CURRICULUM

Pre-diploma in Electrical Engineering

(Apprenticeship Model)



Council for Technical Education and Vocational Training

Curriculum Development and Equivalence Division

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Introduction

This curricular program is designed to prepare the middle-level competent Electrical Engineering Technicians as **Assistant Sub-engineers**. The graduates will be equipped with the required knowledge, skills and attitude necessary to this level to meet the demand of the Electrical Engineering Industry in the country and abroad

The implementation modality of this curriculum is the apprenticeship model. UNESCO-UNEVOC defines apprenticeship as a 'unique form of vocational education, combing on-the-job learning and school-based training, for specially defined tasks and work processes. It is regulated by law and based on written employment contract with a compensatory payment, and standard social protection scheme. A formal assessment and a recognized certification come at the end of a clearly identified duration.'

The program extends over 24 months. The first fifteen weeks of institute-based classes that insist on theoretical and basic practical skills will be provided in the institution. It involves an instructional mode of delivery for technology-based education and training in which learning takes place in two venues: the technical school or training institute and the company or industry. Here, the term "industry" is not a single area, it is meant generally to include all the sectors of the economy in our community, which range from manufacturing firms, service shops, business establishments, and government agencies to non-government organizations (NGOs). There will have a tripartite training agreement between apprentices, sponsoring industries and training institutions for implementing this curricular program.

Rationale

The rationale behind designing this curricular program is to acquire competencies by an apprentice through his/her engagement in hands-on practices and the real world of work experiences as he/she gets an opportunity to get exposed to electrical engineering-based industries where they can learn about modern-day tools, machines and processes which gives them the insight and attitudes to combine creativity, knowledge and tools to complete the difficult task of shaping an idea into reality.
This curricular program will be implemented and operated as based on the ***Apprenticeship Training Operation Working Procedures, 2075 B.S.***

Curriculum Title

The title of this curricular program is Pre-diploma in Electrical Engineering (Apprenticeship Model).

Program Aim

The program aims to prepare middle-level competent Electrical Engineering Technicians as Assistant Sub-engineers who can serve at related government offices, electrical workshops, industries or firms in Nepal and abroad.

Program Objectives

The objectives of the program are to produce a mid-level workforce, who will be able to:

1. Prepare industry ready through institute-based education and industry-based training.
2. Perform basic Electrical works carried out in Electrical workshops.
3. Interpret engineering drawing and computerized drawing.

4. Perform sheet metal fabrications.
5. Operate lathe, milling and welding machines and their accessories.
6. Repair and maintain basic types of Electrical, Hydraulic and Pneumatic devices.
7. Perform simple calculations related to Electrical works.
8. Prepare business plan for establishing small Electrical work-related production and service industries.
9. Create self-employment opportunities through linking skills, knowledge and attitudes to related Electrical works.

Duration

This course will be completed within 24 months after the enrollment in a formal setting. The detailing of course duration is depicted below.

A. Institute Based Training Phase:	**1280 Hours**
• Pre-Training Phase:	15 weeks (600 Hours)
• One day/week for 78 weeks (78 days/13 weeks):	13 weeks (520 Hours)
• Block Release Phase:	4 weeks (160 Hours)
B. Industry Based Training (Hands on Practice) Phase:	**2600 Hours**
65 Academic Weeks (78-13:	**65 Weeks (2600** Hours)
• Handling and maintenance of machinery used in Processing industry	16 Weeks (638 Hours)
• Electrical Installation	30 weeks (1200 Hours)
• Repair Maintenance of Electrical Appliances & Machine	20 Weeks (800 Hours)
• Electrical Motor Installation	15 Weeks (600 Hours)

Entry Criteria

Individuals with following criteria will be eligible for this program:

- SLC/SEE appeared.
- Above 16 years of age.
- Pass entrance examination administered by CTEVT/as decided by the Office of the Controller of Examination, CTEVT.
- Mentally and Physically fit for the occupation.
- Pass the interview conducted jointly by industry and the training institute.

Candidates will be recruited on the merit base of entrance examination.

Group Size

The group size of this program will be 40 (forty) in a batch.

Medium of Instruction

The medium of instruction will be in English and/or Nepali language.

Pattern of Attendance

The apprentices should have 80% attendance in theory classes and 90% in practical performance/industrial practice to be eligible for internal assessments and final examinations.

Qualification of Instructional Staff

- Instructors should have Bachelor Degree in Electrical Engineering
- Assistant Instructors should have Diploma in Electrical Engineering

- Practical Assistant/Teaching Aide should have Pre-diploma in Electrical Engineering with 3 years' experience
- Good communication and instructional skills
- Experience in the related field

Teacher and Apprentice Ratio

- Overall ratio of teacher and student must be 1:10 (at the institution level)
- Teacher and apprentice ratio for theory class should be as per nature of classroom
- Teacher and apprentice ratio for practical should be 1:10
- Minimum 75% of the teachers must be full time

Instructional Media and Materials

The following instructional media and materials are suggested for the effective instruction, demonstration and practical.

- Printed Media Materials (Assignment sheets, Handouts, Information sheets, Individual training packets, Procedure sheets, Performance Check lists, Textbooks etc.).
- Non-projected Media Materials (Display, Photographs, Flip chart, Poster, Writing board etc.).
- Projected Media Materials (Multimedia, etc.).
- Computer-Based Instructional Materials (Computer-based training, Interactive video etc.)
- Web-Based Instructional Materials (Online learning)
- Radio/Television/Telephone
- Education-focused social media platforms

Teaching Learning Methodologies

The methods of teachings for this curricular program will be a combination of several approaches such as.

- Theory: Illustrated lecture Discussion, Seminar, Interaction, Assignment and Group work.
- Practical: Demonstration, Observation, Guided practice, Self-practice and Project work.
- Industrial practice: Work place-based learning at the building construction companies or industries under the supervision of industrial supervisor.

Approaches of learning

There will be inductive, deductive and learner-centered approaches of learning.

Examinations and Marking Scheme

- The subject teacher will internally assess learning achievements of apprentices in each subject during the instructions, followed by a final examination at the end of curricular program.
- Continuous assessment will be adopted for institute based practical components.
- The marking weightage of industrial practice will be limited to practical only for the all subjects that they are offered in industrial practice. Moreover, proportions of internal assessment and final examinations are as follows:

S.N.	Nature	Internal Assessment	Final Exam	Pass %

1	Theory	50%	50%	40%
2	Practical	50%	50%	60%
3	Industrial Practice	50%	50%	60%

- There will be three internal assessments, those to be administered by the institute, and one final examination in each subject at the end of the program. Moreover, modes of internal assessment and final examinations include both theory and practical or as per the nature of instruction as mentioned in the curriculum structure.
- Continuous assessment will be adopted for institute based practical components.
- Each student must pass every internal assessment to appear the final examinations.
- Continuous evaluation of the students' performance is to be done by the related In-company Trainer/ Industrial Supervisor/Internal Guide to ensure the proficiency over each competency under each area of a subject specified in the curriculum.
- Performance evaluation of industrial practice should be done by the related In-company Trainer/Industrial Supervisor/Internal Guide. In addition, on the basis of continuous assessments (at the interval of three months' plan and program) an aggregate mark of each subject will be calculated for determining internal assessment marks of industrial practice.
- Logbook, an official document is used to record information on learning experienced by the learners attained during industrial practice or training. Both of the In-company Trainer/Industrial Supervisor/ Internal Guide and the apprentice are required to sign in the logbook as a skill or a task is confirmed and performed. In addition, the maintained logbook will be baselines for both formative and summative aspects of evaluation.

Provision of Back Paper

There will be the provision of back paper, but the apprentice must pass all the subjects within three years from the enrollment date; however, there should be a provision of chance exam for the apprentices as per CTEVT rules.

Marking System

The Marking system will be as follows:

Grading	**Overall marks**
Distinction:	80% and above
First division:	75% to below 80%
Second division:	65 % to below 75%
Pass division:	Pass marks to below 65%

Disciplinary and Ethical Requirements

- Intoxication, insubordination or rudeness to peers will result in immediate suspension followed by review by the disciplinary review committee of the institute.
- Dishonesty in academic or practice activities will result in immediate suspension followed by administrative review, with possible expulsion.
- Illicit drug use, bearing arms at the institute, threats or assaults to peers, faculty or staff will result in immediate suspension, followed by administrative review with possible expulsion.

Certificate Requirements

The Council for Technical Education and Vocational Training will award certificate of "Pre-diploma in Tea Technology (Apprenticeship Model)" to those apprentices who successfully complete the requirements as prescribed by the curriculum.

Career Path

The graduates will be eligible to work as "Tea Technician" in the government related organizations as prescribed by the Public Service Commission or the concerned authorities of Federal Democratic Republic of Nepal and other private industries.

General Attitudes Required

An apprentice should demonstrate the following general attitudes for effective and active learning.

Acceptance, Affectionate, Ambitious, Aspiring, Candid, Caring, Change, Cheerful, Considerate, Cooperative, Courageous, Decisive, Determined, Devoted, Embraces, Endurance, Enthusiastic, Expansive, Faith, Flexible, Gloomy, Motivated, Perseverance, Thoughtful, Forgiving, Freedom, Friendly, Focused, Frugal, Generous, Goodwill, Grateful, Hardworking, Honest, Humble, Interested, Involved, Not jealous, Kind, Mature, Open minded, Tolerant, Optimistic, Positive, Practical, Punctual, Realistic, Reliable, Distant, Responsibility, Responsive, Responsible, Self-confident, Self-directed, Self-disciplined, Self-esteem, Self-giving, Self-reliant, Selfless, Sensitive, Serious, Sincere, Social independence, Sympathetic, Accepts others points of view, Thoughtful towards others, Trusting, Unpretentiousness, Unselfish, Willingness, Work-oriented.

Curriculum Structure of Pre-Diploma in Electrical Engineering (Apprenticeship Model)

S. N	Subjects	Nature	Hours/ Week			Total Hours		
			T	P	Total	T	P	Total
A.	**Institute Based Training (3.5 Months/90 Working Days or 1 to 15 Weeks) for 15 Academic Weeks @40 Hours/Week**							
1.	Applied Communication and Professionalism	T+P			5	37	38	75
2.	Applied Mathematics	T			3	45	0	45
3.	Bench Work	P			3	0	45	45
4.	Engineering Drawing	P			3	0	45	45
5.	Computer Application	P			1	0	15	15
6.	Electro Technology	T			4	60	0	60
7.	Basic Electronics	T+P			3	15	30	45
8.	Electrical Installation	P			6	10	80	90
9.	Repair and Maintenance of Electrical Appliances and Machine	P			7	14	91	105
10.	Electrical Motor Installation and Control	P			5	11	64	75
	Total of A				**40**	**157**	**403**	**600**
B.	**Institute Based Training @ 1 Day Per Week for 78 Weeks (16 to 93 Weeks)/78 Days/13 Academic Weeks @ 40 Hours/Week**							
1.	Applied Mathematics	T			2	26	0	26
2.	Bench Work	P			2	0	26	26
3.	Engineering Drawing	P			3	0	39	39
4.	Computer Application	P			2	3	23	26
5.	Electro Technology	T			4	52	0	52
6.	Basic Electronics	T+P			4	9	43	52
7.	Electrical Installation	P			8	14	90	104
8.	Repair Maintenance of Electrical Appliances and Machines	P			4	4	48	52
9.	Electrical Motor Installation Control	P			5	12	53	65
10.	Entrepreneurship Development	T+P			6	30	48	78
	Total of B				40	121	399	520

C.	**Industrial Practices @ 5 Days Per Week for 78 Weeks (16 to 93 Weeks)/ (78 -13 Weeks)/ 65 Academic Weeks @ 40 Hours/Week**					
1.	Electrical Installation	P	30 (Weeks)	1200		1200
2.	Repair Maintenance of Electrical Appliances and Machines	P	20 (Weeks)	800		800
3.	Electrical Motor Installation	P	15 (Weeks)	600		600
	Total of C		**(65 weeks)**	**2600**		**2600**
D.	**Block Release for 4 Academic Weeks (94 to 97 Weeks) @40 Hours/Week**	**T+P**	**(4 weeks)**	**80**	**80**	**160**
	Grand Total (A+B+C+D)		**(97 weeks)**	**427**	**3453**	**3880**
E.	**Exam Preparation and Final Exam (98 to 104 Weeks)/7 Weeks**					

Important: Industrial practices (C) phase of learning/training can be extended to 40 Hours X 78 Weeks (5 Working Days/Week) = 3120 Hours on the request of sponsoring industry at the time of Tripartite Agreement if the age of an apprentice is above 18 years.

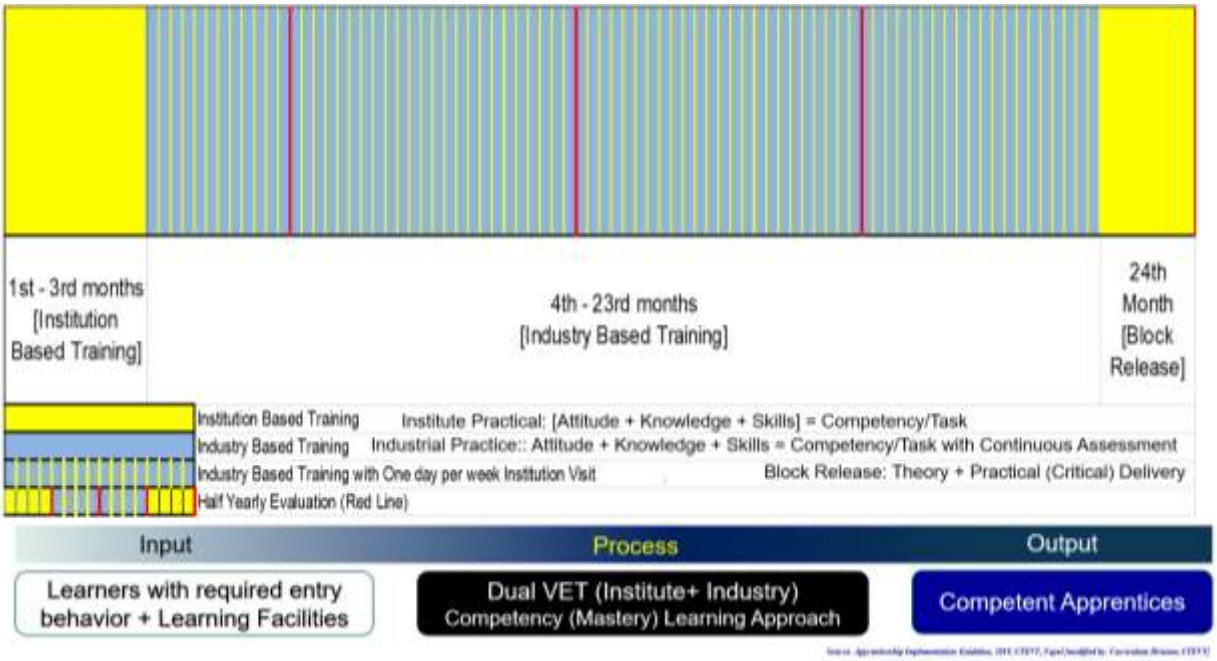
Pre-Diploma in Electrical Engineering (Apprenticeship Model)

Evaluation Scheme

S. N.	Subjects	Nature	Total Hours			Full Marks		
			T	P	Total	T	P	Total
A+B	**Institute Based Training (15 Weeks Plus 13 Weeks) for 28 Academic Weeks @40 Hours/Week**							
1.	Applied Communication and Professionalism	T+P	37	38	75	25	25	50
2.	Applied Mathematics	T+P	71	-	71	50	-	50
3.	Bench Work	P	-	84	84	-	50	50
4.	Engineering Drawing	P	-	84	84	-	50	50
5.	Computer Application	p	-	41	41		25	25
6.	Electro Technology	T	112	-	112	-	50	50
7.	Basic Electronics	T+P	28	69	97	37.5	37.5	75
8.	Electrical Installation	P	-	194	194		100	100
9.	Repair and Maintenance of Electrical Appliances and Machine	p	-	157	157		100	100
10.	Electrical Motor Installation Control	P	-	140	140		100	100
11.	Entrepreneurship Development	T+P	30	48	78	25	25	50
	Total (A+B)		**278**	**855**	**1133**	**137.5**	**562.5**	**700**
C.	**Industry Practice (93 Weeks Minus 28 Weeks) for 65 Academic Weeks @40 Hours/Week**							
1.	Electrical Installation	P		1200	1200		600	600
2.	Repair Maintenance of Electrical	P		800	800		400	400
3.	Electrical Motor Installation	P		600	600		300	300
	Total (C)			**2600**	**2600**		**1300**	**1300**
D.	**Block Release for 4 Academic Weeks @ 40 Hours/Week**	**T+P**	80	80	160			
	Grand Total (A+B+C+D)		**358**	**3535**	**3893**	**195**	**2230**	**2425**

Important: An academic week indicates six working days per week.

Conceptual Framework of Apprenticeship Model



Applied Communication and Professionalism

Total: 75 hours
Theory: 37 hours
Practical: 38 hours

Course Description:
This course is designed for the development of communication skills in Nepali and English languages, intending to enhance professional skills of apprentices at work places. The communication skills are incorporated here with the perspectives of applying in speaking and writing for to-be professional apprentices or technicians so that they can exhibit such skills while working in national and international labor market work places. This course includes speaking and writing skills, self-motivation, positive attitudes, decision-making skill, creativity skill, stress and time management knowledge, team work and leadership skills.
Course Objectives:
After completion of this course, apprentices will be able to:

1. Apply speaking and writing skills of communication skills on day-to-day organizational activities;
2. Write different types of letters, job applications, simple reports and memos in English and Nepali medium;
3. Bring into operation the decision-making & creative activities through acquiring self-motivation and positive thinking;
4. Apply time and stress management skills; and
5. Follow decision-making process, team building and leadership for effective organizational functioning.

Section A: Institute Based Training (15 Academic Weeks)

Units	Topics	Contents	Time (Hrs.)
1	Communicative functions/ Conversation skills		8 Hrs.
		1.1 Everyday functions: 1.1.1 Greetings, 1.1.2 Welcoming, 1.1.3 Introductions, 1.1.4 Thanking, 1.1.5 Excuses/apologizing/forgiving	2
		1.2 Everyday Activities: 1.2.1 Asking about activity 1.2.2 Asking about trouble/problems/conditions 1.2.3 Asking about health status 1.2.4 Telling not to interrupt/disturb	2
		1.3 Requests and offers 1.3.1 Making requests 1.3.2 Offers: Offering, Accepting, Declining 1.3.3 Excuses: Asking to be excused, Excusing 1.3.4 Permission: Asking for permission, Giving permission	2
		1.4 Expressing 1.4.1 Likes/dislikes 1.4.2 Hopes/wishes	2

Units	Topics	Contents	Time (Hrs.)
		1.4.3 Advice/suggestions/recommendations 1.4.4 Prohibitions	
2	Comprehension and Writing skills		10 Hrs.
		2.1 Comprehension passages	2
		2.2 Technical Terms	1
		2.3 Writing Paragraphs	1
		2.4 Writing letters 2.4.1 Resume/bio-data 2.4.2 Applications letters 2.4.3 Business letters	2
		2.5 Writing work reports	2
		2.6 Writing Instructions	1
		2.7 Writing dialogues	1
#	नेपाली संचार		८ घन्टा
		३.१ प्राविधिक शब्दहरु	१ घन्टा
		३.२ बोध अभिव्यक्ति	१ घन्टा
		३.३ अनुच्छेद लेखन	१ घन्टा
		३.४ पत्रलेखनः	१ घन्टा
		क. व्यापारिक पत्र	१ घन्टा
		ख. निवेदनपत्र	१ घन्टा
		ग. व्यक्तिगत विवरण (बायोडाटा) लेखन	१ घन्टा
4	Motivation, Attitudes, Decision-Making & Creativity		5 Hrs.
		4.1 Motivation: 4.1.1 Self-motivation 4.1.2 Features of self-motivation • Honesty, • Enthusiasm, • Dedication • Productiveness	2
		4.2 Attitudes: 4.2.1 Positive and Negative attitudes 4.2.2 Factors affecting attitudes 4.2.3 Positive attitude and advantages 4.2.4 Negative attitude & disadvantages	1
		4.3 Decision-Making to solve problem: 4.3.1 Decision-making and problem-solving; 4.3.2 Steps of problem-solving; 4.3.3 Steps of decision-making process.	1
		4.4 Creativity 4.4.1 Meaning 4.4.2 Purpose 4.4.3 Technique to improve creative thinking skills.	1
5	Stress and Time Management		3 Hrs.
		5.1 Stress Management	2

Units	Topics	Contents	Time (Hrs.)
		5.1.1 Definition of stress 5.1.2 Causes and consequences of stress 5.1.3 Stress management techniques	
		5.2 Time Management 5.2.1 Meaning 5.2.2 Time wasters 5.2.3 Effective time management strategy	1
6	Team works and Leadership		3 Hrs.
		6.1 Team Work 6.1.1 Definition 6.1.2 Purpose 6.1.3 Characteristic of champion team 6.1.4 Interpersonal relationship	1.5
		6.2 Leadership Skills 6.2.1 Leadership Power 6.2.2 Leadership Styles 6.2.3 Public Speaking and Presentation	1.5
	Total Theory		37 Hrs.

Practical

Units	Task	Hours
1	1.1 Compose a dialogue introducing a new friend in the class. 1.2 Compose a dialogue ting new friend in the class. 1.3 Make a request to the teacher for checking your practical work. 1.4 Compose a dialogue offering drinks to the (supposed) guests.	8
2	2.1 Prepare your own resume/bio-data. 2.2 Write a job application. 2.3 Write a letter to the Business Company or industry for the delivery of goods. 2.4 Write a report of a complete task you performed.	8
३	३.१. नेपाली निवेदन लेख्नुहोस् । ३.२. आफुनो अभ्यास कार्यलाई आवश्यक पर्ने सामान अर्डर गरी सम्बन्धितउद्योगलाई एक पत्र लेख्नुहोस् । ३.३. आफुनो व्यक्तिगतविवरण तयार पार्नुहोस्। ३.४. वर्तमान सन्दर्भमा सूचनाप्रविधिको आवश्यकताविषयमा २५० शब्दमा एक निबन्द लेख्नुहोस । ३.५. आफूले एक दिन गरेको अभ्यासका आधारमा कार्य प्रतिवेदन लेख्नुहोस । ३.६. बैंक भौचरको नमूना तयार पार्नुहोस् ।	६
4	4.1 Demonstrate and show the self-motivate people's behaviors in classroom. 4.2 Demonstrate and show the positive and negative attitudes peoples behave in classroom. 4.3 Take decision using decision-making process on given problems by class teacher. 4.4 Perform the creativity skill on classroom on the given situation.	8
5	5.1 Apply the stress management techniques in classroom. 5.2 Apply the time management techniques in classroom.	4

Units	Task	Hours
6	6.1 Perform the team building practices and team work activities in classroom. 6.2 Perform public speaking, applying presentation skills on given topic in classroom.	4
	Total practical	38 Hrs.

References Books:

1. GRANT TAYLOR, English conversation practice.
2. R C Poudel, A manual to Communicative English, K P Pustak Bhandar , Dillibazaar, Kathmandu.
3. लालानाथ सुवेदी, इन्जिनियरिङ्ग नेपाली
4. Surya Sinha (2017). Complete Personality Development Course (Hindi Edition).
5. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.
6. Lucas, Stephen (2001). Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill.

Applied Mathematics

Total: 71 hrs
Theory: 71 hrs
Practical: 0 hrs

Course Description:
This course provides skill and knowledge to solve the numerical problems related to Pre-Diploma in Electrical Engineering course. It allows apprentices to calculate and analyze their practical data using applied mathematics.

Course Objectives:
After completion of this course, apprentice will be able to:

1. Calculate and convert units.
2. Interpret graphical representation.
3. Calculate electrical parameters.
4. Apply and calculate different laws related to electrical fields.
5. Apply fundamental of AC circuit's calculation.
6. Apply the different types of electrical machines' related calculation.

Section A: Institute Based Training (15 Academic Weeks) 45 hours @ hours per week
Module I: Basic Mathematics and Electrical Laws

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Calculate Workshop**:** ▪ Length ▪ Area ▪ Volume ▪ Trigonometry ▪ Conversion units	**Units and measurement** ▪ Introduction ▪ SI units ▪ Pythagoras theorem ▪ Temperature ▪ Formulae	6		6
2.	▪ Calculate work, power and energy ▪ Calculate cost per unit.	**Work, power and energy** ▪ Introduction ▪ Joule's law of electric heating ▪ SI units ▪ Unitary method ▪ Formulae	3		3
3.	Calculate: ▪ scalar and vector quantity	**Scalar and vector quantity** ▪ Introduction ▪ Speed ▪ Velocity ▪ Acceleration ▪ Formulae	3		3
4.	Calculate: ▪ Resistance	**Fundamental of Electricity** ▪ Law of resistance	8		8

	▪ Voltage ▪ Current ▪ Power	▪ Ohm's law ▪ Kirchhoff's law ▪ Resistivity ▪ Resistance in series and parallel circuit ▪ Formulae			
5.	Calculate : ▪ Capacitance ▪ Charge and potential difference ▪ Energy store	**Capacitance** ▪ Coulomb's law ▪ Charging and discharging ▪ series/parallel capacitive circuit ▪ Formulae	4		4
6.	Calculate: ▪ Cycle ▪ Time period ▪ Frequency ▪ Average value ▪ Effective value/RMS	**A.C Fundamental** ▪ Introduction ▪ Formulae	6		6
7.	Calculate: ▪ resistance/capacitance/ inductance ▪ R-L, R-C and R-L-C Series circuit ▪ Impedance ▪ Power factor ▪ Phase angle ▪ Active/reactive and apparent power	**A.C. circuit** ▪ Introduction ▪ Pure ▪ resistive/capacitive/inductive circuit ▪ Effect of power factor (low/high) ▪ Series circuit ▪ Formulae	9		9
8.	Calculate : ▪ Power ▪ Current ▪ Voltage	**Poly-phase circuit** ▪ Introduction ▪ Work, power, energy in delta/star connection	6		6
		Total	**45**		**45**

Section B: Institute Based Training (13 weeks @1 day per week) 26 hours@ 2 hours per week

Module II: Applied Mathematics in Electrical Engineering

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1. 1	**Calculate:** ▪ Input/output voltage ▪ No. of turns in primary/secondary ▪ Transformation ratio ▪ Emf calculation	**Transformer** ▪ Introduction ▪ emf equation ▪ Transformation ratio ▪ Formulae	6		6
2. 2	**Calculate:** ▪ Generator emf and terminal voltage ▪ Armature current and field current	**DC generator** ▪ Introduction ▪ emf equation ▪ Formulae	4		4
	Calculate: ▪ Phase and line voltage ▪ Voltage regulation	**Synchronous generator** ▪ Introduction ▪ Formulae	4		4
3.	**Calculate:** ▪ Synchronous speed ▪ Back emf ▪ Mechanical power	**Synchronous motor** ▪ Introduction ▪ Formulae	4		4
4. 4	**Calculate:** ▪ Synchronous speed ▪ Back emf ▪ Slip, Normal speed	**Induction motor** ▪ Introduction ▪ Working principle ▪ Formulae	4		4
5. 5	**Calculate Tariff** ▪ Domestic ▪ Commercial	**Tariff** ▪ Introduction ▪ Ratio and proportion ▪ Percentage ▪ Formulae	4		4
		Total	26		26

Reference :

- Electrical Technology- B.L. Thereja
- Basic Electrical Engineering – M. L. Anwani
- Basic Electrical Enginneering Vol. 1 & 2 – P.S. Dhogal
- आधारभूत विधुतीय ज्ञान - संजिप भट्टराई
- Practical Basic and Advance Electricals – Bhedhu lal Biswas

Bench Work

Total: 71 hrs.
Theory: 0 hrs.
Practical: 71 hrs.

Course Description:
This subject provides skill and knowledge to perform basic mechanical work which consists of filing, measuring, marking, sawing, punching, drilling, tapping, cutting, folding, riveting, bending etc.

Course Objectives:
After completion of this course, apprentices will be able to:

1. Identify hazards
2. Apply safety rules
3. Use and care mechanical tools, instrument and machines
4. Perform basic operation related to mechanical work, such as:
   measure, mark, cut. bend, file, drill, rivet according to the specification.
5. Perform sheet metal works

Section A: Institute Based Training (15 Academic Weeks)

S.N	Tasks Statement	Related Technical Knowledge	Time Hours		
			Th.	Pr.	Total
1	Perform filing	**Filing** ▪ Introduction ▪ Types ▪ Tools/materials ▪ Importance & Applications ▪ Process ▪ Safety precautions ▪ Demonstration of filing ▪ Exercises on filing	2	23	25
2	Perform measuring & marking	**Measuring & marking** ▪ Introduction ▪ Types ▪ Tools/materials ▪ Importance & Applications ▪ Process ▪ Safety precautions ▪ Demonstration of measuring & marking	2	2	4

		▪ Exercises on measuring & marking			
3	Perform the punching	**Letter/number/center punch** ▪ Introduction ▪ Types & size ▪ Tools/materials ▪ Importance & Applications ▪ Process ▪ Safety precautions ▪ Demonstration of punching ▪ Exercises on punching	1	1	2
4	Perform the sawing	**Sawing** ▪ Introduction ▪ Types ▪ Tools/materials ▪ Importance & Applications ▪ Procedures ▪ Safety precautions ▪ Demonstration of sawing ▪ Exercises on sawing	1	7	8
5	Perform the drilling	**Drilling** ▪ Introduction ▪ Types & Parts ▪ Tools/materials ▪ Importance & Applications ▪ Process ▪ Method of selection RPM and drill ▪ bit size ▪ Safety precautions ▪ Demonstration of drilling ▪ Exercises on drilling	1	5	6
		Total	**7**	**38**	**45**

Section B: Institute Based Training (13 weeks @1 day per week)

		▪ Exercises on drilling		2	2

6	Perform threads cutting ▪ Cut internal threads by taps	▪ Introduction ▪ Thread and its nomenclature ▪ Describe Tap and die ▪ Selection of drill bit for tapping (TDS) ▪ Measuring and marking tools, ▪ drill bits, tap ▪ Procedure of tapping ▪ Safety precautions ▪ Demonstration of threads cutting ▪ Exercises on threads cutting	1	5	6
7	Perform sheet metal work (Figure cutting)	**Sheet metal** ▪ Introduction ▪ Tools and materials ▪ Application ▪ Safety precautions ▪ Demonstration	1	3	4
		Folding ▪ Introduction ▪ Types ▪ Importance and uses ▪ Methods ▪ Safety precautions ▪ Demonstration of folding ▪ Exercises on folding	1	7	8
		Riveting ▪ Introduction ▪ Importance and application ▪ Types ▪ Uses ▪ Methods ▪ Demonstration of riveting ▪ Exercises on riveting	1	5	6
		Total	**4**	**22**	**26**

Reference :

1 G.S Sethi & Balbir Singh - Machinist 1st & 2nd Year

2 Work Shop Technology (Volume I &II) – Hajra & Chaudhary

Engineering Drawing

Total: 84 hrs.
Theory: 0hrs
Practical: 84hrs

Course Description:
This course provides skill and knowledge on drawing instrument, standard drawing symbol, lettering, lines, scales, geometrical drawing, electric circuit diagram of domestic, commercial & Industrial installation.

Course Objectives:
At the end of the course the participants will be able to:

1 Draw line, curve and plan of geometrical solids.
2 Sketch freehand and three-dimensional objects.
3 Read, interpret Electrical symbols to use in different circuit diagram.
4 Read, interpret and draw electrical connection diagram in transmission & distribution system.
5 Draw the development diagram of single phase & three phase motors' component, equipment, & machines.

Section A: Institute Based Training (15 Academic Weeks)

S.N.	Tasks Statement	Related Technical Knowledge	Time hrs.		
			Th.	Pr.	Total
1. Geometrical Engineering Drawing					
1	Explain engineering/technical drawing	▪ Introduction ▪ Classification ▪ Applications ▪ Distinguish	1		1
2	Identify and handle drawing instruments	▪ Selection of drawing instruments ▪ Types, uses and sizes ▪ Handling techniques ▪ Precautions ▪ Demonstration of instruments	1		1
3	Draw/Construct a title block and lines ▪ Set up paper in drawing board ▪ Prepare a drawing sheet using Mini Drafter	▪ Introduction ▪ Layout of the drawing sheet Convention for lines and materials ▪ Uses of lines and title block ▪ Types and Thickness of lines ▪ Demonstration ▪ Exercises	1	3	4
4	Practice lettering	▪ Introduction ▪ Requirements of good lettering	1	2	3

		▪ Spacing and sizes of letters Single-stroke, Demonstration ▪ Exercises			
5	Identify and construct of four sided plane figures, triangles and regular polygons	▪ Introduction ▪ Concept and Importance ▪ Handling techniques ▪ Types ▪ Procedure for making geometrical constructions ▪ Drawing exercises	1	2	3
6	Construct an ellipse	▪ Introduction ▪ Drawing exercises on rectangle, concentric and rhombus method	1	1	2
7	Dimension the drawing objects	▪ Introduction ▪ Elements of dimensioning ▪ Method of dimensioning Arrangement of dimensioning ▪ Symbols for shape indication General rules for dimensioning ▪ Problems on dimensioning ▪ Demonstration	1	2	3
8	Identify pictorial views	▪ Introduction ▪ Differences between isometric and oblique views ▪ Drawing exercises	1	2	3
9	Explain and obtain orthographic views	▪ Introduction ▪ Selection of views ▪ Spacing of views ▪ Principles of orthographic views ▪ Comparison of first and third angle projection ▪ Demonstration ▪ Drawing exercises	1	1	2
10	Select and identify and draw orthographic views from pictorial views, isometric & oblique views	▪ Analysis of three views ▪ Simple cuboids shapes ▪ Angles and slopes ▪ Demonstration ▪ Drawing exercises	1	8	9
		Total	**10**	**21**	**31**

2. Electrical Engineering Drawing					
1	Draw electrical symbols	**Electrical Symbols** ▪ Introduction ▪ Importance and use ▪ Process ▪ Draw symbols	1	2	3
2	Draw the electrical diagram ▪ Lay out ▪ Wiring ▪ Single line diagram	**Electrical diagram** ▪ Introduction ▪ Importance and use ▪ Process ▪ Drawing exercise	1	5	6
3	Draw complete diagram of domestic, commercial building system with architectural building plan, estimating and cost calculation.	**Building drawing** ▪ Introduction ▪ Importance ▪ Material estimating and costing ▪ Process ▪ Drawing Exercise	1	4	5
		Grand Total	**13**	**32**	**45**

Section B: Institute Based Training (13 weeks @1 day per week)

4	Draw Motor control system diagram ▪ DOL ▪ Two places ▪ Forward/reverse ▪ Star/Delta ▪ Manual ▪ Automatic	**Motor control and power diagram**. ▪ Introduction ▪ Importance and use ▪ Process ▪ Drawing exercise (power, control and connection diagram)	1	18	19
5	Draw winding diagram of single phase and three phase motors.	**Winding diagram of motors and connection diagram of single phase and three phase motors.** ▪ Introduction ▪ Types of motors ▪ Development diagram ▪ Connection diagram of different types of single-phase motor ▪ Importance and use ▪ Name plate ▪ Parts of motor	1	15	16

6	Draw single line diagram of generation, transmission, distribution system.	▪ Single line diagram of power supply system ▪ Introduction ▪ Types ▪ Importance and use ▪ Nepal Electrical authority (NEA) rule, regulation and standard.	1	3	4
		Total	**3**	**36**	**39**

Reference :

- Fundamental of Engineering Drawing for Polytechnics - Er. R. K. Dhawan
- Electrical Engineering Drawing - Gupta
- Electrical Estimating and Costing - A K Shawney
- Electric Circuit Diagram -GTZ Handout
- Motor Rewinding - Rosenberg
- Electro Westernman table
- Engineering Drawing – N.D. Bhatta
- Engineering Drawing - W. J Lujadhar
- **आधारभुत कम्प्युटर परिचय भाग १, २ र ३- कमल भट्टराई**

Computer Application

Total : 41 hrs
Theory: 0hrs
Practical: 41hrs

Course Description:
This Computer application is the very basic computer course. This course familiarizes trainees about computer.
This course also covers layout diagram & connection diagram of electrical appliance, machines service drop cable in transmission & distribution system using computer aided design.

Course Objectives:
At the end of the course, the participants will be able to:

1 Understand the concept of computers.
2 Able to work with MS Word.
3 Can create Spreadsheet.
4 Formulate charts with data.
5 Send and receive Email.
6 Search information on the Internet.
7 Familiarize with Windows operating system.
8 Use Computer Aided Drafting (CAD) Software.
9 Construct 2D Engineering Drawing using AutoCAD.
10 Edit drawing using CAD Software.

Section A: Institute Based Training (15 Academic Weeks)

S.N.	Tasks Statement	Related Technical Knowledge	Time hrs.		
			Th.	Pr.	Total
1. Computer Application					
1	Introduction on Computer	▪ Interfacing Computer & its peripherals ▪ Mouse and keyboard practice	-	1	1
2	Program Control Keyboard keys	▪ Control opened program windows ▪ Interface program menus ▪ Familiarize with different keyboard keys	-	1	1

3	Introduce MS Word & its Fundamentals	▪ Open, Create, Save and Close document	-	1	1
4	Formatting text in MS Word	▪ Text and its available options	-	1	1
5	Writing reports and letters with 'Word'	▪ Introduce the concept of styles ▪ Bullets and numbering ▪ Write simple reports and letters	-	1	1
6	Inserting tables and drawing objects in 'Word'	▪ Create and format tables ▪ Simple drawing with drawing toolbar	-	1	1
7	Inserting pictures, into 'Word'	▪ Insert picture ▪ Wrapping or positioning picture ▪ Crop inserted picture	-	1	1
8	Working with my computer	▪ Familiarize with computer drives ▪ Manage files and folders	-	1	1
9	Introduction to 'Ms Excel' and its fundamentals	▪ Open, Create, Save and Close document ▪ Use of MS Excel ▪ Editing and formatting cells	-	1	1
10	Formatting borders and sorting,	▪ Format borders & its available options ▪ Sorting data and its available options	-	1	1
11	Cell options and simple calculations	▪ Use of toolbar and formula ▪ Merge and copy cells ▪ Competing sequences automatically	-	1	1
12	Useful functions Plotting data	▪ Useful functions (sum, if, < >) ▪ Plotting a chart ▪ Format chart	-	1	1
13	Windows operating system Customizing the desktop	▪ Introduce Windows operating system ▪ Manage desktop icons, background, date and time	-	1	1

14	Internet	▪ Introduce internet and its fundamentals ▪ Connect and browse with internet	-	1	1
15	Email and social network	▪ Create email and social network accounts ▪ Attach document and send, receive emails	-	1	1
		Total	**0**	**15**	**15**

Section B: Institute Based Training (13 weeks @1 day per week)

2. AutoCAD					
Unit: 1. Familiarize with Computer Aided Drafting (CAD) Software					
1	Introduction to CAD	▪ Loading AutoCAD ▪ Interfacing with Screen and its organization	-	1	1
2	Setup a Drawing	▪ Create a new drawing ▪ Describe setting preferences (units, angle, direction, area)	-	1	1
3	Manage Toolbar	▪ Introduce toolbar ▪ Types ▪ Manage toolbar	-	0.5	0.5

Unit: 2 Drawing Commands					
1	Draw lines	▪ LINE Command and its options ▪ Different methods of drawing a line in CAD ▪ Relative, Cartesian and absolute coordinate.	0.5	1.5	2
2	Draw rectangle	▪ RECTANGLE Command and its options	-	0.5	0.5
3	Draw arc	▪ ARC Command and its options	0.5	0.5	1
4	Draw circle	▪ CIRCLE Command and its options	0.5	0.5	1
5	Draw polygon	▪ POLYGON Command and its options	-	0.5	0.5
6	Manage lines	▪ Line properties	-	0.5	0.5
7	Draw an Isometric drawing	▪ Isometric snap and rectangular snap ▪ Setting of isometric snap ▪ Create Isometric drawings	0.5	0.5	1
8	Draw Ellipse	▪ ELLIPSE Command and its options	0.5	0.5	1

Unit: 3 Modifying Commands					
1	Move command	▪ Different methods of selecting objects ▪ Base point	-	0.5	0.5
2	Rotate command	▪ Define rotation angle ▪ Explain Reference Point.	-	0.5	0.5
3	Copy command	▪ Differentiate multiple copy and Single copy. ▪ Explain the procedure for duplicating object	-	0.5	0.5
4	Mirror command	▪ State the purpose of Mirror. ▪ Explain First point and Second point of mirror line ▪ Describe options	-	0.5	0.5
5	Offset command	▪ Execute OFFSET and Describe options available	-	0.5	0.5
6	Array command	▪ Differentiate Rectangular Array and Polar Array ▪ Explain options available	-	0.5	0.5
7	Break command	▪ Define break line ▪ Break the selected object between two points	-	0.5	0.5
8	Explode command	▪ Define explode ▪ Break a compounded object into its component object	-	0.5	0.5
9	Trim command	▪ Define Cutting edge ▪ Explain the options available for trimming object	-	0.5	0.5
10	Extend command	▪ Define Boundary edge ▪ State the procedure for modifying object using Extend command.	-	0.5	0.5
11	Fillet command	▪ Explain the options available for filleting object	-	0.5	0.5
12	chamfer command	Explain the options available for chamfering object	-	0.5	0.5
Unit: 4 Annotate a drawing with Text, layer, lock, Hatching and Dimensioning					
1	Create a Layer	▪ Define Layer. ▪ Explain different attributes and properties of a Explain the procedure for creating a layer.	0.5	0.5	1
2	Create text and text styles.	▪ Differentiate Single line text and Multiline Text		0.5	0.5

		▪ Explain Style name, Font Name, Style and Height ▪ Describe Font effect, Width factor and Oblique angle ▪ Explain the procedure for creating text styles.			
3	Edit text	▪ Multiline Text Editor & its options ▪ Layer and symbol	-	0.5	0.5
4	Hatch the sectional area	▪ Define hatching. ▪ Differentiate ISO Hatch Pattern, User Defined Hatch Pattern, Pre-Defined Hatch and Associative Hatch ▪ Explain the procedure for HATCH with its options	-	0.5	0.5
5	Create Block	▪ Explain the procedure for HATCH with its options	-	0.5	0.5
6	Add dimensions to a drawing	▪ Interpret dimension elements ▪ Describe dimension types ▪ Procedure for dimensioning ▪ Modify Dimension style ▪ Dimension in isometric drawing	-	1	1
Unit: 5 Create output					
1	Configure Plotters/Printers	▪ Define Plotter Manager ▪ Explain Plot Style Manager ▪ State the Printer/Plotter Installation process	-	0.5	0.5
2	Plot drawing	▪ Describe the procedure for printing a drawing with its options available.	-	0.5	0.5
Unit: 6 Project works					
1	Following drawings are to be prepared and submitted (e-copy and hard copy both) using CAD software • Draw an Isometric/ Oblique drawing • Draw Orthographic drawing • Draw an assembly drawing • Draw Workshop drawing			5	5
	Total		**3**	**23**	**26**

Reference :

- Kognet learning solution, *Simple steps in AutoCAD*, Dream tech press, India
- George Omura*, Mastering AutoCAD 2013 and AutoCAD LT 2013,* India

Electro-Technology

Total: 112 hrs.
Theory: 112 hrs
Practical: 0 hrs

Description:
This subject provides to equip selected general SLC/SEE graduates with Electro-Technology knowledge required for performing electrical installation of domestic, commercial and industrial complexes.

Objectives:
At the end of the course the participants will be able to:

1. Apply personal, equipment, machine, tools and workplace safety including electrical rules.
2. Identify tools, equipment, machines, materials used in electrical system.
3. Apply the standard terms and terminologies used by electricians.
4. Explain SI definitions, constitution of matter, and fundamental laws of electricity and electromagnetism.
5. Explain the basic concept and utilization of power generation, transmission and distribution.
6. Explain, define and solve problems in D.C. and A.C. single and three phase circuits.
7. Explain and apply the principles of operation, function and construction of electrical machines.
8. Explain and apply electrical measuring instrument and measurement.

Section A: Institute Based Training (15 Academic Weeks) Total: 60 hours

S.N.	Tasks Statement	Related Technical Knowledge	Time .hrs.
1.	Apply electricity rules and regulations	**Electricity rules and regulation** ▪ Concept of electrical energy development in Nepal ▪ Rules for – consumer, standard voltage for distribution Concept of NEA code of practice	2
2.	Explain advantages and application of A.C. and D.C.	**Fundamental SI definitions** ▪ Introduction ▪ Importance and Application ▪ Advantages and disadvantages	3
3	Define: ▪ EMF and P.D. ▪ Current, voltage,	▪ Current, Voltage and Resistance and their measuring units EMF and potential difference	2

	resistance and power		
4.	Explain: ▪ Ohm's law ▪ Kirchhoff's law and their application ▪ Causes of Electrical Resistance ▪ Effect of temperature on resistance ▪ Cells and battery Connection of cells and battery	**Laws of electricity** ▪ Ohm's law ▪ Kirchhoff's laws ▪ Laws of resistance ▪ Effect of temperature on resistance, temperature co-efficient of resistance ▪ Connection of cells and battery	8
5.	Explain ▪ Conductor and insulator ▪ Metal and non-metal Ferrous/nonferrous metal	**Engineering materials** ▪ Introduction ▪ Types ▪ Importance and use ▪ Properties	2
6.	Explain and compare: ▪ Resistances in series and parallel Relation of voltage, current, resistance, and power in series and parallel circuits	**Electrical circuits** ▪ Introduction ▪ Types ▪ Importance and use ▪ Comparison ▪ Relation of voltage, current, resistance, and power in series and parallel circuits	8
7.	Explain work, energy and power in electric circuit and their measuring units	**Work, power and Energy** ▪ Introduction ▪ Types ▪ Importance and use ▪ Measuring units in M.K.S. and F.P.S. system	2
8.	▪ Explain the importance of magnetism in electricity	**Magnetism Electromagnetism** ▪ Importance of magnetism in electricity ▪ Magnetism terms- magnetic poles, magnetic field, magnetic lines of force, magnetic flux	15

	▪ Define magnetic terms and their measuring units Explain magnetic losses	▪ Diamagnetic, Paramagnetic, Ferromagnetic materials ▪ Advantages of electro-magnetism ▪ Faraday's law of electromagnetic induction ▪ Self and mutual inductance ▪ Eddy current and Hysteresis loss	
9	Define: ▪ Period, Cycle or frequency ▪ Generation of alternating voltage and current ▪ Amplitude, Peak ▪ Instantaneous and R.M.S. values ▪ Form factor, in phase, out of phase ▪ Inductance and inductive reactance ▪ Capacitance and capacitive reactance Explain and solve simple A.C. circuits Poly phase A.C.	**AC definition and circuit** ▪ Comparison between A.C. and D.C. ▪ Definition of: 1. Period 2. Cycle or frequency 3. Amplitude 4. Peak 5. Instantaneous and R.M.S. values, 6. Form factor, peak factor in phase, out of phase ▪ Inductance and inductive reactance ▪ Capacitance and capacitive reactance ▪ Condensers in series and parallel ▪ Impedance ▪ Impedance triangle and power factor ▪ Cause of low power factor in industrial areas and its improvement ▪ Single and three phase circuits	18
		Total	**60**

Section B: Institute Based Training (13 weeks) 52 hours@ 4 hours per week

10.	Explain the basic concept of energy sources and power generation in Nepal	**Generation, transmission, distribution and Utilization of Electrical power** ▪ Sources of electrical Energy in Nepal: ▪ Production of power sources: ▪ Solar and wind power station ▪ Hydroelectric power station ▪ Diesel power station etc. ▪ Power development of Nepal	12

	Describe basic concept in substation and sub-station equipment Control and protection	Concept of sub-station: ▪ Sub-station equipment ▪ Fuse, MCB, MCCB, Relays ▪ Lighting arrestor ▪ Methods of Earthing and Types of Earthing ▪ Circuit breakers ▪ Isolators ▪ Bus-bars ▪ Types of sub-station ▪ Pole type sub station ▪ Outdoor sub station ▪ Indoor sub station	
	Explain transmission system	▪ Importance of transmission system ▪ Concept of tower, pole, hard ware and Insulators ▪ Advantages of H.V. Transmission	
	Describe distribution system and service connection	▪ Methods of power distribution ▪ Comparison between overhead line and Underground cable ▪ Domestic service connection and its components (feeder, distributor, service mains) ▪ Poles, insulators, stay set and other accessories ▪ Voltage ranges ▪ Conductor spacing and sag	
	Explain utilization of electric power Explain illumination and its units	▪ Utilization of electrical energy ▪ Concept of illumination, various type of light sources	
11.	Define and explain the basic construction and working of electrical machines	**Electrical Machines** Definition, Basic construction, working principles of: ▪ D.C. generator ▪ Alternator ▪ Transformer ▪ Transformer ratio ▪ Parallel operation of alternator and transformer **D.C and A.C. Motors** **(Definition, Basic construction, working principles)** ▪ Single phase Motors	25

		▪ Three phase motors ▪ Split phase motor ▪ Synchronous motors ▪ Capacitor start induction motor ▪ Capacitor start capacitor run motors ▪ Universal motors ▪ Motor speed and slip	
12.	Explain and apply electrical measuring instrument and measurement	**Electrical measuring instruments** ▪ Concept of measuring units of electrical quantities ▪ Types of measuring Instrument Basic Construction of measuring instruments on the basis of: ▪ Working principles ▪ Construction ▪ Measurement Basic Concept, Construction and working principles of: ▪ Megger ▪ Earth tester ▪ Single and Three Phase Energy meter ▪ Watt meters General Concept of: ▪ Power factor meter ▪ Frequency meter ▪ Synchro scope ▪ Lux meter Increasing range of measuring instruments ▪ Concept and use of C.T. and P.T. ▪ Measurement of specific gravity of electrolyte in battery	15
		Total	**52**

References :

- Basic Electrical Engineering - M.L.Anwani
- Text Book of Electrical Engineering – B. L. Theraja
- Installation Servicing and Maintenance – S.N.Bhattacharya
- Generation, transmission and utilization of electrical power – A. T. Star
- Generation, transmission and utilization of electrical power – A. K. Showny
- Basic electrical engineering volume I and II – P.S. Dhogal
- NEA Rules and Standards
- Skill Standards for Building and Industrial Electrician Level 1, 2 & 3– NSTB, CTEVT

Basic Electronics

Total: 97 hrs.
Theory: 24 hrs
Practical: 73 hrs

Course Description:

This subject provides skill and knowledge related to basic electronics. This consists of simple electronics projects, simple design and general concept of digital electronics. It also covers electronics components used in electronics circuits.

Course Objectives:

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

1. Describe active and passive electronic components.
2. Interpret their characteristics and applications.
3. Calculate the value of electronic components.
4. Test electronics components.
5. Design electronic circuits using diodes.
6. Construct voltage regulator with Zener diode.
7. Construct NOT, AND, OR, NAND, NOR Logic gate in IC.
8. Apply safety precaution during electronics works.

Section A: Institute Based Training (15 Academic Weeks) 45 hours @ 3 hours per week

S.N.	Tasks Statement	Related Technical Knowledge	Time Hours		
			Th.	Pr.	Total
1.	Calculate and check the value of fixed and variable resistor	**Calculate the value of Resistor (Multi-meter and color code)** • Introduction • Importance and uses • Types • Function • Measuring procedure	2	8	10
2.	Check the value of capacitor	**Capacitor** • Introduction • Importance and uses • Types • Measuring Procedure	2	2	4

3.	Check the value of Inductor	**Inductor** • Introduction • Importance and uses • Types • Measuring Procedure	2	2	4
4.	Measure voltage and current in series and parallel circuit	**Series and Parallel circuits** • Introduction • Importance and uses • Connection procedure	3	5	8
5.	Perform and illustrate PN diode characteristic	**Semiconductor PN diode** • Introduction • Importance and uses • Types **Biases** • Introduction • Importance and uses • Types • Connection **V/I curve** • Introduction • Importance and uses Connection	3	11	14
6.	Characterize Zener diode	**Zener Diode** • Introduction • Uses/application • Advantage **V/I curve** • Introduction Importance and uses	3	2	5
		Total	**15**	**30**	**45**

Section B: Institute Based Training (13 weeks) 52 hours@ 4 hours per week

S.N	Tasks Statement	Related Technical Knowledge	Time Hours		
			Th	Pr	Total
7.	Perform rectifier circuits	**Rectifier Circuits** • Introduction • Importance and uses • Types • Connection method • Procedure	3	8	11

		• Input/ Output waveform			
8.	Transistor configuration and its characteristics	**Transistor,** • Introduction • Uses/application • Types • Connection • Procedure	3	7	10
9.	Make connections using Bread Board and Matrix Board for above electronic components	**Soldering Iron, Lead, PCB plate/ matrix board, bread board** • Introduction • Importance and uses • Procedure	1	3	4
10.	Perform Basic and Universal logic gates	**Logic Gate ICs** Introduction Importance and uses Types Circuit diagram Truth table Procedure	2	5	7
11	Perform Projects works	• Make a Regulated DC Power Supply Make a Fire Alarm using Logic Gates	-	20	20
		Total	**9**	**43**	**52**

Reference:

- Principle of Electronics - V.K. Meheta
- Saral Basic Electronics - Hari Bahadur Paudel
- Four in one practical books - Ram Chandra Tiwari
- Digital Fundamental - Floyed

Electrical Installation

Total: 194 hrs.
Theory: 24 hrs
Practical: 170 hrs

Course Description:

This subject provides skill and knowledge related to electrical installation. It also covers classification of wiring, selection of materials, simple design and installation of domestic, industrial and commercial building.

Course Objectives:

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

1. Select electrical tools, equipment, materials, accessories, fitting and safety device as per drawing.
2. Install panel board, capacitor bank, cable tray, lightning arrestor, PABX, telephone distribution board.
3. Interpret lay out and wiring diagram.
4. Perform surface and concealed wiring.
5. Install supporting accessories (PVC conduit, metal box, distribution box, L.T. cable etc.).
6. Perform wiring system and electrical safety test.
7. Connect and control single & three phase motor system.

Section A: Institute Based Training (15 Academic Weeks)

S.N.	Tasks Statement	Related Technical Knowledge	Time Hours		
			Th.	Pr.	Total
1.	Safety and First aid	**Safety** • Introduction • Types • Rules and regulation **First aid** • Introduction • Importance and application • Procedures	2	3	5
2.	Basic electrical tools and equipment	• Introduction • Types • Application & uses • Safety	-	4	4
3.	Electrical materials and accessories • Protective devices	• Introduction • Types • Application and uses • Selection	2	10	12

	• Controlling devices • Warning devices • Conducting devices • Auxiliary accessories				
4.	Interpret lay out and circuit diagram	**Electrical diagram** • Introduction • Types • Importance and use	2	-	2
5.	Board Wiring	**Wiring** • Introduction • Importance and use • Process • Connection of wiring • Related exercises • safety	2	50	52
6.	Surface and Concealed wiring	**Wiring** • Introduction • Types of wiring system • Merits and demerits • Importance and use • Process • Concept and importance of estimating of o Installation • Single and three phase wiring • Laying pipes in concrete slab on building. • Safety	2	13	15
		Total	**10**	**80**	**90**

Section B: Institute Based Training (13 weeks @1 day per week)

7.	LT cable	**LT cable** • Introduction • Types • Importance and use • Testing Process • selection	2	15	17

		• safety • Perform laying and connection			
8.	Earthing	**Earthing** • Introduction • Importance and application • Types • Methods of earthing • Perform earthing	2	13	15
9.	Changeover switch	**Changeover switch** • Introduction • Types • Importance and application • Process • Connect single and three phase supply by using change over switch • safety	1	10	11
10.	Electrical testing	**Electrical test** • Introduction • Types • Importance and application • Process • Insulation test • Earth test • Continuity test • Short circuit test • Polarity test • safety	2	11	13
11.	Solar system	**Solar system** • Introduction • Importance and application • Components • Process • Safety • Solar backup system • Installation of solar system	2	21	23

12.	Telephone & Networking	**PABX/IP telephone, CC camera, Internet.** • Introduction • Types • Application and uses • Wiring Layout diagram • Installation • Color code and tag • Termination method. • Process	5	20	25
		Total	**14**	**90**	**104**

References:

- Electrical installation by Heinz Graff
- Industrial Wiring by J.A. Faindery

Repair and Maintenance of Electrical Appliances and Machine

Total: 157 hrs.
Theory: 0hrs
Practical: 157hrs

Course Description:

This course provides skill and knowledge of domestic and commercial electrical appliances and equipment. The fundamental facts of preventive and post fault maintenance have been emphasized in this course. This course also provides skill and knowledge to repair and maintenance of single, three phase electrical motor, their rewinding, transformer and D.C. motor.

Course Objectives:

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

1. Repair and maintenance of domestic electrical appliances.
2. Repair and maintenance of Industrial machine and tools.
3. Develop simple lay out and connection diagram of different types of electric machine/equipment and appliances.
4. Disassemble and assemble various types of electrical machine and equipment.
5. Perform basic maintenance of transformer.
6. Perform single phase and three phase motor rewinding.
7. Apply safety precautions for electrical repair and maintenance work.

Section A: Institute Based Training (15 Academic Weeks)

S.N.	Tasks Statement	Related Technical Knowledge	Time (hrs.)		
			Th	Pr.	Total
1.	Repair/maintenance electrical appliances and accessories (Immersion heater/rod, Automatic Iron, kettle and hot plate)	Concept of preventive and corrective maintenance **Immersion heater, rod heater, Automatic Iron, Kettle, Hotplate** ▪ Introduction ▪ Importance and use ▪ Working principle and function ▪ Process ▪ connection diagram ▪ Log book/ work report	1	4	5
2.	Repair/maintain Rice Cooker, induction stove, geyser	**Electrical Cooker, Geyser, induction stove** ▪ Introduction ▪ Importance and use ▪ Working principle and function	1.5	9.5	11

		▪ Process ▪ connection diagram ▪ Log book/ work report			
3.	Repair and maintain electrical oven	**Electrical oven** ▪ Introduction ▪ Importance and use ▪ Working principle and function ▪ Process ▪ connection diagram ▪ Log book/ work report	0.5	1.5	2
4.	Repair and maintain fan heater/ electric hair dryer	**Fan heater** ▪ Introduction ▪ Importance and use ▪ Working principle and function ▪ Process ▪ connection diagram ▪ Log book/ work report	1	4	5
5.	Repair and maintain vacuum cleaner	**Vacuum cleaner** ▪ Introduction ▪ Importance and use ▪ Working principle and function ▪ Process ▪ connection diagram ▪ Log book/ work report	0.5	2.5	3
6.	Repair and maintain mixture/grinder/ Wall cutter.	**Mixture/grinder/Wall cutter** ▪ Introduction ▪ Importance and use ▪ Working principle and function ▪ Process ▪ connection diagram ▪ Log book/ work report	0.5	2.5	3
7.	Repair and maintain portable drill machine	**Drill machine** ▪ Introduction ▪ Importance and use ▪ Working principle and function ▪ Process ▪ connection diagram ▪ Log book/ work report		2	2

8.	Repair and maintain table fan, ceiling fan/exhaust fan.	**Fan** ▪ Introduction ▪ Types ▪ Importance and use ▪ Working principle and function ▪ Process ▪ connection diagram ▪ Log book/ work report	1	5	6
9.	Repair and maintain AC single phase motor.	**AC single phase motor** ▪ Introduction ▪ Importance and use ▪ Process ▪ Size/types ▪ connection diagram ▪ Prepare winding data ▪ Rewinding and installing process of coil ▪ Log book/ work report	4	38	42
10.	Repair and maintain AC three phase motor (Squirrel)	**AC three phase motor** ▪ Introduction ▪ Importance and use ▪ Process ▪ Size ▪ connection diagram ▪ Prepare winding data ▪ Rewinding and installing process of coil ▪ Log book/ work report	4	22	26
		Total	**14**	**91**	**105**

Section B: Institute Based Training (13 weeks @1 day per week)

11.	Repair and maintain Generator Set	**Generator** ▪ Introduction ▪ Importance and use ▪ Types of generator ▪ Process of maintenance ▪ Trouble shooting	2	20	22

12.	Repair and maintain single phase low voltage transformer.	**Single phase low voltage transformer** ▪ Introducti on ▪ Parts/components ▪ Importance and use ▪ Process ▪ connection diagram ▪ calculation of turns and size ▪ Binding and installing process ▪ Log book/ work report		15	15
13.	Repair and maintain Invertors, converters, solar panel, Battery, charge controller	**Inverters, converters, solar panel, charge controller, battery** ▪ Introduction ▪ Importance and use ▪ Process ▪ connection diagram ▪ Log book/ work report	2	13	15
		Total	**4**	**48**	**52**

References Books:

- Basic Electrical Engineering - M.L.Anwani
- Text Book of Electrical Engineering – B. L. Theraja
- Installation Servicing and Maintenance – S.N.Bhattacharya
- Generation, transmission and utilization of electrical power – A. T. Star
- Generation, transmission and utilization of electrical power – A. K. Showny
- Basic electrical engineering volume I and II – P.S. Dhogal
- NEA Rules and Standards
- Skill Standards for Building and Industrial Electrician Level 1, 2 & 3– NSTB, CTEVT

Electrical Motor Installation and Control

Total: 140 hrs.
Theory: 0 hrs
Practical: 140 hrs

Course Description:
This subject provides skill and knowledge related to motor installation and control system of single and three phase electrical system.

Course Objectives:
At the end of the course the participants will be able to:

1. Interpret connection diagram of three phase induction motors.
2. Connect three phase induction motors with various control and protection arrangements.
3. Connect and start three phase induction motor using PLC

Section A: Institute Based Training (15 Academic Weeks)

S.N.	Tasks Statement	Related Technical Knowledge	Time Hours		
			Th.	Pr.	Total
1.	Install DOL starter to control induction motor	**3-Phase starter/single phase (Relay, contractor, switch, multi-meter, MCB, TP MCB, Actuator push button)** • Introduction • Importance and uses • Function • Procedure • Control and power circuit diagram • Log Book/work report	3	14	17
2	Install DOL starter to control the induction motor from two places	• Introduction • Importance and uses • Function • Advantages and limitations • Procedure • Control and power circuit diagram • Log Book/work report	2	12	14
3.	Install forward/reverse starter to control 3 phase induction motor (two direction motor)	**3-Phase starter (forward/reverse)** • Introduction • Importance and uses • Function • Procedure • Control and power circuit diagram	4	18	22

		• Log Book/work report			
4.	Install star/delta starter (manual) to control 3 phase induction motor.	**3-Phase starter (star/delta)** • Introduction • Importance and uses • Function • Procedure • Control and power circuit diagram • Log Book/work report	2	20	22
		Total	**11**	**64**	**75**

Section B: Institute Based Training (13 weeks @1 day per week)

5.	Install star/delta starter (semi-auto) to control 3 phase induction motor.	**Star/delta semi- automatic** • Introduction • Importance and uses • Function • Procedure • Procedure • Control and power circuit diagram • Log Book/work report	4	18	22
6.	Install star/delta starter (automatic) to control 3 phase induction motor.	**Star/delta automatic** • Introduction • Importance and uses • Function • Procedure • Control and power circuit diagram • Log book/work report	4	20	24
8.	Install PLC controller for 3 phase induction motor control (DOL starter)	**3 phase starter** **(PLC, Relay, Contractor, switch)** ▪ Introduction ▪ Importance and uses ▪ Function ▪ Procedure ▪ Control and power circuit diagram ▪ Log book/work report	4	15	19
		Total	**12**	**53**	**65**

Reference :

- Basic Electrical Engineering- A.L Anwani
- Basic Electrical Engineering- M.L Anwani
- Basic Electrical Engineering- P.S. Dhogal

Entrepreneurship Development

Total: 78 hours
Theory: 30 hours
Practical: 48 hours

Course Description:
This course is designed to impart knowledge and the skills on formulating business plan and managing small business in general. This course intends to deal with exploring, acquiring and developing enterprising tasks, identification of suitable business idea and developing of business plan.

Course Objectives:
After completion of this course, apprentices will be able to:

1. Define business and entrepreneurship;
2. Explore entrepreneurial tasks;
3. Analyze business ideas and viability;
4. Formulate business plan; and
5. Learn to manage small business.

Section B: Institute Based Training One Day Per Week (78 days/13 Academic Weeks)

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
Module I: Introduction to Entrepreneurship			**5.94**	**4.06**	**10**
1	Introduce business.	**Introduction of business:** • Definition of business/enterprise • Types of business • Classification of business • Overview of MSMEs (Micro, Small and Medium Enterprises) in Nepal	1.5		1.5
2	Define entrepreneur/entrepreneurship.	**Definition of entrepreneur:** • Definition of entrepreneur • Definition of entrepreneurship • Entrepreneurship development process	0.5	0.5	1.0

3	Describe entrepreneur's characteristics.	**Entrepreneur's characteristics:** • Characteristics ofentrepreneurs • Nature of entrepreneurs	0.67	0.83	1.5
4	Assess entrepreneur's characteristics.	**Assessment of entrepreneur's characteristics:** • List of humans characteristics • Assessment of entrepreneuri al characteristic s	0.5	1.0	1.5
5	Compare entrepreneur with other occupations.	**Entrepreneur and other occupations:** • Comparison of entrepreneurwith other occupations • Types and styles ofentrepreneurs	1.0		1.0
6	Differentiate between entrepreneur and employee.	**Entrepreneur and employee:** • Difference between entrepreneur and employee • Benefit of doing ownbusiness	0.5	0.5	1.0
7	Assess "Self.'	**"Self" assessment:** • Understanding "self" • Self-disclosure and feedbacktaking	0.6	0. 4	1.0
8	Entrepreneurial personality test: Assess "Self" inclination to business.	**Entrepreneurial personality test:** • Concept of entrepreneurial personality test • Assessing self-entrepreneurial inclination	0.67	0.83	1.5
Module II: Creativity and Assessment			**6.5**	**4.0**	**10.5**
9	Create viable business idea.	**Creativity:** • Concept of creativity • Barriers to creative thinking	1.67	0.33	2.0
10	Innovate business idea.	**Innovation:** • Concept of innovation • SCAMPER Method ofinnovation	0.83	0.67	1.5

11	Transfer ideas into action.	**Transformation of idea intoaction:** • Concept of transferring ideainto action • Self-assessment of creativestyle	1.0	0.5	1.5
12	Assess personal entrepreneurial tasks.	**Personal entrepreneurial tasks:** • Concept of entrepreneurialtasks • Assessing personal entrepreneurial tasks	0.5	1.0	1.5
13	Assess personal risk-taking attitude.	**Risk taking attitude:** • Concept of risk • Personal risk-taking attitude • Do and don't do whiletaking risk	1.5	1.0	2.5
14	Make decision.	**Decision making:** • Concept of decision making • Personal decision-makingattitude • Do and don't do whilemaking decision	1.0	0.5	1.5
Module III: Identification and Selection of Viable Business Ideas			**0.83**	**3.42**	**4.25**
15	Identify/ select potentialbusiness idea. • Analyze strength, Weakness, Opportunityand Threat (SWOT) of business idea.	**Identification and selection ofpotential business:** • Sources of business ideas • Points to be considered while selecting business idea • Business selection process • Potential business selectionamong different businesses • Strength, Weakness, Opportunity and Threats (SWOT) analysis of businessidea • Selection of viable businessidea matching to "self"	0.83	3.42	4.25

Module IV: Business Plan			**16.67**	**36.58**	**53.25**
16	Assess market and marketing	**Market and marketing:** • Concept of market andmarketing • Marketing and selling • Market forces • 4 Ps of marketing • Marketing strategies	1.33	0.75	2.08
17	**Business exercise:** Explore small business management concept.	**Business exercise:** • Business exercise rules • Concept of small businessmanagement • Elements of business management ▪ Planning ▪ Organizing ▪ Executing ▪ Controlling	1.58	1.67	3.25
18	Prepare market plan.	**Business plan/Market plan** • Concept of business plan • Concept of market plan • Steps of market plan	2.0	2.0	4.0
19	Prepare production plan.	**Business plan/Production plan:** • Concept of production plan • Steps of production plan	1.25	1.5	2.75
20	Prepare business operationplan.	**Business plan/Business operation plan:** • Concept of business operation plan • Steps of business operationplan • Cost price determination	2.5	2.67	5.17

21	Prepare financial plan.	**Business plan/Financial plan:** • Concept of financial plan • Steps of financial plan • Working capital estimation • Pricing strategy • Profit/loss calculation • BEP and ROI analysis • Cash flow calculation	4.5	7.5	12.0

22	Collect market information / prepare business plan.	**Information collection and preparing business plan:** • Introduction • Market survey ▪ Precaution to be takenwhile collecting information ▪ Sample questions formarket survey ▪ Questions to be asked tothe customers ▪ Questions to be asked tothe retailer ▪ Questions to be asked tothe stockiest/suppliers • Preparing business plan	2.0	13.0	15.0
23	Appraise business plan.	**Business plan appraisal:** • Return on investment • Breakeven analysis • Cash flow • Risk factors	0.5	5.5	6.0
24	Maintain basic book keeping.	**Basic book keeping:** • Concept and need of bookkeeping • Methods and types of bookkeeping • Keeping and maintaining ofday book and sales records	1.0	2.0	3.0
		Total:	**30**	**48**	**78**

Industrial Practice

(Workplace Learning)

Program Description

Under the apprenticeship or the dual learning system of curricular program, the related industries are served as work place learning venues for apprentices. In addition, the related industries would have vital roles in providing platforms for learning occupational tasks, core skills and soft skills for the apprentices. Therefore, this curricular program is designed to acquire competencies by an apprentice through his/her engagement in hands-on practices (the real world of work experiences). It also helps the apprentices in enhancing employability, adaptability, confidentiality, independence and social and emotional intelligence.

For operating this curricular program, the technical schools or training institutes will make necessary arrangements to provide platforms for the industrial practices. Additionally, there will be a Tripartite training agreement among the apprentices, sponsoring industries and training institute. The terms and conditions of agreement will be implemented during the whole training period effectively based on the Apprenticeship Training Working Procedure, 2075 B.S.

This type of curricular program operates in two phases: training institutes or technical schools phase on the one hand and mostly sponsoring industries partly training institute phase on the other hand.The proposed apprentices have to engage for three and half months (15 academic weeks) theoretical and practical classes in the training institute. After completing the 15 weeks training from the training institute, the apprentices will be placed in industries as the apprentices under the supervision of In-company Trainer, whereas industrial practice & related occupational tasks/competencies and skills will be learned. The natureof training in the industries will be practical, and the duration will be of approximately 18 months (78 weeks/2600 hours). The apprentices will engage in the related sponsoring industries for 5 days in aweek, and they should come back to the training institute for rest of 1 day per week during the second phase of whole training period.

The sponsoring industries or companies will provide industrial practice platforms to the agreed apprentices for the above-mentioned duration. Furthermore, the sponsoringindustries could change industrial practice venues in different geographical locations on their volume of construction works and convenient.

Program Objectives

The main objective of this curricular program is to provide hands on practice platforms to experience the real world of works. However, the general objectives of the industrial practice program are to:

1. Ensure quality training and proper skills, work attitude and knowledge of apprentices;
2. Establish a national apprenticeship program through the participation of employers, workersand government and non-government agencies;
3. Apply acquired knowledge, skills and attitude in problem-based exercises in real lifeindustrial projects; Provide occupational tasks learning platforms in the form of work-based learning;
4. Make apprentices familiar with the future occupation/ job platforms;
5. Provide platforms for learning and experiencing professional, organizational, team

building,analytical and personal life skills;
6. Make apprentices familiar with the day to day administrative / management activitiesapplicable in their related occupation;
7. Establish the strong linkage between industries and institution;
8. Match the technical skills learned at the institute with the needs of the employer;
9. Ensure the relevant degree coursework and training programs conducted according to theexpectations of the industry, to ensure the subject contents are relevant and up to date;
10. Provide opportunity for apprentice to acquire interpersonal skills and ability for team workthrough interaction with professionals in their field of study;
11. Enhance employability, adaptability, confidentiality, independence and social and emotionalintelligence;
12. Provide an opportunity for apprentices to learn about the industry of their discipline andrelated environment;
13. Provide an opportunity for the industry to identify potential employees and to feedbackcomments on the pre-diploma program at large;
14. Provide opportunity to obtain knowledge and skills as of how to make optimal decisions toresolve work challenges;
15. Earn ethics in the industries;
16. Learn accepted safety practices in the industry;
17. Increase better chances for career mobility;
18. Ensure workforce development according to the company's needs; and
19. Ensure better employment opportunities for its graduates.

Learning Outcomes

After completion of industrial practice, apprentices will be able to:

1. Extend the boundaries of knowledge and skills through work place practice;
2. Develop significant commitment in the apprentices' profession/ specialization;
3. Integrate classroom theory and basic practical skills with workplace practice;
4. Develop greater clarity about academic and career goals;
5. Develop new or advanced skills;
6. Develop lifelong learning skills;
7. Gain understanding of administrative functions and company culture;
8. Appreciate the ethical basis of professional practice in relevant industry;
9. Display a capacity for critical reasoning and independent learning;
10. Exercise the role of the professional worker/supervisor confidently in the relevant industry;
11. Write a formatted report explaining the work in industrial practice and describing the experience;
12. Assess the adequacy of industrial practice;
13. Explore options in career plans and goals; and
14. Make a gradual transition from academia to career

Industrial Placement Orientation Program

After having three parties training agreement among the apprentices, sponsoring industries and training institute, industrial placement orientation program will be organized for apprentices by the training providing institutes or technical schools in presence of sponsoring industries or companies

representatives just before industry placements. The objectives of orientation of the program are as follows.

1. Orient apprentices regarding the agreement terms and conditions that will be implementedduring the period of industrial practice;
2. Orient apprentices about highlights of the Apprenticeship Training Operation Working Procedure, 2075 B.S.;
3. Orient apprentices about daily learning and performing procedures;
4. Make sure that about work place safety and learnable environment;
5. Orient apprentices about industrial practice supervision and monitoring schedules that to beconducted from training providing institute;
6. Make familiar to apprentices about mandatory rules, regulation and code of conducts to befollowed;
7. Orient apprentices about their attendance and daily dairy/logbook fill-up.
8. Orient apprentices about industry based continuous assessments (at the interval of threemonths plan and program)criteria and marking scheme that to be executed by the sponsoring industries (In-company Trainer and Supervisor jointly);
9. Orient apprentices about to prepare Industry Practice end-off Report covering all subjectsthat they are offered in industrial practice;
10. Inform apprentices about final practical examination criteria and venue of the industrialpractice program;
11. Inform the apprentice about industries rotation practice (if any);
12. Inform apprentices about Industry Practice end-off Report submission date;
13. Inform apprentices about final report submission date at institute; and
14. Inform apprentices about marking weightage of Industry Practice end-off Report preparation and presentation (Report should be presented in the presence of In-company Trainer or Supervisor and Trainers/ Instructors of training providing institute).

Complete Apprenticeship Plan

S. N.	Activities	Duration	When
1	Orientation to apprentices	Two days	Before placement
2	Report to the site	One day	Before placement
3	Actual work at site	65 weeks	During apprenticeship (Maximum 78 weeks)
4	Evaluation conducted by the sponsoring industries		Continuous
6	Evaluation conducted by the training institute		At least one time in every three months
7	Final evaluation		Last month of the apprenticeship program conducted by the industries
6	Final report preparation and presentation	5 days	After completion of the apprenticeship

Industry Orientation Program

After arrival of apprentices at the allocated sponsoring industries, the industry will organize an orientation program for apprentices to share detail information about functions, infrastructures, organizational structure, construction works and working procedures. In addition, they will be oriented about established rules, regulation, codes of conducts of those building construction industries or companies. Similarly, the Agreement terms and conditions, Tripartite trainingagreement among apprentices, sponsoring industries and training institute; and the Apprenticeship Training Operation Working Procedure, 2075 B.S. will be reoriented and overviewed.

An orientation programs may focus on following areas:

1. Profile of the industry
2. Vision, mission, goals and objectives of industry
3. Layout of industry
4. Basic features of the industry
5. The service or delivery provided by industry
6. Organization structure of the industry
7. Departments, divisions, units structures and their functions
8. Special technology adapted
9. Safety concerns of the industry
10. General rules, regulations and code of conducts of the industry
11. Facilities being provided and to be provided by the companies
12. Introduction of In–company trainer and supervisors, site engineers, contractors, colleaguesand owners
13. Working procedures and work schedule
14. Scope of related works
15. Industry practice rotation/venue changing

Guidelines for The Apprentices

Instructions for Apprentices:

1. Receive orientation for industrial practice.
2. Obtain curriculum.
3. Obtain official letter from sponsoring industries.
4. Maintain attendance.
5. Manage accommodation.
6. Finalize the daily/weekly tasks with your
    1. In-company Instructor or
    2. Supervisor
7. Practice / perform / occupational tasks.
8. Perform related administrative functions
9. Get help form the senior (s) / supervisor (s) to perform the tasks \develop skills as maximum as possible.
10. Receive logbook.
11. Fill logbook regularly.
12. Get signed by your supervisor regularly.
13. Seek & follow suggestion from seniors.
14. Show excellent job performance to influence your supervisor/instructor so that they couldbe willing to recommend to the employer to offer you the job after completion of industrial practice.
15. Follow established code of conducts of sponsoring industries.

General Behavior:

1. Maintain confidentiality of all work material.
2. Dress professionally and be well groomed.
3. Be polite and respectful.
4. Be sensitive and courteous to all your colleagues and clients.
5. Become acquainted with your colleagues from various departments and beappreciative of the services they provide.

Working Attitude and Behavior:

1. Show enthusiasm in the work assigned to you.
2. Give top priority in time, attention, and preparation to the work assigned by the company.
3. Be punctual for work.
4. Adhere to the working hours and working days as stated in the offer letter,and be willing to put in extra work hours if requested by your company.
5. Do not be absent from work unless you are sick, and you have obtained the medicalcertificate from the doctor.
6. Inform your Company Supervisor or Manager in the event of an unavoidable tardiness or absence as soon as possible and provide the medical certificate to your company when you return to work.
7. Prepare thoroughly and carefully before you meet your colleagues/superiors / clients.
8. Become acquainted with the various learning materials and resources available for yourwork.

9. Always have the initiative to explore solutions for the work assigned to you.
10. Clarify your doubts on the assigned work with your colleagues or companySupervisor after you have put in your best effort.
11. Take note of any advice given to you in your log book so that you do not need to ask yourcolleagues or company Supervisor again in the future.
12. Carry out your assigned duties and responsibilities responsibly and professionally.

Industry Practice Report

Format of Report:

A report needs to be submitted by all the apprentices on the basis of the following minimumguidelines at the end of their industrial practice.

- A hard copy of the report with simple binding.
- The font through-out the report must be of 12 size and Times New Roman.
- Cover page including name of Institute, industry, interns and report submission date.
- Approval page from the side of sponsoring industry.
- Acknowledgement
- Abstract
- Table of contents
- Chapter one: Introduction
    - Background of apprenticeship program
    - Introduction to industry, goal and organizational structure with role
    - Services of the construction industry/company
- Chapter two: Description of the construction industry/company
    - Industry/workshop layout
    - Departments/units with their functions
    - List of major tools and equipment with their functions
    - Material testing laboratories
- Chapter three: Practices on the construction industry/company
    - Basic and frequent practices
    - Special practices
    - Special technology found on industry/company
    - Major problems faced
- Chapter four: Conclusion and recommendation
    - Conclusion on attachment: practices, industry management and human behavior,problems and better terms.
    - Recommendation for industry: practices, industry management and human behavior,any other personnel opinion
- References if any
- Annexes: Logbook, drawings, photographs and so others.

Electrical Installation

Total Duration: 30 Weeks (1200 Hours)

S. N.	Task Statements/Projects	Time (Hrs.)		
		T	P	Tot
1.	Toolbox talks/ safety and first aid, tools, equipment and selection of electrical materials for the respective electrical job.		50	50
2.	Interpret architectural plan and electrical drawings. • Single Line Diagram • Layout Diagram • Connection Diagram		50	50
3.	Estimate the required materials, accessories needed to get the job done.		50	50
4.	Perform single phase Electrical Installation • Surface wiring ▪ Casing, Caping ▪ Conduit (HDPE, FRLS PVC) ▪ GI (Galvanized Iron) • Concealed wiring		400	400
5.	Perform three phase Electrical Installation • Surface wiring ▪ Casing, Caping ▪ Conduit (HDPE, FRLS PVC) ▪ GI (Galvanized Iron) ▪ Cable tray • Concealed wiring		200	200
6.	Perform repair and maintenance works of residential and commercial building.		100	100
6.	Perform laying and connection of LT cable and its testing. ▪ Overhead ▪ Underground		50	50
7.	Perform Earthing ▪ Rod Earthing ▪ Plate Earthing ▪ Chemical Earthing		50	50
8.	Connect single and three phase supply by using change over switch.		20	20

9.	Perform the Electrical Safety tests ▪ Insulation test ▪ Earth test ▪ Polarity test		30	30
10.	Install the solar panel, charge controller, battery and Inverter/ UPS as ▪ Main system ▪ Backup system		100	100
11.	Perform Telephone and Network Wiring ▪ Interpret wiring layout diagram ▪ CC camera installation ▪ Analog Telephone installation ▪ PABX/ IP telephone installation ▪ Internet connection ▪ Networking Switch and Circuit installation		100	100
	Total		**1200**	**1200**

Repair and maintenance of Electrical Appliances and Machines

Total Duration: 20 Weeks (800 Hours)

S. N.	Task Statements/Projects	Time (Hrs.)		
		T	P	**Tot**
1.	Toolbox talks/ safety and first aid, tools, equipment and selection of electrical materials for the respective electrical job.		30	30
2.	Interpret electrical drawings. • Connection Diagram • Development Diagram		30	30
3.	Repair and maintenance of household electrical appliances.		200	200
4.	Repair, maintenance and rewinding of single-phase motor.		150	150
5.	Repair, maintenance and rewinding of three-phase motor.		250	250
6.	Repair and maintenance of generator set.		50	50
7.	Repair, maintenance and rewinding of single-phase low voltage transformer.		40	40
8.	Repair and maintain Invertors, converters, solar panel, Battery, charge controller		50	50
	Total		**800**	**800**

Electrical Motor Installation and Control

Total Duration: 15 Weeks (600 Hours)

S. N.	Task Statements/Projects	Time (Hrs.)		
		T	P	Tot
1.	Toolbox talks/ safety and first aid, tools, equipment and selection of electrical materials for the respective electrical job.		30	30
2.	Interpret electrical drawings. • Connection Diagram • Control Circuit Diagram • Power Circuit Diagram		30	30
3.	Install DOL starter • Control from single place • Control from two places • Forward/ Reverse control		150	150
4.	Install star/delta starter • Manual • Semi- auto • Auto		170	170
5.	Install PLC controller		100	100
6.	Install VFD (Variable Frequency Drive) controller		20	20
7.	Install sequence motor controller		50	50
8.	Repair and maintenance of motor starters		50	50
	Total		**600**	**600**

Annex 1: Weekly Report (Logbook)

To be filled by apprentices regularly

Week…

Month:

S. No.	Date	Description of work	Sign of Industry Supervisor
1.			
2.			
3.			
4.			
5.			
6.			

Name of Supervisor: ……..

Sign of Supervisor: ……

Date: …….

Remarks by Supervisor: ……

Name of Internal Guide: ……..

Sign of Internal Guide: ……...

Weekly Summary

Duration From _____ To _____

Work/Task Assigned by the Supervisor: _____

_____

_____

_____

_____

_____

Learning Outcome: _____

_____

_____

_____

_____

_____

Remarks: _____

_____

Name of Supervisor: _____

Sigh of Supervisor: _____

Annex 2: Industry Practice Monitoring Tools

Monitoring Tools (For Industry/Company Purpose)

To be filled by the industrial Supervisor (In-company Trainer)/Roving Instructor/at the time of monitoring

Kindly refer to the mark scale provided below in assessing the performance of apprentices.

	Very Poor	Poor	Fair	Good	Very Good
Mark Scale	0	1	2	3	4

Evaluation Criteria	Score
1. Behavior and Attitude	32
1.1. Grooming/ Personal Appearance	…/4
1.2. Overall Attendance	…/4
1.3. Punctuality	…/4
1.4. Compliance to company Policies	…/4
1.5. Interest in work	…/4
1.6. Reliability and Accountability	…/4
1.7. Ability to cope	…/4
1.8. Acceptance of constructive criticisms and feedback	. ./4
2. Knowledge	8
2.1. Business knowledge/ General knowledge	…/4
2.2. Work ethics/ Professionalism	…/4
3. Skills	36
3.1. Problem-Solving	…/4
3.2. Interaction with the work environment (e.g. Supervisor, colleagues)	…/4
3.3. Appropriate interaction with clients/ External Parties	…/4
3.4. Oral Communication Skills	…/4
3.5. Written Communication Skills	…/4
3.6. Leadership	…/4
3.7. Team Work	…/4
3.8. Technical Skills (e.g. computer software, etc.)	…/4
3.9. Creative Thinking	.../4
4. Performance	24
4.1. Quality of work performed	…/4
4.2. Ability to prioritize multitasks	…/4

4.3. Initiative to learn	…/4
4.4. Ability to work independently	…/4
4.5. Commitment to work	…/4
4.6. Value-added contribution	…/4
Total Marks Obtained	…/100
Comments (if any):	
Name of Supervisor:	
Designation:	
Tel/ Mobile No:	
Signature:	
Date:	
Comments/Feedback/ Remarks From Internal Guide	
Name of Internal Guide:	
Sign of Internal Guide:	
Date filed:	

Monitoring Tools (For Training Institute/CTEVT Purpose)

To be filled by the Instructor /Training Coordinator/ /Principal/CTEVT Official at the time of monitoring.

Kindly refer to the mark scale provided below in assessing the performance of apprentices

	Very Poor	Poor	Fair	Good	Very Good
Mark Scale	0	1	2	3	4

Evaluation Criteria	Score
1. Behavior and Attitude	32
1.1. Grooming/ Personal Appearance	…/4
1.2. Overall Attendance	…/4
1.3. Punctuality	…/4
1.4. Compliance to company Policies	…/4
1.5. Interest in work	…/4
1.6. Reliability and Accountability	…/4
1.7. Ability to cope	…/4
1.8. Acceptance of constructive criticisms and feedback	.. /4
2. Knowledge	8
2.1. Business knowledge/ General knowledge	…/4
2.2. Work ethics/ Professionalism	…/4
3. Skills	36
3.1. Problem-Solving	…/4
3.2. Interaction with the work environment (e.g. Supervisor, colleagues)	…/4
3.3. Appropriate interaction with clients/ External Parties	…/4
3.4. Oral Communication Skills	…/4
3.5. Written Communication Skills	…/4
3.6. Leadership	…/4
3.7. Team Work	…/4
3.8. Technical Skills (e.g. computer software, etc.)	…/4
3.9. Creative Thinking	.../4
4. Performance	24
4.1. Quality of work performed	…/4
4.2. Ability to prioritize multitasks	…/4
4.3. Initiative to learn	…/4

4.4. Ability to work independently	…/4
4.5. Commitment to work	
4.6. Value-added contribution	…/4
Total Marks Obtained	/100

Comments (if any):
Name of Monitoring Official:
Designation:
Tel/ Mobile No:
Signature:
Date:
Comments/Feedback/from Training Coordinator/Principal:
Name of Training Coordinator/Principal:
Sign of Training Coordinator/Principal:
Date filed:

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9	Umesh Aryal		
10	Manoj Bhattarai		
11	Abhimannu Panthi		
12	Raj Kumar Thapa		
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