Format for syllabus development of Skill development course

05

(For First Semester)

Title of Course- **Installation, Maintenance and Repair of Electrical and Electronic Products.**	
Nodal Department of HEI to run course	
Broad Area/ Sector-	**Electrical and Electronic Products.**
Subsector-	**Installation, Maintenance and Repairing**
Nature of course-Independent/ Progressive	Independent and Progressive (**Both Nature**)
Name of suggestive Sector Skill Council	
Aliened NSQF level	**LEVEL-4**
Expected fees of the course-Free/ Paid	
Stipend to student expected from industry	
Number of Seats-	
Course Code-…	**Credits-03 (1-Theory, 2- Practical)**
Max. Marks-100---- Minimum Marks-----	
Name of Proposed skill partner (Please specify, Name of Industry, Company etc. for Practical / Training/ internship/ OJT	
Job prospect-Expected Fields of Occupation where student will be able to get job after competing this course in (Please specify name/ type of industry, company etc.)	**Service Sectors and Self-Employment.**

Syllabus

Unit	Topics	General/ Skill component	Theory/ Practical/ OJT/ Internship/ Training	No. of theory hours (Total-15 Hrs = 1 Credit)	No. of Skill hours (Total-60 Hrs = 2 Credits)
I	Occupational Safety & Health	Both	T&P	3	15
II	Electrical and electronic Measurement	Both	T& P	4	15
III	Electrical & Electronics Cables and Connector	Both	T& P	4	15
IV	Domestic Wiring - Methods, Installation& Testing	Both	T&P	4	15

Suggested Readings:

1. J B Gupta, Electrical Measurements and Measuring Instruments.
2. Sonal Patel and R. A. Brapate, Basic Electrical and Electronics Engineering.
3. Samarjit Ghosh, Fundamentals of Electrical and Electronics Engineering.
4. Pradeep Chaturvedi, Occupational Safety Health & Environment Sustainable Economic Development.
5. Shashi Bhushan Sinha, Handbook of Repair and Maintenance of Domestic Electronics Appliances handbook.
6. M. Lotia, Modern Basic Electrical & House Wiring Servicing.

Suggested Digital platforms/ web links for reading: **Only theoretical purpose students may use digital library etc.**

Suggested OJT/ Internship/ Training/ Skill partner:

Suggested Continuous Evaluation Methods : Semester wise

Course Pre-requisites:

- No pre-requisite required, open to all- **open to all Science Students.**
- To study this course, a student must have subject **Science** in Class/12th/ certificate/ diploma.
- If progressive, to study this course a student must have passed previous courses of this series. **(Both in Nature)**

Suggested equivalent online courses: **No required**

Any remarks/ Suggestions: This format is not suitable to specify the units for 2, 3 and 4 semesters. It is applicable not for one semester course. It may be considerable.

Notes:

- **More details about the general/ skill component is available in syllabus of course in Installation, Maintenance and Repair of Electrical and Electronic Products.**
- Number of units in theory/ practical may vary as per need.
- Total credits-3 (it can be more credits, but students will get ony 3 credit/ semester or 6 credits/ year.
- Credits for theory = 01 (Teaching Hours = 15)
- Credits for OJT/ Internship/ Training/ Practical = 02 (Training Hours = 60)

Format for syllabus development of Skill development course

(For Second Semester)

Title of Course- **Installation, Maintenance and Repair of Electrical and Electronic Products.**	
Nodal Department of HEI to run course	
Broad Area/ Sector-	**Electrical and Electronic Products.**
Subsector-	**Installation, Maintenance and Repairing**
Nature of course-Independent/ Progressive	Independent and Progressive (**Both Nature**)
Name of suggestive Sector Skill Council	
Aliened NSQF level	**LEVEL-4**
Expected fees of the course-Free/ Paid	
Stipend to student expected from industry	
Number of Seats-	
Course Code-…	**Credits-03 (1-Theory, 2- Practical)**
Max. Marks-100---- Minimum Marks-----	
Name of Proposed skill partner (Please specify, Name of Industry, Company etc. for Practical / Training/ internship/ OJT	
Job prospect-Expected Fields of Occupation where student will be able to get job after competing this course in (Please specify name/ type of industry, company etc.)	**Service Sectors and Self-Employment.**

Syllabus

Unit	Topics	General/ Skill component	Theory/ Practical/ OJT/ Internship/ Training	No. of theory hours (Total-15 Hrs = 1 Credit)	No. of Skill hours (Total-60 Hrs = 2 Credits)
V	Fundamental of Electricity	Both	T&P	3	15
VI	Various Electrical Components and Their Applications	Both	T& P	4	15
VII	Electrical and Electronics Accessories	Both	T& P	4	15
VIII	Installation ,Maintenance And Repair Of Electrical Products	Both	T&P	4	15

Suggested Readings:

7. J B Gupta, Electrical Measurements and Measuring Instruments.
8. Sonal Patel and R. A. Brapate, Basic Electrical and Electronics Engineering.
9. Samarjit Ghosh, Fundamentals of Electrical and Electronics Engineering.
10. Pradeep Chaturvedi, Occupational Safety Health & Environment Sustainable Economic Development.
11. Shashi Bhushan Sinha, Handbook of Repair and Maintenance of Domestic Electronics Appliances handbook.

Suggested Digital platforms/ web links for reading: **Only theoretical purpose students may use digital library etc.**

Suggested OJT/ Internship/ Training/ Skill partner: **No required**

Suggested Continuous Evaluation Methods : Semester wise

Course Pre-requisites:

- No pre-requisite required, open to all- **open to all Science Students.**
- To study this course, a student must have subject **Science** in Class/12th/ certificate/ diploma.
- If progressive, to study this course a student must have passed previous courses of this series. **(Both in Nature)**

Suggested equivalent online courses: **No required**

Any remarks/ Suggestions: This format is not suitable to specify the units for 2, 3 and 4 semesters. It is applicable not for one semester course. It may be considerable.

Notes:

- **More details about the general/ skill component is available in syllabus of course in Installation, Maintenance and Repair of Electrical and Electronic Products.**
- Number of units in theory/ practical may vary as per need.
- Total credits-3 (it can be more credits, but students will get ony 3 credit/ semester or 6 credits/ year.
- Credits for theory = 01 (Teaching Hours = 15)
  - Credits for OJT/ Internship/ Training/ Practical = 02 (Training Hours = 60)

Format for syllabus development of Skill development course

(For Third Semester)

Title of Course- **Installation, Maintenance and Repair of Electrical and Electronic Products.**	
Nodal Department of HEI to run course	
Broad Area/ Sector-	**Electrical and Electronic Products.**
Subsector-	**Installation, Maintenance and Repairing**
Nature of course-Independent/ Progressive	Independent and Progressive (**Both Nature**)
Name of suggestive Sector Skill Council	
Aliened NSQF level	**LEVEL-4**
Expected fees of the course-Free/ Paid	
Stipend to student expected from industry	
Number of Seats-	
Course Code-…	**Credits-03 (1-Theory, 2- Practical)**
Max. Marks-100---- Minimum Marks-----	
Name of Proposed skill partner (Please specify, Name of Industry, Company etc. for Practical / Training/ internship/ OJT	
Job prospect-Expected Fields of Occupation where student will be able to get job after competing this course in (Please specify name/ type of industry, company etc.)	**Service Sectors and Self-Employment.**

Syllabus

Unit	Topics	General/ Skill component	Theory/ Practical/ OJT/ Internship/ Training	No. of theory hours (Total-15 Hrs = 1 Credit)	No. of Skill hours (Total-60 Hrs = 2 Credits)
XI	Batteries and its Maintenance Knowledge.	Both	T&P	3	15
X	Testing of Batteries.	Both	T& P	4	15
XI	Type of Soldering	Both	T& P	4	15
XII	Soldering: Solders, flux and soldering technique.	Both	T&P	4	15

Suggested Readings:

12. J B Gupta, Electrical Measurements and Measuring Instruments.
13. Sonal Patel and R. A. Brapate, Basic Electrical and Electronics Engineering.
14. Samarjit Ghosh, Fundamentals of Electrical and Electronics Engineering.
15. Pradeep Chaturvedi, Occupational Safety Health & Environment Sustainable Economic Development.
16. Shashi Bhushan Sinha, Handbook of Repair and Maintenance of Domestic Electronics Appliances handbook.

Suggested Digital platforms/ web links for reading: **Only theoretical purpose students may use digital library etc.**

Suggested OJT/ Internship/ Training/ Skill partner: **No required**

Suggested Continuous Evaluation Methods : Semester wise

Course Pre-requisites:

- No pre-requisite required, open to all- **open to all Science Students.**
- To study this course, a student must have subject **Science** in Class/12th/ certificate/ diploma.
- If progressive, to study this course a student must have passed previous courses of this series. **(Both in Nature)**

Suggested equivalent online courses: **No required**

Any remarks/ Suggestions: This format is not suitable to specify the units for 2, 3 and 4 semesters. It is applicable not for one semester course. It may be considerable.

Notes:

- **More details about the general/ skill component is available in syllabus of course in Installation, Maintenance and Repair of Electrical and Electronic Products.**
- Number of units in theory/ practical may vary as per need.
- Total credits-3 (it can be more credits, but students will get ony 3 credit/ semester or 6 credits/ year.
- Credits for theory = 01 (Teaching Hours = 15)
- Credits for OJT/ Internship/ Training/ Practical = 02 (Training Hours = 60)

Format for syllabus development of Skill development course

(For Fourth Semester)

Title of Course- **Installation, Maintenance and Repair of Electrical and Electronic Products.**	
Nodal Department of HEI to run course	
Broad Area/ Sector-	**Electrical and Electronic Products.**
Subsector-	**Installation, Maintenance and Repairing**
Nature of course-Independent/ Progressive	Independent and Progressive (**Both Nature**)
Name of suggestive Sector Skill Council	
Aliened NSQF level	**LEVEL-4**
Expected fees of the course-Free/ Paid	
Stipend to student expected from industry	
Number of Seats-	
Course Code-…	**Credits-03 (1-Theory, 2- Practical)**
Max. Marks-100---- Minimum Marks-----	
Name of Proposed skill partner (Please specify, Name of Industry, Company etc. for Practical / Training/ internship/ OJT	
Job prospect-Expected Fields of Occupation where student will be able to get job after competing this course in (Please specify name/ type of industry, company etc.)	**Service Sectors and Self-Employment.**

Syllabus

Unit	Topics	General/ Skill component	Theory/ Practical/ OJT/ Internship/ Training	No. of theory hours (Total-15 Hrs = 1 Credit)	No. of Skill hours (Total-60 Hrs = 2 Credits)
XIII	Analog Electronics	Both	T&P	3	15
XIV	Transistors and Amplifiers and Their Applications	Both	T& P	4	15
XV	Electrical And Electronic Instruments And Measurement	Both	T& P	4	15
XVI	Installation ,Maintenance And Repair Of Electrical Products	Both	T&P	4	15

Suggested Readings:

17. Sonal Patel and R. A. Brapate, Basic Electrical and Electronics Engineering.
18. Samarjit Ghosh, Fundamentals of Electrical and Electronics Engineering.
19. Shashi Bhushan Sinha, Handbook of Repair and Maintenance of Domestic Electronics Appliances handbook.
20. M. Lotia, Modern Basic Electrical & House Wiring Servicing.

Suggested Digital platforms/ web links for reading: **Only theoretical purpose students may use digital library etc.**

Suggested OJT/ Internship/ Training/ Skill partner: **No required**

Suggested Continuous Evaluation Methods : Semester wise

Course Pre-requisites:

- No pre-requisite required, open to all- **open to all Science Students.**
- To study this course, a student must have subject **Science** in Class/12th/ certificate/ diploma.
- If progressive, to study this course a student must have passed previous courses of this series. **(Both in Nature)**

Suggested equivalent online courses: **No required**

Any remarks/ Suggestions: This format is not suitable to specify the units for 2, 3 and 4 semesters. It is applicable not for one semester course. It may be considerable.

Notes:

- **More details about the general/ skill component is available in syllabus of course in Installation, Maintenance and Repair of Electrical and Electronic Products.**
- Number of units in theory/ practical may vary as per need.
- Total credits-3 (it can be more credits, but students will get ony 3 credit/ semester or 6 credits/ year.
- Credits for theory = 01 (Teaching Hours = 15)
- Credits for OJT/ Internship/ Training/ Practical = 02 (Training Hours = 60)

A COURSE IN INSTALLATION, MAINTENANCE AND REPAIR OF ELECTRICAL AND ELECTRONIC PRODUCTS

Aim and Goals of Designing the Skill Development Course:

1. Completion of the first semester, the students would be able to testing, repairing and installation of Domestic wiring and fitting.
2. The certificate may be issued for his/her skill development Course of **three credits**.
3. Completion of the second semester, the students would be able to install, Maintenance, and Repairing Electrical Home appliances.
4. Certificates may be issued for his/her skill development Course of **six credits**.
5. After completing the third semester, the students will be able to test, maintain, and repair many types of electrical systems and batteries.
6. Certificates may be issued for his/her skill development Course. Those will be **nine credits**.
7. By the end of the fourth semester, students will be able to install, maintain, and repair electrical and electronic products.
8. Certificates may be issued for his/her skill development Course. There are **twelve credits**.

Learning Outcomes:

1. Perform & Maintain safety operation
2. Perform basic 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 electronics product.
6. Test & service different batteries used in electronic applications.
7. Test various electronic components using proper measuring instruments
8. Identify, place, solder and de-solder and test different component.
9. Detect the faults and troubleshoot inverter, stabilizer, battery charger, emergency light and UPS etc.

Semester:1

Unit	Theory	Practical
I	1.**Occupational Safety & Health** Basic safety introduction, Personal protection:- Safety signs for Danger, Warning, caution & personal safety message. Use of Fire extinguishers,Basic injury prevention, Basic first aid	1.1 Health, Safety and Environment guidelines, legislations & regulations as applicable. 1.2 Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. (4 hrs.) 1.3 Basic safety introduction, Personal protective Equipment (PPE):- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, cautionpersonal safety message. 1.4 Preventive measures for electrical accidents & steps to be taken in such accidents.
II	**2.Electrical and electronic Measurement** Hand tools and their Uses: 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, neon tester, clamp meter, test lamp etc.	2.1 Demonstration of hand tools. 2.2. Identification of simple types-screws, nuts & bolts, chassis, clamps, rivets etc. 2.3 Use, care & maintenance of various hand tools. 2.4 Familiarization with signs and symbols of Electrical accessories. 2.5Practice in using cutting pliers, screw drivers etc. skinning the cables, and joint practice on single strand 2.6 practice on drilling, chipping, internal and external threading of different sizes.
III	**3. Electrical & Electronics Cables and Connector:** Different type of electrical cables and their Specifications. Types of wires &cables. Standard wire gauge (SWG)	3.1 practice on different type of cable joint. 3.2 Testing phase ,neutral and Earth by tester and multi-meter and test lamp.
IV	4.**Domestic Wiring - Methods, Installation& Testing-** Introduction and explanation of electrical wiring systems, cleat wiring, casing & Capping, CTS, Conduit and concealed etc., I. E. Rules. Related to wiring, National Building codes for house wiring, specification and types, rating & material.	4. Domestic Wiring - Methods, Installation & Testing- 4.1 Demonstration & Practice on connecting common electrical accessories in circuits and testing them in series board. 4.2.Testing& replacement of different types of fuses, switches, plug, sockets. 4.3 Identification of different wiring materials and their specifications. 4.4. Removing of insulation from

		assorted wires and cables. 4.5. Making a switch board with electrical accessories. 4.6 Making Extension board

	Semester:2	
Unit	**Theory**	**Practical**
V	**5.Fundamental of electricity**: Electron theory- free electron, Fundamental terms, definitions, units & effects of electric current. Atom& Electrons, Charge, Conductors and Insulators, Semi-Conductors, Current & Voltage, Power. Single phase and Three phase supply. Terms like Line and Phase voltage/ currents. Resistance, Resistors in Series Circuit, Resistors in Parallel. Ohms Laws & Kirchhoff Laws.	5.1Practice on measurement of parameters in combinational electrical circuit by applying Ohm's Law for different resistor values and voltage sources and analyses by drawing graphs. 5.2. Identify the different types of active electronic components. 5.3. Measure the resistor value by color code and verify the same by measuring with multi-meter. 5.4 Measure current and voltage in electrical circuits to verify Kirchhoff's Law Ohm's 5.5 Measure resistance using voltage drop method
VI	**6. Various Electrical Components and Their Applications:** Resistor Color coding, Specification of various types of Resistor and their application. Special Purpose Resistors: LDR, Thermistor. Capacitor and capacitances, Series & Parallel connection of capacitors, Different types of Capacitors and their construction & application. Testing of Capacitors Types of inductors, construction, specifications, applications and energy storage concept.	6.1 Identify various types of capacitors, charging / discharging and testing. 6.2 Group the given capacitors to get the required capacity and voltage rating.
VII	**7. Electrical and Electronics Accessories :** wiring accessories e.g. switches, fuses, relays, MCB,ELCB, sockets, regulators, indicator, fuse, heater coil, capacitor, plug, relay,crocodile clips, clamping plug, Distribution box, Connecting lead ,PCB plate, LED different color, Transformer (12-0-12,6-0-6), Diode(IN4007) Etc.	7.1 Identify different types of transformers and test. 7.2. Identify the electrical accessories like switch, plug, socket by current carrying capacity. 7.3. Identify different types of fuses along with fuse holders 7.4. Test the given MCBs, ELCB 7.5 Identify different type electronic accessories like capacitor range, resistor, lead, cables, and switches.

VIII	**8. Installation ,Maintenance And Repair Of Electrical Product**: Basic concept, block diagram and working of Table heater, Room heater Immersion heater, Hot plates Electric kettle Toaster Electric iron Automatic iron Electric fans: table fan, Exhaust fan, ceiling fan Hair Drier Mixer grinder	8.1 Dismantle and assemble electrical parts of various electrical appliance e.g. Heater, cooking range, geyser, washing machine, Electric iron, Electric fan Etc. 8.2 Service and repair of table heater 8.3 Service and repair of Room heater 8.4 Service and repair of Immersion heater7.5 Service and repair of Hot plates 8.6Service and repair of Electric kettle 8.7 Service and repair of Toaster 8.8Service and repair of Electric iron 8.9 Service and repair of Table Fan 8.10 Service and repair of Exhaust fan 8.11 Service and repair of Ceiling fan 8.12 Service and repair of Hair drier 8.13 Service and repair of Mixer grinder

Suggested Readings:

1. J B Gupta, Electrical Measurements and Measuring Instruments.
2. Samarjit Ghosh, Fundamentals of Electrical and Electronics Engineering.
3. Pradeep Chaturvedi, Occupational Safety Health & Environment Sustainable Economic Development.
4. Shashi Bhushan Sinha, Handbook of Repair and Maintenance Of Domestic Electronics Appliances handbook.
5. M. Lotia, Modern Basic Electrical & House Wiring Servicing.

Semester :3

Unit	Theory	Practical
IX	**9. Batteries and its Maintenance Knowledge:** Types of Batteries Battery types, Primary Cell, Secondary Cell, Wet charged, Dry-charged, Low maintenance, Construction of Battery, Case Cover plates, Separator, Cells, Electrolyte, etc. Understanding working principles of Batteries Lead Acid battery, Electrochemical reaction, NICD Battery, Capacity rating, CCA, RC, AH & Power(watt) Silver-Oxide Batteries Zinc-Carbon Batteries Diagnostics and	9.1 Identify the +ve and -ve terminals of the battery. 9.2. Identify the rated output voltage and Ah capacity of given battery. 9.3. Measure the voltages of the given cells/battery using analog/ digital multi-meter. 9.4. Charge and discharge the battery through load resistor. 9.5. Maintain the secondary cells. 9.6. Measure the specific gravity of the electrolyte using hydrometer.
X	**10. Testing of Batteries:** Testing Factor affecting charging, Cause of battery failure, diagnosis and testing, visual inspection, Heavy load test Professional	10. Test a battery and verify whether the battery is ready for use of needs recharging.
XI & XII	**11&12. Soldering:** Solders, flux and soldering technique. Different types of soldering guns, related to Temperature and wattages, types of tips. Solder materials and their grading. Use of flux and other materials. Selection of soldering gun for specific requirement. Soldering and De-soldering stations and their specifications.	11.1Soldering/ De-soldering and Various Switches 11.2. Practice soldering on differentelectronic components, small transformer and lugs. 11.3. Practice soldering on IC bases and PCBs. 11.4. Practice de-soldering using pump 12.1. Identify and use SPST, SPDT, DPST, DPDT, tumbler, push button, toggle, piano switches used in electronic system. 12.2. Make a panel board using different types of switches for a given application

Semester :4

Unit	Theory	Practical
XIII	**13.Analog Electronics**: Atomic Structure Semiconductor Material P N Junction , Diode, Special Diodes Power Supply Rectifier, Filter, Regulators, Regulated Power supply using 78XX series, 79XX series.	13.1Identify different types of diodes, diode modules and their specifications. 13.2. Test the given diode using multi meter and determine forward to reverse resistance ratio. 13.3. Measure the voltage and current through a diode in a circuit and verify its forward characteristic. 13.4. Construct and test a half wave, full wave and Bridge rectifier circuit.
XIV	**14.Transitors and Amplifiers and Their Applications:** Op-amp regulator, Construction, working of a PNP and NPN Transistors, purpose of E, B & C Terminals. Significance of α, β and relationship of a Transistor. Need for Biasing of Transistor.	14.1 Identify and test Zener diode. 14.2 Construct and test Zener based voltage regulator circuit. 14.3 Calculate the percentage regulation of regulated power supply. 14.4 Construct and test a +12V fixed voltage regulator. 14.5 Identify the different types of fixed +ve and –ve regulator ICs and the different current ratings (78/79 series)
XV	**15. Electrical And Electronic Instruments And Measurement**: Analog voltmeter, ammeter, ohm meter, digital multi-meter, clamp meter,CRO.	15.1Use the multi meter to measure the various functions (AC V, DC V, DC I, AC I, R) 15.2Identify the different controls on the clamp meter and observe the function of each control 15.3 use CRO function
XVI	**16.Installation ,Maintenance And Repair Of Electrical Product**: Basic concept, block diagram and working of Soldering iron Geyser Musical bell Washing machine Semi auto washing machine Desert cooler Domestic Refrigerator Water cooler Air conditioner battery charger, emergency light, Inverter and UPS. Voltage stabilizer	16.1 Dismantle and assemble electrical parts of various electrical appliance e.gHeater, geyser, washing machine, Electric iron, Electric fan Etc. 16.2 Service and repair of Soldering iron 16.3 Service and repair of Geyser 16.4 Service and repair of Musical bell 16.5 Service and repair of Washing machine 16.6 Service and repair of Desert cooler 16.7 Service and repair of Domestic Refrigerator 16.8 Service and repair of Water cooler 16.9 Service and repair of Air conditioner 16.10 Service and repair of battery charger 16.11 Service and repair ofemergency light, 16.12 Service and repair ofinverter and UPS 16.13 Service and repair of Voltage stabilizer

Suggested Readings:

1. Smarajit Ghosh, Fundamentals of Electrical and Electronics Engineering
2. Sonal Patel and R. A. Brapate, Basic Electrical and Electronics Engineering.
3. Shashi Bhushan Sinha, Handbook of Repair and Maintenance of Domestic Electronics Appliances handbook.
4. M. Lotia, Modern Basic Electrical & House Wiring Servicing.