

# Module Descriptions

**Department of Electrical  
and Electronic Skills**

**Industrial Electrical Skills**

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and Electronic Skills**

**Industrial Electrical Skills**

**2009**





# DEGREE PLAN

## Industrial Electrical Skills (IELT)

### Level 1

Sr.	Module Code	Module Name	Contact Hours
1	IELT114	Electrical Circuits	88
2	IELT115	Electronic Circuits	88
3	IELT116	Electrical Skills Practice 1	64
4	ENGC102	English Communication 1	24
<b>TOTAL HOURS</b>			<b>264</b>

### Level 2

Sr.	Module Code	Module Name	Contact Hours
1	IELT217	Electrical Wiring	88
2	IELT218	Electrical Machines	88
3	IELT219	NEC Code and Calculations	64
4	ENGC203	English Communication 2	24
<b>TOTAL HOURS</b>			<b>264</b>

### Level 3

Sr.	Module Code	Module Name	Contact Hours
1	IELT320	Electrical Power Distribution	88
2	IELT321	Electrical Motor Control	88
3	IELT322	Electrical Blueprint Reading	64
4	TRWT304	Technical Report Writing 1	24
<b>TOTAL HOURS</b>			<b>264</b>

### Level 4

Sr.	Module Code	Module Name	Contact Hours
1	IELT423	Motor Winding	88
2	IELT424	Electrical Installation and Troubleshooting	88
3	IELT425	Electrical Skills Practice 2	64
5	TRWT405	Technical Report Writing 2	24
<b>TOTAL HOURS</b>			<b>264</b>

### Coop (15 Weeks)

Sr.	Module Code	Module Name	Equivalent Contact Hours
1	IELT526	Cooperative Training Program	<b>128</b>

Prerequisite —

Level 1

Contact Hours: 88

**Module Description** This module covers electrical quantities, units, type of connections and their characteristics, different laws and concepts, applications for DC and AC power supply, measures current and voltage, calculates power and percent error.

**Objectives** This module provides:

- Understanding of the electrical quantities.
- Skills of circuits analyzing and calculation.
- Skills of connecting circuits with different power supplies.

**Learning Outcomes** After completing this module the students:

- Can connect any circuit safely.
- Deal with any power supply.
- Calculate the voltage & current passing through the circuit.

**Contents**

- Basic Electrical Quantities.
- DC Circuits.
- AC Circuits.
- Three Phase Circuits.

## Pacing Schedule

Contact Hours	Contents	Skills Gained
6	<b>Basic Electrical Quantities</b>	Using Multimeter for proper measurements and accuracy
	Introduction to electrical circuit & safety	
	Basic electrical quantities	
6	Lab equipments	
	Multimeters	
	Measurement and accuracy	
6	Digital & Analogue Multimeters	
	<b>DC Circuits</b>	Using different rules to calculate the DC electrical quantities
	Ohm's law	
DC circuit (series , parallel)		
6	Series parallel combined connection	
	Kirchhoff's voltage & current laws	
10	Voltage divider rule	
	Current divider rule	
	Power & energy	
6	Capacitor	Understanding the characteristics of capacitor & inductor with the use of oscilloscope
	Capacitor in (series , parallel)	
6	Inductor	
	Inductance in (series , parallel)	
	Relay	
6	Oscilloscope	
	Measuring frequency & voltage	
6	<b>AC Circuits</b>	Knowing the difference between AC & DC supplies and the effect of different loads
	Capacitor in AC	
12	Inductor in AC	
	RL circuit	
	RC circuit	
	Impedance	
	Transformers	
6	<b>Three Phase Circuits</b>	Understanding the three phase connections, load calculations and the effects of balance & unbalance loads
	Star connection	
6	Delta connection	
	Star load (balance & unbalance)	
	Delta load (balance & unbalance)	
6	Revisions	

Reference:  
Electrical Circuits (In House).

Prerequisite —

Level 1

Contact Hours: 88

**Module Description** This module covers Analog Electronics (diodes, transistors, thyristors) and Digital Electronics (logic gates, Flip Flops, coders, adders).

**Objectives** This module provides

- Understanding the properties of Electronic components.
- Skills of testing different types of Electronic components.
- Skills of connecting circuits of different Electronic components.

**Learning Outcomes** After completing this module the student

- Can differentiate between Analog and Digital Electronic circuits.
- Can test the different types of electronics component.
- Can connect the circuits with different types of electronics component.

**Contents**

- Introduction to Electronics & Diodes.
- Transistors.
- Thyristors.
- Digital Electronics.

## Pacing Schedule

Contact Hours	Contents	Skills Gained
6	<b>Introduction to Electronics &amp; Diodes</b>	Understanding the properties of semi- conductive material, testing, different types of diode, characteristics and its applications
	Digital and Analog Signals	
	Semiconductor principles	
6	Diodes	
	Types of diodes	
	Testing diode	
6	The PN junction diode in DC circuit	
	The PN junction diode in AC circuit (half wave rectifier)	
6	The PN junction diode in AC circuit (full wave rectifier)	
	The PN junction diode in AC circuit (full wave rectifier with smoothing capacitor)	
12	Zener diode	
	Light Emitting Diode (LED)	
	Photo Diode	
6	<b>Transistors</b>	
	Types of Transistors	
	Testing Transistors	
	Bipolar junction Transistor (BJT)	
6	Field Effect Transistor (FET)	
	Metal oxide Field Effect Transistor (MOSFET)	
6	<b>Thyristors</b>	Testing different types of Thyristors, applications and its properties.
	Types of thyristor	
	Testing thyristor	
	SCR	
6	TRIAC	
	DIAC	
12	<b>Digital Electronics</b>	Connecting the circuits using logic gates and finding the truth table & timing analysis
	Decimal System , Binary System and BCD	
	Converting between numbering systems	
6	Logic Gates	
	Truth tables	
6	Timing Analysis	
	Binary Arithmetic (half & full Adder)	
4	Encoder & Decoder	
	RS & D & JK Flip Flop	

Reference:  
Electronics Circuit (In House)

Prerequisite —

Level 1

Contact Hours: 64

**Module Description**

This module covers the types of electrical conduit, boxes, and fittings and their applications which are necessary for every electrician to know. It also includes cable splicing and termination.

**Objectives**

This module provides:

- Opportunity for the student to practice skills similar to what he will find in the actual field of work.
- It covers the process of selecting the proper types of electrical conduit, boxes, fittings, for electrical wiring system
- The student will develop the hands-on skills of conduit bending and cable splicing..

**Learning Outcomes**

After completing this module the student will be able:

- To select and order the conduit, boxes, and fittings appropriate for the location where they will be installed.
- To do conduit bending for any types of obstacles and turns.
- To do conduit cutting and threading of rigid conduit.
- To do basic cable splicing and termination.

**Contents**

- Electrical conduit.
- Electrical boxes and fittings.
- Conduit bending.
- Saddle conduit bending.
- Conduit bending using electrical bender.
- Rigid conduit cutting and threading.
- Cable splicing and termination.

## Pacing Schedule

Contact Hours	Contents	Skills Gained
9	<b>Electrical Conduit</b>	Identify Proper Conduit.
	Types of electrical conduit.	
	Selecting and ordering electrical conduit.	
	Using conduit bending tools.	
6	<b>Electrical Boxes and Fittings</b>	Identify Proper Boxes and Fittings.
	Types of electrical boxes and conduit fittings.	
	Selecting and ordering electrical boxes and conduit fittings	
16	<b>Conduit Bending</b>	Different types of Conduit Bending.
	90° Electrical conduit bending.	
	Back-to-Back electrical conduit bending.	
	Little kick electrical box knockout offset.	
	30° Electrical conduit offset bending.	
	45° Electrical conduit offset bending.	
	60° Electrical conduit offset bending.	
9	<b>Saddle Conduit Bending</b>	3 and 4point saddle
	3-point saddle conduit bending.	
	4-point saddle conduit bending.	
6	<b>Conduit Bending Using Electrical Bender</b>	Conduit bending using electrical bender
	Introduction to electrical conduit bending machine.	
	Conduit bending using electrical bender.	
6	<b>Rigid conduit Cutting and Threading</b>	Conduit cutting and threading using electrical machine
	Manual conduit cutting and threading.	
	Introduction to electrical cutting and threading machine.	
	Rigid metal conduit cutting and threading.	
12	<b>Cable Splicing and Termination</b>	Basic cable splicing
	Familiarization of cable splicing tools and equipment	
	Safety Procedures in using LPG	
	Cable Splicing and Termination (Heat shrink)	

Reference:  
Electrical Skills Practice I (In House).

Prerequisite **BSEL 406**Level **1**Contact Hours: **24****Module Description**

English Communication 1 is a module for level 1 students of specialization program, as part of the English communicative competence requirement for their diploma. The module is built around a communicative competency-based program that focuses on general English language skills and workplace competencies.

**Objectives**

- To help students build on and enhance EL proficiency achieved at level 4 of BSEL 406.
- To help them achieve target language competencies required at work.
- To help them learn and practice the same competencies for job success.

**Learning Outcomes**

At the end of the course the students will be able to:

- Illustrate points and express preferences.
- Listen to and speak about job safety and team work.
- Participate effectively in meetings.
- Tell about cause and effect.
- Express disapproval, make counter-argument, conclude, compare and contrast statements

**Contents**

- Understanding Company Benefits
- Employees' Rights
- Job Safety
- Teamwork
- Meetings and Minutes
- Tools and Supplies
- Unions and Employment Contracts
- Using Business Machines
- Self-Employment

**Pacing Schedule**

Contact Hours	Contents	Skills Gained
3	Understanding Company Benefits	Illustrating points and express preferences using appropriate words and phrases
3	Employees' Rights	Describing events chronologically and telling about past situations using past perfect tense
<b>Quiz 1</b>		
3	Job Safety	Predicting consequences using past simple present and past
3	Teamwork	Telling about tasks and predicting consequences using causative verbs
<b>Midterm</b>		
3	Meetings and Minutes	Expressing indifference and disapproval and indicating order and sequence using unreal conditional with 'would' and 'could'
3	Tools and Supplies & Unions and Employment Contracts	Persuading and explaining using 'could have', 'would have' and 'however'
<b>Quiz 2</b>		
3	Using Business Machines	Talking about the future and inferring using passive simple future
3	Self-employment	Concluding, comparing and contrasting using 'might have', 'as---as'.
<b>Final Examination</b>		

Reference: Put English to Work , Level 5 by Sandra Linn

Prerequisite —

Level 2

Contact Hours: 88

**Module Description**

This module covers the wiring of electrical system distribution components used in residential, commercial, and industrial buildings. The module includes the wiring of 3-phase feeder, 3-phase electrical panel, and connecting different types of loads including wiring hazardous location electrical components.

**Objectives**

The objective of this module is to learn:

- How to differentiate between residential, commercial, and industrial wiring.
- The layout of power distribution system in buildings.
- The selection and installation of conduit, boxes, and load components.
- Differentiate between wiring electrical components in normal and hazardous locations.

**Learning Outcomes**

After completing this module the student will be able to the following:

- Wiring 3-phase feeder and 3-phase electrical panel.
- Connecting a balanced 3-phase electrical distribution system.
- Making phase sequence measurement.
- Connecting switching control from 3 or more locations.
- Translate electrical drawing into actual wiring of electrical components.
- Wiring hazardous locations components.

**Contents**

- Introduction to Wiring Diagrams.
- Electrical wiring components.
- Power measurement.
- Electrical Panel.
- Rough-in system.
- Switches, receptacles, and lighting loads.
- Cable trays and trunking.
- Wiring hazardous locations.

## Pacing Schedule

Contact Hours	Contents	Skills Gained
6	<b>Introduction to Wiring Diagrams</b>	Learning on wiring technique.
	Introduction to different methods of wiring	
	Interpreting of wiring diagram and symbols	
6	<b>Electrical Wiring Components</b>	Wiring electrical components.
	Introducing rough-in system components.	
	Introduction to electrical wiring components such as feeder, panel, branch circuits, circuit breakers, switches, receptacles, and loads.	
10	<b>Power Measurement</b>	Measuring Voltage, Current and Power.
	Kilowatt-hour meter.	
	Voltage and current measurement.	
	Phase sequence measurements	
6	<b>Electrical Panel</b>	Mounting Electrical Panel Board.
	Installing 3-phase electrical feeder and panel.	
	Main circuit breaker, branch circuits, neutral, and ground.	
12	<b>Rough-in System</b>	Inserting cables to the conduit.
	Installing conduit, boxes, and fittings.	
	Inserting phase, neutral, and ground conductors.	
12	<b>Switches, Receptacles and Lighting Loads</b>	Mounting switches, lights and receptacles
	Installing switches and lighting loads.	
	Installing receptacles and split circuit	
18	<b>Cable Trays and Trunking</b>	Learning the cable tray installation
	Selecting and installing cable tray and fittings.	
	Selecting and installing trunking system and fittings.	
18	<b>Hazardous Locations</b>	Wiring hazardous locations
	Hazardous locations classification.	
	Installing hazardous locations electrical components.	

Reference:

Electrical Wiring (ELABO / In house)

Prerequisite —

Level 2

Contact Hours: 88

**Module Description**

This module covers the different types of electrical machines, such as Transformers, AC and DC motors, AC and DC generators, concept of motors and generators, transformer polarity test, transformer ratio and its applications.

**Objectives**

The objective of this module is to:

- Learn the importance and concept of motors, generators and transformers.
- Know the operations and its functions.
- Observe the behavior and characteristics of the different machines during the operations

**Learning Outcomes**

After completing this module the students will be able to:

- Measure and calculate the equivalent resistance from a single resistor to a group of resistors.
- Learn the current and voltage transformation ratio, polarity tests and voltage regulations.
- Know the characteristics of DC and AC generators.
- Differentiate the characteristics of DC and AC motors.

**Contents**

- Series and Parallel Equivalent.
- Power Supply and Safety.
- Transformers.
- DC generator.
- DC motors.
- Alternator.
- AC motors.
- Induction and synchronous motors.
- Capacitor start, Capacitor run & Split-Phase motors.

## Pacing Schedule

Contact Hours	Contents	Skills Gained
12	<b>Series and Parallel Equivalent</b>	Calculating of the equivalent resistor
	Introduction to Basic Electrical Quantities	
	Series and Parallel Equivalent Resistance	
6	<b>Power Supply and Safety</b>	Familiar with the safety and ohm's law
	Safety and the Power Supply	
	Ohm's Law	
12	<b>Transformers</b>	Learning the transformer testing and operation
	Single Phase Transformer	
	Three Phase Transformer	
	Transformer Polarity	
	Transformer in Parallel	
12	<b>D.C Generator</b>	Operation and properties of dc generator
	Operation of D.C. Series, Shunt and Compound Generator	
	Properties of D.C. generator	
6	<b>D.C Motors</b>	Learning on DC motors operations
	Introduction of D.C Motors	
	Types of D.C Motors	
	Applications of DC Motor	
6	<b>Alternator</b>	Learning on synchronizing alternator
	Introduction to alternator	
	Characteristics and the uses of alternator	
	Alternator under Load & its Synchronization	
6	<b>A.C Motors</b>	Operating the different kinds of ac machines
	Introduction to A.C machines	
	Kinds of A.C machines	
12	<b>Induction and Synchronous Motor</b>	Operating the induction and synchronous motor
	Concepts of SCIM and Synchronous motor	
	Operations of Squirrel Cage and synchronous motor	
	Load characteristics of SCIM and synchronous motor	
16	<b>Capacitor start, Capacitor run &amp; Split - Phase Motors</b>	To learn the characteristics of capacitor start, run & split-phase motor
	Starting and operating characteristics of Capacitor start & Capacitor run motor	
	The Split - Phase Induction Motor (Part I, II and III)	

Reference:

Electrical Machines (Lab-Volt)

Prerequisite —

Level 2

Contact Hours: 64

**Module Description**

This module covers safety, electrical code, standard electrical devices, equipment and standard materials to be used in electrical projects, size of conductors, conduits, and circuit breakers, code of grounding and size of grounding cables.

**Objectives**

This module provides:

- The student's information on how to use the correct size of conductor, fuse or circuit breaker, conduit and grounding cable to avoid accident that may it happen during testing and commissioning.

**Learning Outcomes**

After completing this module the students will be able to:

- Apply their skills and knowledge on how to use the prescribed equipment/devices/materials.
- Check the actual size of the conductors and conduits.
- Know the exact rating of fuse or circuit breaker.
- Know the standard distance of switches, outlets and panel boards with respect to the references.
- Know the rules for electrical grounding system.

**Contents**

- Introduction to National Electrical Code.
- Voltage systems.
- Ampacities of conductors.
- General Lighting Load by Occupancies.
- Motor Load and Branch Circuit Calculations.
- Over Current Protection.
- Grounding.
- Electrical boxes.
- Electrical conduit.
- Service entrance equipment
- Lightning Arrester

## Pacing Schedule

Contact Hours	Contents	Skills Gained
6	<b>Introduction to National Electrical Code</b>	Learning essential terms in the NEC
	Definition of terms	
	Ohms law	
6	<b>Voltage Systems</b>	Knowledge of different voltage systems.
	Single phase 2-wire system.	
	Single phase 3-wire system.	
	Three phase Delta system.	
	Three phase Delta system with ground.	
6	<b>Ampacities of conductors</b>	Calculating ampacities of conductors.
	Calculating ampacities of conductors.	
	Ampacities with temperature correcting factor.	
6	<b>General Lighting Load by Occupancies</b>	Calculating lighting loads.
	General lighting load required by NEC.	
	Connected load calculation.	
6	<b>Motor Load and Branch Circuit Calculations</b>	Calculating motors loads.
	Single Phase Motor and Three Phase Motor	
	Synchronous Motor	
	Single motor branch circuit feeder.	
	Multiple motors branch circuit feeder.	
6	<b>Over Current Protection</b>	Sizing overcurrent protection devices.
	Finding the size of Circuit Breaker or Fuse	
	Over Current Protection and Circuit Rating	
	Main Feeder Protection and Calculation	
6	<b>Grounding</b>	Sizing grounding electrode and bonding jumper.
	Rules of electrical grounding.	
	Calculating of proper ground electrode.	
6	<b>Electrical Boxes</b>	Selecting and sizing boxes.
	Selecting the proper type of boxes.	
	Calculating the capacity of electrical boxes.	
6	<b>Electrical Conduit</b>	Selecting and sizing conduit.
	Selecting the proper type of conduit.	
	Calculating the capacity of electrical conduit.	
6	<b>Service Entrance Equipment</b>	Selecting panel and the maximum number of O.C.P.
	Panel board selection.	
	Maximum number of over current protection device.	
4	<b>Lightning Arrester</b>	Learning on Lightning Installation
	Types of lightning arrester	
	Code and Procedures on lightning Arrester Installation	

Reference:

National Electrical Code and Calculations (In house)

Prerequisite **ENGC 102**Level **2**Contact Hours: **24****Module Description**

English Communication 2 is a module for level 2 students of specialization program that builds on English Communication 1 as part of the communicative competence requirement for their diploma. The module is built around a communicative competency-based program that focuses on communication skills and workplace competencies.

**Objectives**

- To consolidate the students' communicative competence achieved at level 1 of the skill program.
- To develop language skills, document literacy, critical thinking and problem solving in workplace situations.
- To develop purposeful use of language in realistic contexts and communicative competence.

**Learning Outcomes**

At the end of the course the students will be able to:

- Check assumptions, express values and understand social systems
- Express wishes and confirming conjectures
- Summarize, bargain and predict things
- Analyze and express values and judgments, negotiate and talk about causes and effects.

**Contents**

- Career Planning and Self-Assessment
- Taxes and Tax Forma
- Rights, Responsibilities and Benefits.
- Performance Reviews
- Health Problems on the Job
- Emergency Procedures
- Scheduling and Budgeting
- Using Computers
- Job Promotions

**Pacing Schedule**

Contact Hours	Contents	Skills Gained
3	Career Planning and Self-Assessment	Checking assumptions, expressing values and analyzing using tag questions and appropriate noun clauses
3	Taxes and Tax forms	Paraphrasing and confirming conjectures using past subjunctive and direct speech
<b>Quiz 1</b>		
3	Rights and Responsibilities	Summarizing, bargaining and predicting using future perfect and future conditional
3	Performance Reviews	Reporting information and complimenting using passive simple future and passive present perfect
<b>Midterm</b>		
3	Health Problems on the Job	Predicting and analyzing using future perfect continuous.
3	Emergency Procedures	Expressing values, requesting information and predicting consequences using present continuous conditional and embedded questions.
<b>Quiz 2</b>		
3	Scheduling and Budgeting	Compromising and negotiating using clauses with 'although' and 'unless'.
3	Using Computers and Job Promotions	Talking about possibility, cause and effect and expressing judgment using causative and past unreal conditional
<b>Final Examination</b>		

Reference: Put English to Work – Level 6 by Sally Gearhart

Prerequisite —

Level 3

Contact Hours: 88

**Module Description**

This module covers the low, medium and high voltage transmission line, high tension single and double busbars, power and distribution transformers, circuit breakers and capacitor bank.

**Objectives**

This module provides:

- Students about the Personal Protective Equipment for safety measures.
- Different types of voltage supply and transformer applications.
- Importance of capacitor bank and circuit breaker.
- Correct procedure on testing transformer insulation resistance.

**Learning Outcomes**

After completing this module the students will be able to:

- Perform their jobs under the maximum safest condition.
- Connect the single phase and three phase transformer of different input and output voltage.
- Operate the large capacity of air circuit breaker.
- Test the transformer in correct procedure.

**Contents**

- Introduction to electrical power distribution.
- Double busbar operation.
- Introduction to short transmission line.
- Introduction to transformer.
- Testing the transformer using TTR instrument
- Introduction to circuit breaker.

## Pacing Schedule

Contact Hours	Contents	Skills Gained
24	<b>Introduction to Electrical Power Distribution</b>	Learning on switching ON/OFF the busbar correctly.
	Definition of terms	
	Introduction to busbar	
	Single busbar with one supply source	
	Single busbar with two supply source	
	Load analysis	
12	<b>Double Busbar Operation</b>	Changing busbar without power interruption
	Busbar change over without supply interruption	
24	<b>Introduction to Transmission Line</b>	Connecting capacitor bank to the transmission line to minimize power losses.
	Voltage regulation in a short transmission line	
	Principles and operations	
	Medium transmission line	
	Voltage regulation in a medium transmission line	
	Introduction to long transmission line	
	Capacitor bank	
	Voltage regulation in a long transmission line	
18	<b>Introduction to Transformer</b>	Testing the insulation resistance and polarity of transformer windings.
	Principle and operation of transformer	
	Single phase transformer	
	Transformer testing insulation resistance	
	Transformer polarity	
	Three phase transformer	
	Step up and step down 3 phase transmission line	
	Testing the transformer using TTR instrument	
10	<b>Introduction to Circuit Breaker</b>	Operating and testing air circuit breaker in correct procedure
	Types of circuit breaker	
	Air circuit breaker	
	Testing of air circuit breaker	

Reference:

Electrical Power Distribution (In house)

Prerequisite —

Level 3

Contact Hours: 88

**Module Description** This module covers the different ways of controlling the AC and DC Motors, type of relays, timers, contactors, protective devices and switches to control the motors, lamp indicator and alarming system.

**Objectives** This module provides:

- Knowledge and Skills to develop and construct the different kinds of control & power circuits, type of AC/DC motors which is being used frequently in electrical field.

**Learning Outcomes** After completing this module the student will be able to:

- Read & understand the circuit diagram with its proper operational sequence.
- Operate the motors efficiently with different controls as required.
- Design and develop circuits for AC/DC motors.
- Understand the characteristics for various controls of motors.

**Contents**

- Control basics, safety & control from different locations.
- Delaying, jogging and reversal control.
- Types of motor starter.
- Cam switch & sequence timer control
- Synchronous motor.

## Pacing Schedule

Contact Hours	Contents	Skills Gained
18	<b>Control Basics, Safety &amp; Control From Different Locations</b>	Identifying the Proper Accessories Symbols and Specifications
	Control definitions and description	
	Graphic symbols and device designation	
	Safety and the Power Supply	
	Continuity tests, Buzzer and lamp	
	Two-Station and Three –Station Control	
30	<b>Delaying, Jogging and Reversal Control</b>	Understanding the Various Controls for AC motors
	Two-Station and Three –Station Control	
	Full Voltage Control of a 3-Ph Squirrel Cage Induction Motor (SCI)	
	Delayed Start of a 3-Ph SCI Motor	
	Start-Stop-Jog of a 3-Ph SCI Motor	
	Definite time-Jogging and Magnetic Brake	
	Forward-Reverse Control for a 3-Ph SCI Motor	
20	<b>Types of Motor Starter</b>	Selecting the type of motor starter as per required
	Primary-Resistor Starting for a 3-Ph SCI Motor	
	Auto Transformer Starting for a 3-Ph SCI Motor	
	Wye-Delta Starting for a 3-Ph SCI Motor	
20	<b>Cam Switch &amp; Sequence Timer Control</b>	Constructing the controls for cranes & hoists
	Starting Method for a 3-Ph Wound Rotor Motor	
	Cam-Switch "Hoist Lower" Control of a DC Motor	
	DC Braking of a 3-Ph SCI Motor	
	Definite Time Starter of a 3-Ph Synchronous Motor	
	Sequence Timer	
	Starting Split Phase, Capacitor-Start Motor	

Reference  
Electrical Motors Control. (Lab - Volt)

Prerequisite —

Level 3

Contact Hours: 64

**Module Description**

This module covers the basic and advanced knowledge in Blue Print reading, identification of various electrical symbols, computation of loads, supply and materials, cost estimate of the project, analyze and interpretation of different types of electrical plan; from Single-Family Dwelling, commercial Buildings and Industrial Plan.

**Objectives**

This module provides:

- The basic skills and advance knowledge in interpreting and further understanding on the importance of electrical plan.
- Develop the skills in Blue Print reading and make them realize the importance in the field.
- Read and understand the symbols and its function.
- Procedures on applying electrical permit.

**Learning Outcomes**

After completing this module the students will be able to:

- Read and interpret the Electrical plan for any type of occupancy (dwelling units and commercial buildings).
- Prepare the industrial plan such as motor circuit design stressing on control and power wiring circuits.
- Identify and estimate the electrical material used for building and Industrial materials.
- Understand and interpret the requirement of an electrical plan in accordance with the National Electrical Code and other existing load ordinances.

**Contents**

- Classification of electrical diagrams.
- Parts of an electrical plan.
- Design and load computation.
- Code requirements.
- Illumination and wiring design.
- Motor Circuits.
- Power distribution diagrams.
- Cost estimate.
- Schedule of loads and computation

### Pacing Schedule

Contact Hours	Contents	Skills Gained
6	<b>Classification of Electrical Diagrams</b>	Learning the types of diagrams.
	Introduction	
	Technical Drawing	
	Elevation, electrical layout, cross-section and details	
	Types of electrical diagrams.	
	Requirements, specifications, site and plan	
	One line and detailed diagram	
	Requirements, specifications, site and plan	
12	<b>Parts of an Electrical Plan</b>	Identifying the different parts of electrical plan
	General notes and Specification, legend and symbols, low voltage diagram, riser diagram, panel schedule, title block, electrical lighting and power layout	
6	<b>Design and Load Computation</b>	Designing load and computation
	Single-Family dwelling and Multi-Family dwelling	
	Commercial Units and Industrial Plant	
	Panel Board, Circuit breaker, outlet, plugs etc.	
6	<b>Code Requirements</b>	Code requirement of service entrance
	Service entrance equipment and conductors layout.	
	Wiring Permit and Conductor Application	
6	<b>Illumination and Wiring Design</b>	Understanding on lighting layout, Instrument & current transformer and circuit breaker
	Electrical Lighting Material	
	Principles of Illumination	
	Instruments, Current Transformer and Circuit Breakers	
6	<b>Motor Circuits</b>	Understanding the symbols and layouts used in Motor control circuits
	Electrical Symbols used in motor control system	
	Electrical control layout symbols	
	Numerical cross referring system	
12	<b>Power Distribution Diagrams</b>	Reading different power distribution diagrams
	Reading residential diagrams.	
	Reading commercial diagrams.	
	Reading industrial diagrams.	
	Utility power distribution diagrams.	
6	<b>Cost Estimate</b>	Learning cost estimation
	Tally sheets, estimate sheet, quotations and price list	
4	<b>Schedule of Loads and Computation</b>	Learning on Load Computation
	Lighting and Power layout	

Reference:

Electrical Blue Print Reading (In house)

Prerequisite —

Level **3**Contact Hours: **24****Module Description**

Technical Report Writing 1, is offered to students to improve their English language proficiency in writing short technical reports which is part of their diploma requirement. The module integrates different methods of report writing with the basic mechanics organized writing.

**Objectives**

- To consolidate and extend the writing skills they have learned in ENGC 203.
- To help technical student write short reports involving technical expression.

**Learning Outcomes**

After completing this module the student will be able to:

- use writing as a means of communication in work environments
- write short reports involving technical expression
- organize information using the mechanics of writing

**Contents**

- Introduction to Technical Report Writing
- Precaution Instructions
- Operational Instructions
- Progress Reports
- Accident Reports
- Industrial Visit Reports

**Pacing Schedule**

Contact Hours	Contents	Skills Gained
3	Introduction to Technical Report Writing	Learning the basics of paragraph writing
3	Precaution Instructions	Sequencing precautionary instructions following the rules of writing
<b>Quiz 1</b>		
4	Operational Instructions	Writing operational instructions using the imperative form of verb
<b>Midterm</b>		
5	Progress Reports	Ability to write reports on jobs completed and not completed using present perfect and past simple verb forms
<b>Quiz 2</b>		
5	Accident Reports	Writing short reports on causes and consequences of accidents using past tense verb forms
4	Industrial Visit Reports	Reporting industrial visit experiences using past tense verb forms
<b>Final Examination</b>		

Reference: Technical Report Writing 1 (In-house made)

**Module Description** This module covers the different technique of motor winding for Single-Phase, Three-Phase and DC Motor. It also includes the different connection of field poles to vary the speed of the motors.

**Objectives** This module provides:  
The concepts of Single-Phase and 3-Phase motor winding.  
The different types of motor, its connection, installation, operation and maintenance.  
The students on how to study and develop the skills of DC motor rewinding particularly in armature and Field Poles.

**Learning Outcomes** At the end of this module, the students should be able to:  
Acquire the skills of winding and rewinding a Single-Phase and a Three-Phase Motor.  
Differentiate the AC Machine from a DC Machine.  
Know the safety procedures to be followed in winding and rewinding the different kinds of motor.

**Contents** Safety at work.  
Introduction to capacitor-start motor.  
Introduction to split-phase motor.  
Introduction to motor winding.  
Terminal markings for single phase motors.  
Capacitor-start motor winding.  
Three-phase induction motor winding.  
Introduction to DC motor.  
Field Poles winding.  
Armature winding.

Prerequisite —

Level 4

Contact Hours: 88

**Pacing Schedule**

Contact Hours	Contents	Skills Gained
4	<b>Safety at Work</b>	Learning on working safely
	Safety awareness at work	
6	<b>Introduction to Capacitor-Start Motor</b>	Get familiar with the parts of Capacitor-Start Motor
	Main parts of Capacitor Motor	
	Operation of Capacitor Motor	
6	<b>Introduction to Split-Phase Motor</b>	Gain Ideas about Split-Phase Motor
	Construction and Operation	
6	<b>Introduction to Motor Winding</b>	Understand the techniques involved in winding a motor
	Name plate reading and taking data	
	Winding Procedure	
	Sizing of magnet wires	
6	<b>Terminal Markings for Single Phase Motors</b>	Marking terminals of a Single-phase motor
	Dual Voltage	
	Single Voltage	
12	<b>Capacitor-start Motor Winding</b>	Learning on winding a Capacitor-start motor
	Taking data	
	Circuit connections and Winding Techniques	
12	<b>Three-Phase Induction Motor Winding</b>	Learning on winding a 3-Phase Induction motor
	Construction and Operation	
	Taking data	
	Circuit connections and Winding Techniques	
	Three-Phase Induction Motor Assembly	
12	<b>Introduction to DC Motor</b>	Learning on the construction and connections of DC Motor
	Types of DC Motor	
	Construction and Operation	
	Wire Sizing	
12	<b>Field Poles Winding</b>	Learning on winding and connecting the Field Poles
	DC Series and Shunt Motor winding	
	DC Compound motor	
	Magnetic Field Poles connection	
12	<b>Armature Winding</b>	Learning the techniques in winding the Armature
	Techniques in winding the armature and motor assembly	

Reference:  
Motors winding (In house)

**Module Description** This module covers the principles and actual operations of different electrical devices, installation of equipment, findings, and solution to the problems, analysis and evaluation of the information data.

**Objectives** This module provides:

- The principles and operations on different electrical devices.
- The correct procedure on how to install the equipment.
- The solution to the problems.
- The analysis and evaluation to the causes and effects of problems

**Learning Outcomes** After completing this module the students may be able to:

- Evaluate the actual operation.
- Trace problems.
- Find the solution easily and fix problems.

**Contents**

- Introduction to electrical devices and symbols.
- Troubleshooting for AC and DC motors.
- Tracing motor controls.
- Direct current controllers.
- Motor windings and ground Test.
- Battery testing.
- Testing cables.
- Testing protective relays.

Prerequisite —

Level 4

Contact Hours: 88

**Pacing Schedule**

Contact Hours	Contents	Skills Gained
6	<b>Introduction to Electrical devices and symbols</b>	Identifying devices and reading wiring diagrams
	Operation and functions of switches, pilot devices, relays, and timers	
	Reading, analyzing and understanding schematic diagram	
12	<b>Troubleshooting AC and DC Motors</b>	Troubleshooting the different type of motors
	Single Phase and Three Phase Motor	
	Parts of AC motor, function operation and troubleshooting	
	DC Motors (Series, Shunt and Compound) Parts of DC motor, function, operation and troubleshooting	
12	<b>Tracing Motor Controls</b>	Tracing the motor control circuits
	Variable Frequency Drive	
	Sequential Control Circuit Multi Speed Control Circuit	
12	Direct Current Controllers	Learning on reducing starting current
	<b>Four Point Starter</b>	
	Field Rheostat	
	Methods of Braking	
	Jogging Anti-plugging	
6	<b>Motor Windings and Ground Test</b>	Testing motor windings and insulation
	Single Phase (Capacitor start and run motor)	
	Three Phase (Induction and Synchronous Motor) DC Motor(Series, Shunt and Compound)	
12	<b>Battery Testing</b>	Learning on testing batteries
	Set up of battery testing equipment Battery testing and data Analysis.	
12	<b>Testing cables</b>	Learning on testing and tracing cables
	Tracing cable location. Tracing a fault in a cable.	
16	<b>Testing Protective Relays</b>	Learning on testing protective relays
	LM 10 Motor Protection Relay	
	239 Motor Protection Relay 269 Motor Protection Relay	

Reference:  
Electrical Installation and Troubleshooting (In house)

**Module Description**

This module covers safety practices, the actual wiring and installation of different power and control circuits, familiarization with disassembling and assembling of AC and DC motors, and interfacing of PLC with external components.

**Objectives**

This module provides:

- Student skills and knowledge by means of wiring practice such as wiring the control and power circuit, testing and commissioning the circuit.
- Complete information on electrical devices and its function.
- Preventive and corrective maintenance.

**Learning Outcomes**

After completing this module the students will be able to:

- Perform his duty as a competent and certified electrician in different reputable companies.

**Contents**

- Electrical Safety.
- Direct on line and forward/reverse control starter.
- Wye-Delat starter.
- Timer controlled starter.
- Dissectible machine.
- Motor control center.
- PLC interfacing.
- Hazardous Locations.

Prerequisite —

Level 4

Contact Hours: 64

**Pacing Schedule**

Contact Hours	Contents	Skills Gained
6	<b>Safety</b>	Safety practices
	Safety awareness in the workshop and the field.	
	What is the importance of PPE?	
6	<b>Direct on line and Forward/Reverse Control Starter</b>	Learning on connecting forward and reverse control circuit
	Understanding wiring layout.	
	Differentiate between power and control circuits.	
	Selecting components of circuit.	
	Wiring forward/reverse control circuit.	
6	<b>Wye-Delta Starter</b>	Learning on connecting wye-delta control circuit
	Understanding wiring layout.	
	Selecting components of circuit.	
	Wiring Wye-Delta control circuit.	
6	<b>Timer Controlled Starter</b>	Learning on using timer to control the circuit
	Understanding wiring layout.	
	Selecting components of circuit.	
	Wiring timer controlled circuit.	
12	<b>Dissectible Machine</b>	Learning on disassemble and assemble the different types of motors
	Disassemble/Assemble and test of DC motor.	
	Disassemble/Assemble and test of capacitor start motor.	
	Disassemble/Assemble and test 3-phase induction motor	
12	<b>Motor Control Center</b>	Get familiar with motor control center
	Familiarization of motor control center components and their functions.	
	Understanding wiring layout.	
	Connecting the motor control center circuit components.	
12	<b>PLC Interfacing</b>	Learning on interfacing PLC to external components
	Introduction to PLC	
	Familiarization with the input and output terminals.	
	Understanding control circuit layout.	
	Connecting the PLC controlled circuit components.	
4	<b>Hazardous Locations</b>	Learning on electrical safety installation
	Installation of Distribution Panel and starter for hazardous locations	

Reference:  
Electrical Skills Practice II (In house)

**Module Description** Technical Report Writing 2, is offered to students to enhance and build on their proficiency in writing short technical reports which they learnt at level 3. The module integrates less- controlled methods of report writing with practicing the skill of filling out various forms required at workplace.

- Objectives**
- To consolidate and extend the report writing skills they have learned in TRWT 304.
  - To help technical student write resumes, more work related reports, and fill out forms involving technical and general vocabulary.

- Learning Outcomes** After completing this module the student will be able to:
- use writing as a means of communication in work environments
  - fill out forms and write short reports involving technical expression
  - write resumes and work related reports

- Contents**
- Making Descriptive Requisitions
  - Curriculum Vitae
  - Letter Writing
  - Cooperative Training Report
  - Filling out Requisition Forms
  - Filling Work -Related and General Forms

### Pacing Schedule

Contact Hours	Contents	Skills Gained
4	Making Descriptive Requisitions	Making official requests in writing for materials needed at work.
3	Curriculum Vitae	Writing CV's in response to job ads
<b>Quiz 1</b>		
4	Letter Writing	Writing formal cover letters for different jobs
<b>Midterm</b>		
4	Cooperative Training Report	Writing relevant reports on cooperative training to department heads
<b>Quiz 2</b>		
5	Filling out Requisition Forms	Ability to make different requisitions by filling out specific forms
4	Filling out Work-related and General Forms	Ability to fill out different forms - an ability required in real life situations
<b>Final Examination</b>		

Reference: Technical Report Writing 2 (In-house made)