliers | 150 mm | 8 Nos. |
| 5. | Insulated side cutting pliers | 150 mm | 10 Nos. |
| 6. | Long nose pliers | 150 mm | 8 Nos. |
| 7. | Soldering iron | 25-Watt, 240 Volt | 24+1 Nos. |
| 8. | Electrician knife | 100 mm | 8 Nos. |
| 9. | Tweezers | 150 mm | 24+1 Nos. |
| 10. | Tweezer | Smart SMD tester tweezer resistance capacitance, diode test auto power off low battery indication. | 01 No. |
| 11. | Digital Multimeter | (3 3/4 digit) ,4000 Counts Digital Multimeter with 4000 counts, Large Display with Auto/Manual and can measure DCV- 1000V-ACV-750V, DC & AC A – 20A, Resistance 40MΩ, Capacitance up to 200µF , Capacitance and Frequency - 30 MHz | 12 Nos. |
| 12. | 6 1/2 Digit Digital Multimeter | Measurement Functions: DC &AC Voltage, DC&AC Current, 2-wire, 4-wire Resistance, CAP, Diode, Connectivity, Frequency, Period, Any Sensor.<br>Temperature: RTD, THERM,TC (B/E/J/K/N/R/S/T)<br>PC Interface USB Host, USB Device, LAN(LXI-C)<br>Measurement Speed 10k readings/sec | 02 No. |

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| 13. | 9KHz to 3.2GHz Spectrum Analyzer with LISN and Sniffer Probe for EMI-EMC Testing | Frequency Range 9 kHz to 3.2 GHz<br>Resolution Bandwidth (-3 dB): 10 Hz to 1 MHz<br>Built in tracking generator<br>Min. -148 dBm DANL<br>Display 8" TFT or more<br>PC Interface: USB Host & Device, LAN(LXI), near field probe, EMI Pre-compliance Software, EMI filter and quasi peak detector and 2 Line LISN 300Vrms, 16A as per CISPR16-1-2. | 1 No. |
| 14. | Soldering Iron Changeable bits | 15-Watt, 240 Volt | 12 Nos. |
| 15. | De-soldering pump electrical heated, manual operators | 230 V, 40 W | 12 Nos. |
| 16. | Continuity tester | | 24+1 Nos. |
| **B. SHOP TOOLS, INSTRUMENTS** – For 2 (1+1) units no additional items are required | | | |
| 17. | Steel rule graduated both in Metric and English Unit | 300 mm | 4 Nos. |
| 18. | Precision set of screw drivers | T5, T6, T7 | 2 Nos. |
| 19. | Tweezers – Bend tip | | 2 Nos. |
| 20. | Steel measuring tape | 3 meter | 4 Nos. |
| 21. | Tools makers vice | 100mm (clamp) | 1 No. |
| 22. | Tools maker vice | 50mm (clamp) | 1 No. |
| 23. | Crimping tool (pliers) | 7 in 1 | 2 Nos. |
| 24. | Magneto spanner set | 8 Spanners | 2 Nos. |
| 25. | File flat bastard | 200 mm | 2 Nos. |
| 26. | File flat second cut | 200 mm | 2 Nos. |
| 27. | File flat smooth | 200 mm | 2 Nos. |
| 28. | Plier - Flat Nose | 150 mm | 4 Nos. |
| 29. | Round Nose pliers | 100 mm | 4 Nos. |
| 30. | Scriber straight | 150 mm | 2 Nos. |
| 31. | Hammer ball pen | 500 grams | 1 No. |
| 32. | Allen key set (Hexagonal -set of 9) | 1 - 12 mm, set of 24 Keys | 1 No. |
| 33. | Tubular box spanner | Set - 6 - 32 mm | 1 set. |
| 34. | Magnifying lenses | 75 mm | 6 Nos. |
| 35. | Hacksaw frame adjustable | 300 mm | 2 Nos. |
| 36. | Chisel - Cold - Flat | 10 mm X 150 mm | 1 No. |

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| 37. | Scissors | 200mm | 4 Nos. |
| 38. | Handsaw 450mm | Hand Saw - 450 mm | 1 No. |
| 39. | Hand Drill Machine Electric with Hammer Action | 13 mm | 3 Nos. |
| 40. | First aid kit | | 1 No. |
| 41. | Bench Vice | Bench Vice - 125 mm | 1 No. each |
| | | Bench Vice - 100 mm | |
| | | Bench Vice - 50 mm | |
| **C. List of Equipment** | | | |
| 42. | Dual DC regulated power supply | 30-0-30 V, 2 Amps<br>Dual DC 0 - 30 V,2 A , current limit 100 mA - 2 A, Line & Load regulation ± (0.05 % + 10 mV) , ripple < 1mVrms , 3 digit display for voltage & current | 2 Nos. |
| 43. | Multiple Output DC regulated power supply | 0-30V, 2 Amps, + 15V Dual Tracking ,5V/5A, Display digital, Load & Line Regulation: ± (0.05 %+100 mV), Ripple & Noise <= 1 mVrms constant Voltage & Current operation | 2 Nos. |
| 44. | DC Regulated Variable Programmable DC Power Supply | 0-30V/3A<br>0-30V/3A with numeric keypad, PC interface and LCD for Voltage, Current & Power | 2 Nos. |
| 45. | LCR meter (Digital) Handheld | LCR Meter Primary parameters: L / C / R / Z Secondary parameters: D / Q / R Display LCD 4000 Count for primary parameter Inductance Range: 0.00µH - 1000.0H Capacitance Range: 0.00pF - 20.000mF Resistance Range: 0.0000Ω- 10.000MΩ Basic Accuracy : 0.25% Frequency 100Hz,120Hz,1kHz,10kHz | 1 No. |
| 46. | 100MHz Two Channel Digital Storage Oscilloscope | With more than 20Mpt memory Real time Sampling 1GSa/sec , having LAN Interface, RS232/UART, I2C ,SPI trigger & decoding plus math functions like differentiation, integration, abs, AND,OR,NOT etc.. | 02 Nos. |

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| 47. | 25 MHz Arbitrary Waveform Generator with Digital Display for Frequency and Amplitude | Two Channel, 125MSa/Sec and 2Mpt memory with more than 150 different arbitrary waveforms , RS232,PRBS and built-in 8th order harmonic generation , and 225MHz Frequency counter , Connectivity USB Device &Host | 01 No. |
| 48. | CRO Dual Trace | 20 MHz (component testing facilities) | 1 No. |
| 49. | Signal Generator with Digital Display for Frequency Amplitude | 10 Hz to 100 Khz, 50/600 Ohms (output impedance) | 1 No. |
| 50. | Battery Charger | 0 - 6 - 9 - 12 - 24 - 48 V, 30 Amp | 1 No. |
| 51. | Analog multimeter | | 4 Nos. |
| 52. | Clamp meter | 0 - 10 A | 2 Nos. |
| 53. | Function generator (DDS Technology (Sine, Square, Triangle, Ramp, Pulse, Serial Data, TTL and Modulation.) | 1 MHz -10 MHz Function- Pulse – Modulation Generator with Built in 40 MHz Frequency Counter | 2 Nos. |
| 54. | Dimmer starter | 3 Amps | 2 Nos. |
| 55. | Autotransformer | 15 Amps | 2 Nos. |
| 56. | Analog Component Trainer | Breadboard for Circuit design with necessary DC /AC power supply: Sine, Square, Triangle Modulating Signal Generator and Simulation Software | 4 Nos. |
| 57. | Milli Ammeter (AC) | 0 – 200 mA | 2 Nos. |
| 58. | Milli Ammeter (DC) | 0 – 500 mA | 2 Nos. |
| 59. | Op Amp trainer | Study of different configuration of Operational Amplifier Simulation software Fixed DC power supply : +12V,-12V, +5V, -5V,Regulated Variable DC power supply : +1.5V to +10V , -1.5V to -10V Function Generator: Sine Wave, Square Wave, Triangular Wave (1KHz to 100KHz; 0-5Vpp) | 2 Nos. |

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| | | Op Amp IC: IC uA741 (2 Nos..), and Resistance (SMD), Capacitance and Variable Resistance, Diode Bank. | |
| 60. | Digital IC Trainer | Breadboard for Circuit design with necessary DC Power Supply, Graphical LCD, Clock Frequency 4 different steps, Data Switches: 8 Nos., LED Display: 8 Nos.. (TTL), Seven Segment Display, Teaching Simulation Software | 4 Nos. |
| 61. | Digital IC Tester | | 1 No. |
| 62. | Digital and Analog Bread Board Trainer | DC/AC Power Supply, Sine/ Square/ TTL Generator Data Switches, LED indication, LED Display**:** 8 in Nos. Simulation/Teaching Content through software | 6 Nos. |
| 63. | Rheostats various values and ratings | | 2 Nos. each |
| 64. | **Power Electronics Trainer** with at least 6 no's of application board MOSFET Characteristics SCR Characteristics SCR Lamp Flasher SCR Alarm Circuit | POWER ELECTRONICS TRAINER DC Power Supply: ±5V/500mA; ±12V/500mA; +15V/250mA; ±35V/250mA AC power Supply: 18V-0V-18V; 0V-15V , circuit with Frequency range: 30Hz to 900Hz variable; Amplitude: 12V; PWM control of G1, G2, G3 & G4; Duty cycle control of Gate signal is 0 to 100% and application boards MOSFET Characteristics, SCR Characteristics, SCR Lamp Flasher, SCR Alarm Circuit, Series Inverter, ingle Phase PWM Inverter | 4 Nos. |
| 65. | Computers in the assembled form (including cabinet, motherboards, HDD, DVD, SMPS, Monitor, KB, Mouse, LAN card, Blu-Ray drive and | | 4 Nos. |

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| | player),<br>MS Office education version. | | |
| 66. | Laptops latest configuration | | 1 No. |
| 67. | Laser jet Printer | | 1 No. |
| 68. | INTERNET BROADBAND CONNECTION | | 1 No. |
| 69. | Electronic circuit simulation software with 6 user licenses | Circuit Design and Simulation Software with PCB Design with Gerber and G Code Generation, 3D View of PCB, Breadboard View, Fault Creation and Simulation. | 1 No. |
| 70. | Different types of electronic and electrical cables, connectors, sockets, terminations. | | As required |
| 71. | Different types of Analog electronic components, digital ICs, power electronic components, general purpose PCBs, bread board, MCB, ELCB | | As required |
| 72. | Soldering & De soldering Station | SMD Soldering & De-soldering, Station Digitally Calibrated, Temperature Control SMD, Soldering & De-soldering, Power Consumption 60 Watts, I/P Voltage 170 to 270 V, De-soldering 70-Watt, Temperature Range 180 to, 480º Centigrade, Power Consumption 270 Watts, Hot Air Temperature 200 to 480º C | 2 No. |
| 73. | SMD Technology Kit | SMD component identification board with SMD components Resistors, Capacitors, Inductors, Diodes, Transistors & IC's packages. Proto boards with readymade solder pads for various SMD Components. SMD Soldering Jig and Wall chart | 1 No |
| 74. | DOL starter | | 1 No. |
| 75. | AC Motor Trainer Kit<br>¼ HP motor Single Phase | | 1 No. |

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| | Contactors Relays<br>MCB<br>DOL Starter | | |
| 76. | Microcontroller kits (8051) along with programming software (Assembly level Programming) | Core 8051, ready to run programmer for AT89C51/52 & 55, programming modes Key Pad and PC circuits. Detailed learning content through simulation Software. | 4 Nos. |
| 77. | Application kits for Microcontrollers 6 different applications | a) Input Interface: 4x4 Matrix Keypad, ASCII Key PAD, Four Input Switch<br>b) Display Module 16X2 LCD, Seven Segment, LED Bar Graph<br>c) ADC/DAC Module with most popular DC/DAC0808<br>d) PC Interface: RS232 &USB<br>e) Motor Drive: DC, Servo, Stepper<br>f) DAQ: Data Acquisition to sense different sensors signals | 1 set |
| 78. | Sensor Trainer Kit Containing Following Sensors<br>a) Thermocouple<br>b) RTD<br>c) Load Cell/ Strain Gauge<br>d) LVDT<br>e) Smoke Detector Sensors<br>f) Speed Sensor<br>g) Limit Switch<br>h) Photosensors<br>i) Opto-coupler<br>j) Proximity Sensor | Graphical touch LCD with inbuilt processor for viewing the output waveforms, In built DAQ, and standard processing circuits like Inverting, Non-Inverting, Power, Current, Instrumentation Differential Amplifier, F/V,V/F,V/I,I/V Converter, **Sensors :**RTD,NTC Thermistor,LM35 Thermocouple, Gas (Smoke) Sensor, Load cell, LVDT Sensor, Speed Sensor | 2 Nos. |
| 79. | Various analog and digital ICs useful for doing project works mentioned in the digital and analog IC applications modules | | As required |
| 80. | Different types of electronic and electrical cables, connectors, sockets, terminations. | | As required |
| 81. | Seven segment DPM trainer | | 6 Nos. |
| 82. | LCD based DPM | | 6 Nos. |

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| 83. | SMPS of different make | | 4 Nos. |
| 84. | SMPS Trainer | Wide variation of Input AC Voltage 90 to 230 VAC, 50/60Hz.<br>Ouput: +12V,-12V,+5V Regulated DC<br>Switching Transformer 300V DC switching at 125KHz<br>Output : 30V approx. | 2 Nos. |
| 85. | PCB making machine | PCB Prototype machine with auto resuming operation facility, auto bit protection, auto depth sensing, start-stop and play-pause. orking area (XYZ) 220x200x15 mm Min drill hole Size 0.3 mm, Min cutting trace/space : 0.15 mm (6 mil)X/Y travel speed 40 mm/sec ,X/Y Resolution 0.06 mm ,Spindle speed (RPM) 25000 Tool change Manual Change Tool holder 1/8 inch | 1 No. |
| 86. | FR4 Grade PCBs | | As required |
| 87. | Different types of Analog electronic components, digital ICs, power electronic components, general purpose PCBs, bread board, MCB, ELCB | | As required |
| 88. | PCB Drill Machine | | 1 No. |
| 89. | RAW MATERIAL FOR PCB DEVELOPMENT | | AS Required |
| 90. | Desktop computer | Latest configuration with preloaded OS and MS office | 12 Nos. |
| 91. | Laptop | Latest configuration with preloaded OS and MS office | 1 No. |
| 92. | Microcontroller 8051 Development Board(consumables) with suitable IDE software | 8051 associated circuits with on board LEDs (8), push buttons (8), Potentiometer, buzzer, ADC, relay driver, DC motor driver, stepper motor driver, 7 segment display (2), 4X4 keypad, LCD display, RTC, LM35, PIR sensor. | 8 Nos. |
| 93. | PICF18 Microcontroller Development board with suitable IDE software (consumables) | PIC associated circuits with on board LEDs (8), push buttons (8), Potentiometer, buzzer, ADC, relay driver, DC motor | 8 Nos. |

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| | | driver, stepper motor driver, 7 segment display (2), 4X4 keypad, LCD display, RTC, LM35, PIR sensor. | |
| 94. | Different Microcontroller/Processor Training and Development Platform for AVR, PIC, ARM and Arduino. | MCU PIC16F877A, 4MHz, Ready to run programmer will program PIC Devices, USB Port<br>MCU ATMEGA8515 ,8MHz, Ready to run programmer will program ATMEGA series microcontroller, USB Port<br>MCU LPC2148, 12MHz, LED 8Nos, ADC 10 bit 10Nos, DAC 10bit, PWM, Sensor LM35 , Display 16X2 LCD Display , Motor Drive: L293D 600mA (5-12V),Programmer USB Interface.<br>Microcontroller ATmega328p, 16MHz, Digital I/O Pins: 14 (of which 6 provide PWM output), Flash Memory: 16KB (of which 2KB used by boot loader)<br><br>Each platform should have Bread DC Power Supplies +12V, -12V, +5V & - 5V, Breadboard to make circuits | 1 No. |
| 95. | Different Modules for controllers | Zigbee<br>Bluetooth<br>RFID<br>Finger Print<br>GSM<br>GPS<br>Display LCD, Seven Segment, KED Matrix, LED<br>Input Devices ASCII Keyboard, Hexa Keypad and Switch<br>Motors DC , Stepper, Servo | 1 No. |
| 96. | Sensor Trainer Kit Containing following Sensors<br>1. Thermocouple 2. RTD 3. Load Cell/ Strain Gauge 4. LVDT 5. Smoke Detector Sensors 6. Speed Sensor<br>7. Limit Switch 8. Photo sensors 9. Opto-coupler 10. Proximity | Graphical touch LCD with inbuilt processor for viewing the output waveforms, In built DAQ, and standard processing circuits like Inverting, Non – Inverting, Power, Current, Instrumentation Differential Amplifier, F/V, V/F, V/I, I/V | 4 Nos. |

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| | Sensor | Converter,<br>**Sensors(consumables):** RTD, NTC Thermistor, LM35 Thermocouple, Gas (Smoke) Sensor, Load cell, LVDT Sensor, Speed Sensor | |
| 97. | Electronic Circuit simulation software suite<br>(with PCB design and Mechanic Design) | | 12 licenses |
| 98. | IoT Smart City Trainer with 3-5 applications. [modular trainer]<br>(These Trainers can also be assembled by instructors with consumables, for which a training can be proposed at NSTIs) | With smart parking station, garbage control, dynamic traffic control, water management, smart lighting, | 1 No. |
| 99. | IoT Smart Agriculture Trainer with 3-5 applications. [modular trainer]<br>(These Trainers can also be assembled by instructors with consumables, for which a training can be proposed at NSTIs) | | 1 No. |
| 100. | IoT Smart Health care Trainer with 2-4 applications. [modular trainer]<br>(These Trainers can also be assembled by instructors with consumables, for which a training can be proposed at NSTIs) | | 1 No. |
| 101. | IoT Smart Home Trainer with 3-5 applications. [modular trainer]<br>(These Trainers can also be assembled by instructors with consumables, for which a training can be proposed at NSTIs) | | 1 No. |
| 102. | IoT Smart wearables Trainer with 3-5 applications. [modular trainer]<br>(These Trainers can also be assembled by instructors with consumables, for which a training can be proposed at NSTIs) | | 1 No. |

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| 103. | IoT Smart grid Trainer with 2-3 applications. [modular trainer] (These Trainers can also be assembled by instructors with consumables, for which a training can be proposed at NSTIs) | | 1 No. |
| 104. | IoT Smart Bike Trainer with 2-3 applications. [modular trainer] (These Trainers can also be assembled by instructors with consumables, for which a training can be proposed at NSTIs) | | 1 No. |
| 105. | Industrial IoT Trainer with 2-3 applications. [modular trainer] (These Trainers can also be assembled by instructors with consumables, for which a training can be proposed at NSTIs) | | 1 No. |
| 106. | Embedded & IoT Simulating software | VSM for 8051, PIC, IoT Simulator for Arduino, RPi with cloud tools support. | 13 Users |
| 107. | Node MCU (ESP) [Consumable] | | 24 Nos. |
| 108. | Arduino Uno Boards [Consumable] | | 24 Nos. |
| 109. | Arduino Nano Boards [Consumable] | | 10 Nos. |
| 110. | Raspberry Pi 3+/4 Boards | | 10 Nos. each |
| 111. | Universal IO board for IoT compatible with NodeMCU, Arduino, RPi. | LED (8 Nos.), switches, buzzer, LCD, OLED, segment display, DC motor, Servo motor, stepper motor, relays 5V/12V (4 Nos.) with required power supplies. | 12 Nos. |
| 112. | Universal IoT Sensor Board compatible with NodeMCU, Arduino, RPi. | LDR, LM35, PIR, IR, Ultrasonic, Alchoholic, Rain drop, DHT11/22, CO2, air pollution, soil moisture, & photo detector | 12 Nos. |
| 113. | Universal IoT protocol Board compatible with NodeMCU, Arduino, RPi. | USART/UART, SPI, I2C, CAN | 10 Nos. |
| 114. | Bluetooth interface board compatible with NodeMCU, Arduino, RPi. | | 12 Nos. |
| 115. | WiFi (ESP8266) interface board | | 12 Nos. |

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| | compatible with NodeMCU, Arduino, RPi. | | |
| 116. | Zigbee interface board compatible with NodeMCU, Arduino, RPi. | | 12 Nos. |
| 117. | MQTT protocol trainer | | 5 Nos. |
| 118. | BLYNK IoT platform License | | 25 users |
| 119. | CCTV Surveillance with RPi trainer | | 4 Nos. |
| 120. | Computer Hardware & Networking workstation | The bench comprises with Computer Hardware Training System (02 Nos.) The different circuit boards of PC/AT Computer are exposed on a PCB, LAN Training System with Wireless LAN as well to study Peer to Peer, STAR, BUS, RING Topology.<br>Data transmission speed: 10/100 Mbps 4, Smart managed 3 Layer and 2 Layer Switch, Media converter, POE Switch, IP Camera<br>Networking Fundamentals Teaching Simulation Software<br>DSO 50MHz 4 Channel, 1GSa/Sec, more than 20 Mpt memory DSO<br>DMM: 41/2 Digit with LCD Display. | 2 Nos. |
| 121. | Consumables: LEDs, switches, buzzer, DC motors, stepper motors, servo motors, relays(5V,12V), RS232-USB converters(TTL o/p and USB output), cross cables, RS232 cables, USB cables, RPi power adapters, USB cables, power adapters-(5V,9V,12V,3.3V), Jumper wires(M-M,M-F,F-F), Zero boards, ESP8266 modules, Bluetooth modules, 7 segment, LCD, sensors modules. | | As required |
| **D. Shop Floor Furniture and Materials** - For 2 (1+1) units no additional items are required. | | | |
| 122. | Instructor's table | | 1 No. |
| 123. | Instructor's chair | | 2 Nos. |
| 124. | Metal Rack | 100cm x 150cm x 45cm | 4 Nos. |

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| 125. | Lockers with 16 drawers standard size | | 2 Nos. |
| 126. | Steel Almirah | 2.5 m x 1.20 m x 0.5 m | 2 Nos. |
| 127. | Black board/white board | | 1 No. |
| 128. | Fire Extinguisher | | 2 Nos. |
| 129. | Fire Buckets | | 2 Nos. |
| 130. | ESD work station with seating capacity 2 | 5/15 Amp Switch + Socket with Modular Plate - 05 Nos.., C32 Single Pole MCB - 01 No., Power Indicator - 1 No. and an On\Off switch for tube-light. This will also include 3.5M of standard 2.5 sq mm 3 Core Mains Cord with 15Amp Top Plug - 1No.<br>Dimension of Table top in mm x mm=1500X900 | 12 Nos. |
| 131. | Trainees Chair/ stool | | 24 Nos. |

## ANNEXURE - II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts, trainers of ITIs, NSTIs, faculties from universities and all others who contributed in revising the curriculum.

Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

| **List of Expert Members participated for finalizing the course curriculum of Technician Electronics System Design and Repair trade** | | | |
|---|---|---|---|
| **S No.** | **Name & Designation Sh/Mr./Ms.** | **Organization** | **Remarks** |
| **Industry Expert** | | | |
| 1. | Pari P. General Manager – Technical | Electronics City Industries Association (Elcia) Bangalore | Expert |
| 2. | Visweswaran J, National Territory Manager | National Instruments (Ni) Bangalore | Expert |
| 3. | Anil Kumar Satapathy, Chief Technical Officer | Difacto Robotics & Automation | Expert |
| 4. | Manish Joshi, General Manager | Scientech Technologies Pvt Ltd Indore | Expert |
| 5. | B N Nandakumar, Director | Fanuc India | Expert |
| 6. | Bhooshan N Iyer, Vice President | Embedded System Solutions | Expert |
| 7. | Sameer Saha, Ceo | Embin Technologies Mumbai | Expert |
| 8. | S. Kumar, Sr. Manager | Tmi Systems Bangalore | Expert |
| **Trade Expert/Member** | | | |
| 9. | Ujjwal Biswas, JDT | NSTI Vidyanagar, Hyderabad | Convenor |
| 10. | C.S. Murthy, JDT | CSTARI, Kolkata | STCC Co-ordinator |
| 11. | Dr. Rajat Kumar Panigrahy Principal | Govt ITI Berhampur, Odisha | Representative from state Directorate |
| 12. | A. Rarhi, DDT | CSTARI, Kolkata | Representative from CSTARI |
| 13. | S. Gopala Krishnan, AM | NIMI, Chennai | Representative from NIMI |
| 14. | N K Mohapatra, CEO | ESSCI | Representative from SSC |
| 15. | Priya Sreenivasan ADT | NSTI Bangalore | Representative from NSTI |
| 16. | Raju Kannam ADT | NSTI Bangalore | Representative from NSTI |
| 17. | Kunkunuru Srikanth Babu ADT | RDSDE/ DGT | Representative from RDSDE/ DGT |

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|---|---|---|---|
| | | | Data analytics |
| 18. | Hemant Bargal, Gr. Instructor | ITI Ambernat, Thane | Special Trade Expert |
| 19. | Nagendar Naik Dharvath, Training Officer. | NSTI W Hyderabad | Special Trade Expert |
| 20. | K Arulselvi, Principal | NSTI (W) TRICHY | Special Trade Expert |
| 21. | R. Malathi, Training officer | NSTI (W) Bangalore | Member |
| 22. | P.K. Bairagi, Training Officer | CSTARI, Kolkata | Member |
| 23. | B. K. Nigam, Training Officer | CSTARI, Kolkata | Member |
| 24. | B. Biswas, Training Officer | CSTARI, Kolkata | Member |
| 25. | Manish Mamgain, JTA | NSTI Dehradun | Member |

## ABBREVIATIONS

| | |
|---|---|
| CTS | Craftsmen Training Scheme |
| ATS | Apprenticeship Training Scheme |
| CITS | Craft Instructor Training Scheme |
| DGT | Directorate General of Training |
| MSDE | Ministry of Skill Development and Entrepreneurship |
| NTC | National Trade Certificate |
| NAC | National Apprenticeship Certificate |
| NCIC | National Craft Instructor Certificate |
| LD | Locomotor Disability |
| CP | Cerebral Palsy |
| MD | Multiple Disabilities |
| LV | Low Vision |
| HH | Hard of Hearing |
| ID | Intellectual Disabilities |
| LC | Leprosy Cured |
| SLD | Specific Learning Disabilities |
| DW | Dwarfism |
| MI | Mental Illness |
| AA | Acid Attack |
| PwD | Person with disabilities |


कौशलं बलम्