CURRICULUM

Pre-diploma in Civil Engineering

Building Construction

(Apprenticeship Model)

Council for Technical Education and Vocational Training
Curriculum Development and Equivalence Division
Sanothimi, Bhaktapur
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INTRODUCTION

This curricular program is designed to prepare the middle level competent Civil Engineering Technicians as **Assistant Sub-engineers**. They will be equipped with knowledge, skills and attitude of civil engineering discipline for that level, especially in the building construction sub-sector under it. They can provide services from various aspects in the growing infrastructure development industries (building construction companies, industries and consulting firms) government institutions (at the centre and local level), national as well as international non-governmental organisations or can benefit from self-employment.

Ministry of Education, Science and Technology of Nepal Government has implemented the letter grading system in School Education Examination (SEE) since 2072 B.S. The door of Pre-diploma curricular programme is open for those students who have appeared in the SEE examinations and achieved any GPA and grade in any subject. Aiming to target at such students, the curricular programs of TSLC of 29 months and 15 months have been converted into 18 months to make uniformity among different Pre-diploma curricular programs.

The council for Technical Education and Vocational Training (CTEVT) has been developing and implementing Pre-diploma level Apprenticeship curricular programs. The Apprenticeship training program is one of the distinct training modalities under the Enterprise-based curricular program. It is dual training system (DTS) and 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. It is also known as combined form of institute based training and industry based practice or industrial training curricular program. In addition, practice in an industry practice is also a means of instruction. 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 the manufacturing firms, service shops, business establishments, government agencies to the NGOs that employ the mid-level technical manpower that are trained by TVET institutions as well as colleges and universities to other types of training institutions.

> 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.'
>
> Apprenticeship is a form of vocational training in which the apprentice learns a trade or craft in dual system consisting of both schooling and 'training on the job' where they are generally an employee contract (Mincer, 1962).

This curricular program is designed for apprentices willing to specialize in Building construction under Civil Engineering curricular program. In this curricular program, the expected apprentices will learn basic knowledge and skills of civil engineering related courses and other core courses in technical schools or training institutes and learn the rest of knowledge and skills of the curricular program in related building construction companies or firms or industries. In addition, attitude of an apprentice is one of the important aspects of learning along with knowledge and skills for performing occupational competencies. The training, provided by the technical institutes or schools will be linked with the construction industries; will furnish the entire educational processes of the curricular program. The building construction companies or industries serve as the practice venues. The apprentices are expected to learn through the real world of work experiences in the actual building construction companies or industries. There will have the tripartite training agreement among apprentices, sponsoring industries and training institute for implementing this curricular program.

Rationale behind designing this curricular program is to acquire competencies by an apprentice through his/her engagement in hands-on practices (the real world of work experiences) as he/she involves in construction of all

components of buildings with emphasizing on the earthquake resistant building constructions and building services from the building construction related industries. It also allows an apprentice to involve in pre-and-post building construction phases. Furthermore, after certification such graduates will provide quality services especially in rural areas in building construction sub-sector.

This curricular program will be implemented as an apprenticeship model of learning. This program is based on practical exposure in different areas as required. In every subject/course, theoretical contents will be delivered and explained will be followed through demonstrations by the instructors and in all the tasks, apprentices will be asked to practice by themselves through do-it-yourself/hands-on practice so that they could internalize what they have learned in the institutes and related industries.

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 Civil Engineering with specialization in Building Construction (**Apprenticeship).

PROGRAM AIM

The aim of the program is to prepare middle level competent Civil Engineering Technicians as **Assistant Sub-engineers** in the field of Civil Engineering with specialization in Building Construction to serve at the related government offices and building construction industries or companies or firms in the Nepal and abroad.

PROGRAM OBJECTIVES

The program has following objectives to:

1. Provide simple planning, designing overseeing and maintaining services in the field of civil engineering especially in building construction sub-sector;
2. Supervise building construction works including earthquake resistant building construction perspectives in growing building infrastructure development industries, government institutions (centre and local level) as well as international non-governmental organisations;
3. Prepare municipal and details working drawings of simple residential and non-residential buildings and assist in preparing quantity estimate and abstract of cost of those simple buildings;
4. Conduct surveying for the construction of residential and non-residential buildings and simple civil construction works;
5. Prepare business plan for establishing small construction related production and service industries;
6. Reduce the dependence on employing such technicians from foreign countries; and
7. Create self-employment opportunities through linking learned skills to related construction works.

PROGRAMME DESCRIPTION

This curricular program is based on the job require to be performed by the middle level construction technician as **Assistant Civil Sub-Engineers** at different levels of public and private sectors infrastructures development related civil engineering building construction works in Nepal. This program includes various courses of civil engineering discipline including core courses of civil engineering such as Engineering Drawing, Construction Material, Construction Technology, Building Construction and Services, Surveying, Estimating and Costing and Computer Aided

Drafting. In addition, Applied Communication and Professionalism, Computer Application, and Entrepreneurship Development subjects are also offered here. Moreover, Building Construction and Services subject is offered here as specialization subject with emphasizing earthquake resistant building construction techniques. The expected apprentices will learn basic skills and knowledge in institutes and learn in-depth knowledge and skills at related building construction companies or industries through hands on practice at work places. Furthermore, workplace learning is envisioned in this type of technical educations.

PROGRAM DURATION

This course will be completed within 24 months after the enrolment in a formal setting. The total duration for the curricular program will be 3880 hours in the 24 months (2 years) of period. Pre-training phase (maximum 15 weeks), 78 weeks are allocated for industrial practice or workplace learning in related sponsored construction industries or companies and at the last phase of the whole curricular program, four weeks Block Release is allocated. The Block Release program is conducted at the Institute.

There will have the tripartite training agreement among apprentices, sponsoring industries and training institute for implementing this curricular program. The Agreement terms and conditions will be implemented and operated as based on the **Apprenticeship Training Operation Working Procedure, 2075 B.S**. for the whole training period.

The details of the course duration are as follows:

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)
• Construction Materials and Construction Technology	13 weeks (520 Hours)
• Building Construction and Services	28 weeks (1120 Hours)
• Engineering Surveying	10 weeks (400 Hours)
• Computer Application and Computer Aided Drafting	5 weeks (200 Hours)
• Estimating Costing and Supervision	9 weeks (360 Hours)

FOCUS OF CURRICULUM

This is a competency-based curriculum. This curriculum emphasizes on competencies performance. 80% time is allotted for performance and remaining 20% time is allotted for related technical knowledge. So, the main focus will be on performance of the specified competencies in this curriculum.

TARGET GROUP

The target group for this program will be all interested individuals who have passed School Education Examinations (SEE) or equivalent to SEE pass.

TARGET LOCATION

The target location will be all over Nepal.

GROUP SIZE

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

ENTRY QUALIFICATION

Entry qualification of the applicants for Pre-diploma in Civil Engineering with specialization in Building Construction curricular program should be SEE pass in any grade and any GPA obtained or SLC pass. S/he should have minimum of 16 years of age and fit physically for the curricular program or as per provisions mentioned in the admission guidelines of Office of the Controller of Examinations, CTEVT.

ENTRY CRITERIA

Individuals with following criteria will be eligible for this program:

- Should submit SEE or SLC pass certificates
- Should submit citizenship or birth registration certificate
- Should pass entrance examination as administered by CTEVT

SELECTION

Applicants fulfilling the entry qualification and entry criteria will be selected for admission on the basis of merit list. Furthermore, selected candidates should pass interview conducted jointly by the training institute and industry representatives. Finally, the applicants will be selected for admission on the merit basis of an aggregate mark of entrance test and interview.

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 Civil in Engineering
- Assistant Instructors should have Diploma in Civil Engineering
- Practical Assistant/Teaching Aide should have Pre-diploma in Civil 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 fulltime

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, Overhead transparencies, Slides 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; Illustrated Lecture, Panel Discussion, Demonstration, Simulation, Group work, Guided practice, Practical experiences, Fieldwork, Industrial practice, Report writing, Term paper presentation, Case analysis, Tutoring/coaching, Role-playing, Assignment, Heuristic, Project work and other Independent learning.

- 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 EDUCATION

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

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 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.

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 institute, threats or assaults to peers, faculty or staff will result in immediate suspension, followed by administrative review with possible expulsion.

PASS MARKS

The apprentices must secure minimum of 40% marks theory and 60% marks in practical. Moreover, the apprentices must secure minimum of 60% marks in all subjects separately those are allocated for Industrial practice.

GRADING SYSTEM

The grading system will be as follows:

Grading	**Overall marks**
Distinction	80% or above
First division	75% to below 80%
Second division	65% to below 75%
Third division	Pass aggregate to below 65%

CURRICULUM AND CREDITS

In this curriculum, each subject has its full marks and instructional hours; and instructional hours are divided into theory hours, practical hours and industrial practice hours.

CERTIFICATE REQUIREMENTS

The Council for Technical Education and Vocational Training, Office of the Controller of Examinations will award certificate of "**Pre-diploma in Civil Engineering with Specialization in**

Building Construction (Apprenticeship)" to those apprentices who gain a minimum mark of **60% in practical exam** and **40% in theoretical exam** in all subjects.
In addition, Industrial practice section has to be evaluated by keeping 1300 as full marks. The evaluation of the performance of the apprentice is to be carried out by the concerned construction **industry or company where the apprentice is placed and the CTEVT** unless otherwise directed by Office of the Controller of Examinations of the Council for Technical Education and Vocational Training. Here also the apprentice has to score 60% or above for successful completion of the curricular program.

CAREER PATH

The graduates will be eligible to work in the position of **Assistant Sub-engineer (Civil)** in the government related organizations as prescribed by the Public Service Commission or the concerned authorities of Federal Democratic Republic of Nepal.

GENERAL ATTITUDES REQUIRED

An apprentice should demonstrate 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 CIVIL ENGINEERING

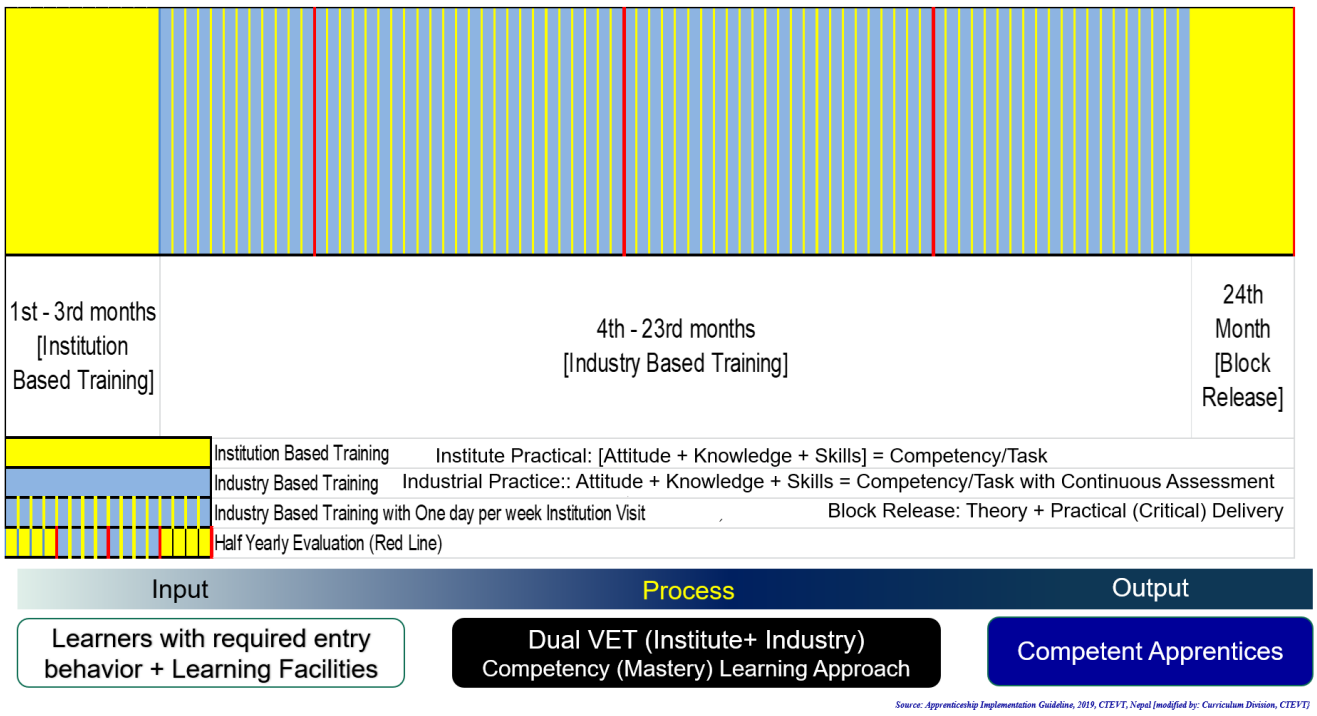
S. N	Subjects	Nature	Hours/ Week			Total Hours		
			T	P	Total	T	P	Total
A.	**Institute Based Training (3.5 Months/90 Working Days or 1 to 15 Weeks) for 15 Academic Weeks @40 Hours/Week**							
1.	Applied Communication and Professionalism	T+P			5	37	38	75
2.	Engineering Drawing	P			6	14	76	90
3.	Construction Materials and Construction Technology	T+P			8	52	68	120
4.	Building Construction and Services	T+P			8	40	80	120
5.	Engineering Surveying	T+P			6	25	65	90
6.	Estimating Costing and Supervision	T+P			5	22	53	75
7.	Computer Application and Computer Aided Drafting	T+P			2	7	23	30
	Total of A				**40**	**197**	**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.	Engineering Drawing	P			3	3	36	39
2.	Construction Materials and Construction Technology	T+P			6	22	56	78
3.	Building Construction and Services	T+P			12	59	97	156
4.	Engineering Surveying	T+P			5	11	54	65
5.	Estimating Costing and Supervision	T+P			3	12	27	39
6.	Computer Application and Computer Aided Drafting	T+P			5	13	52	65
7.	Entrepreneurship Development	T+P			6	30	48	78
	Total of B				**40**	**150**	**370**	**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.	Construction Materials and Construction Technology	P	(13 weeks)				520	520
2.	Building Construction and Services	P	(28 weeks)				1120	1120
3.	Engineering Surveying	P	(10 weeks)				400	400
4.	Estimating Costing and Supervision	P	(9 weeks)				360	360
5.	Computer Application and Computer Aided Drafting	P	(5 weeks)				200	200
	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 year.*

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.	Engineering Drawing	P	17	112	129		75	75
3.	Construction Materials and Construction Technology	T+P	74	124	198	50	75	125
4.	Building Construction and Services	T+P	99	177	276	50	125	175
5.	Engineering Surveying	T+P	36	119	155	25	75	100
6.	Estimating Costing and Supervision	T+P	34	80	114	25	50	75
7.	Computer Application and Computer Aided Drafting	T+P	20	75	95	15	35	50
8.	Entrepreneurship Development	T+P	30	48	78	20	30	50
	Total (A+B)		**345**	**775**	**1120**	**210**	**490**	**700**
C.	**Industry Practice (93 Weeks Minus 28 Weeks) for 65 Academic Weeks@40 Hours/Week**							
1.	Construction Materials and Construction Technology	P		1120	1120		550	550
2.	Building Construction and Services	P		520	520		250	250
3.	Engineering Surveying	P		400	400		200	200
4.	Estimating Costing and Supervision	P		360	360		200	200
5	Computer Application and Computer Aided Drafting	P		200	200		100	100
	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)		**425**	**3455**	**3880**	**210**	**1790**	**2000**

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


Conceptual Framework of Apprenticeship Model
1st - 3rd months [Institution Based Training]
4th - 23rd months [Industry Based Training]
24th Month [Block Release]
Institution Based Training
Institute Practical: [Attitude + Knowledge + Skills] = Competency/Task
Industry Based Training
Industrial Practice:: Attitude + Knowledge + Skills = Competency/Task with Continuous Assessment
Industry Based Training with One day per week Institution Visit
Block Release: Theory + Practical (Critical) Delivery
Half Yearly Evaluation (Red Line)
Input
Process
Output
Learners with required entry behavior + Learning Facilities
Dual VET (Institute+ Industry) Competency (Mastery) Learning Approach
Competent Apprentices
Source: Apprenticeship Implementation Guideline, 2019, CTEVT, Nepal [modified by: Curriculum Division, CTEVT]

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 to 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	2

Units	Topics	Contents	Time (Hrs.)
		1.4.1 Likes/dislikes 1.4.2 Hopes/wishes 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
३	**नेपाली संचार**		**८ घण्टा**
		३.१प्राविधिकशब्दहरु	१ घण्टा
		३.२ बोधअभिव्यक्ति	१ घण्टा
		३.३ अनुच्छेद लेखन	१ घण्टा
		३.४ पत्रलेखन: क. व्यापारिक पत्र ख. निवेदनपत्र ग. व्यक्तिगतविवरण (बायोडाटा) लेखन	२ घण्टा
		३.५ निबन्ध लेखन	१ घण्टा
		३.६ कार्य प्रतिवेदन लेखन	१ घण्टा
		३.७ भौचर लेखन	१ घण्टा
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	1

Units	Topics	Contents	Time (Hrs.)
		4.4.3 Technique to improve creative thinking skills.	
5	**Stress and Time Management**		**3 Hrs.**
		5.1 Stress Management 5.1.1 Definition of stress 5.1.2 Causes and consequences of stress 5.1.3 Stress management techniques	2
		5.2 Time Management 5.2.1 Meaning 5.2.2 Time wasters 5.2.3 Effective time management strategy	1
6	**Team work 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 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 अभ्यासकाआधारमाकार्य प्रतिवेदन लेख्नुहोस । ३.६. बैंक भौचरको नमूना तयार पार्नुहोस् ।	**6**
4	4.1 Demonstrate and show the self-motivate people's behaviors in class room. 4.2 Demonstrate and show the positive and negative attitudes peoples behave in class room. 4.3 Take decision using decision making process on given problems by class teacher. 4.4 Perform the creativity skill on class room on the given situation.	**8**
5	5.1 Apply the stress management techniques in class room. 5.2 Apply the time management techniques in class room.	**4**

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

References:

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.

ENGINEERING DRAWING

Total: 129 hours
Theory: 17 hours
Practical: 112 hours

Course Description:
This course is designed to impart basic knowledge and skills on technical and building drawings. It especially provides skills on Fundamentals of drawing along with handling tools for preparing drawings, drawing free hand sketches, different technical drawings, building drawings and coping of drawings. It also includes bar-bending schedules and door and window openings.

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

1. Illustrate significance of engineering drawing in the construction sectors;
2. Identify various drawing tools and instruments;
3. Apply lettering and dimensioning techniques;
4. Describe the scale, its type and construction;
5. Draw various geometrical figures;
6. Draw the different oblique and orthographic projections;
7. Draw detailed drawings of simple residential and non-residential buildings; and
8. Read and interpret various construction drawings;

Section A: Institute Based Training (15 Academic Weeks)

Module I: Technical Drawings

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Handle basic drawing tools/instruments.	**Drawing tools and instruments:** ▪ Definition, importance and use of drawing ▪ Tools & instruments use in drawing ▪ Handling techniques of drawing tools and instruments	1.0	2	3.0
2.	Prepare drawing sheet with title block.	**Drawing sheet with title block:** ▪ Drawing sheets and their standard sizes ▪ Annotation (letter size, types, measuring units) ▪ Border lines and title blocks	0.5	2	2.5
3.	Draw free hand sketches.	**Sketch & sketching techniques of different figures**: ▪ Different figures	0.5	2	2.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		• Straight lines (horizontal, vertical and inclined) • Circles • Arcs & curves ▪ Uses of freehand sketches ▪ Difference between drawing & sketch			
4.	Apply different scales.	**Drawing scale:** ▪ Types of scales; Plain and diagonal, Reducing and Enlarging scale and vice-versa ▪ Representative Fraction ▪ Different types of measuring systems and its conversions	0.5	2	2.5
5.	Draw different types of lines.	**Drawing lines:** ▪ Different types of lines and symbols: Outlines, Dashed lines, Center line, dimension line, extension line, hatching/section line, Leader/Pointer lines, Cutting-Plane lines, Boarder line, Long and short break line and their uses ▪ Line thickness	1.0	2.0	3.0
6.	Write English letter/ numbering script.	**Letter and numbering script:** ▪ Different lettering; Single-stroke letters & their writing rules ▪ Essential features of lettering	0.5	2	2.5
7.	Construct different regular geometrical figures (rectangle/ square/ triangles/ parallelogram/ rhombus/circle).	**Regular geometrical figures:** ▪ Angle & their types ▪ Triangle & their types ▪ Quadrilaterals & their types	0.5	6	6.5
8.	Construct regular polygons. (Pentagon/Hexagon/Heptagon /Octagon)	**Regular polygons:** ▪ Regular polygon & their types. ▪ Construction methods	0.5	4	4.5
9	Bisect a straight line	**Bisection of straight lines:** ▪ Introduction ▪ Procedure of bisection			

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
10.	Divide a straight line into equal parts.	**Straight lines division:** ▪ Introduction ▪ Procedure of division of straight line into equal parts	1	10	11
11.	Bisect / divide an angle.	**Bisection of angle:** ▪ Angles & their types ▪ Procedure of bisection of an angle			
12.	Bisect circular arc.	**Bisection of circular arc:** ▪ Different engineering curves ▪ Procedure of bisection of circular arc			
13.	Locate the center point of a circular arc.	**Location of center point:** ▪ Procedure of locating center point of a circular arc			
14.	Draw a parabola.	**Parabola:** ▪ Construction procedure of parabola ▪ Tangent, rectangle, offset method	0.5	3	3.5
15	Draw an ellipse.	**Ellipse:** ▪ Concept of conic sections ▪ Concentric circle & Arc of circle methods	0.5	3	3.5
16.	Dimension the drawing.	**Dimensioning:** ▪ Introduction ▪ Dimension types ▪ Procedure for dimensioning	0.5	2	2.5
17.	Draw orthographic projection of simple objects. (I & III angles projection)	**Orthographic projection** ▪ Introduction ▪ Projection & their types ▪ Methods of orthographic projection (I & III angle projection) ▪ Glass box (Projection box)	0.5	4	4.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
18.	Draw isometric views.	**Isometric projection:** ▪ Introduction ▪ Isometric scale ▪ Process of preparation of isometric drawing ▪ Free hand sketch of isometric views	0.5	4	4.5
19.	Draw sections.	**Sectioning:** ▪ Introduction ▪ Cutting plane or section plane ▪ True shape of a section ▪ Section lines	0.5	3	3.5
	Sub-total I		**9**	**51**	**60**

Module II: Building Drawings

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Draw plan of simple buildings (Single storied two roomed building).	**Plan of building:** ▪ Introduction ▪ Types of buildings ▪ Standard sizes of rooms ▪ Location of rooms ▪ Plinth area of building ▪ Openings in building ▪ Dimensioning & their rules	1.0	3.0	4.0
2.	Draw elevations of simple building (Single storied two roomed building).	**Elevations of building:** ▪ Different elevations ▪ Flat & sloped roof elevations ▪ Position of elevations in drawing sheet ▪ Method of drawing elevation from plan	0.5	3.0	3.5
3.	Draw section of simple building (Single storied two roomed building).	**Sections of building:** ▪ Introduction ▪ Section plan in building plan ▪ G.L., P.L., D.PC. Sill level, lintel level, sun shade/ chhajjah, walls, roof, & its type roof covering	1.0	4.5	5.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Symbols used for wall, concrete, timber, glass, sections			
4.	Prepare site plan.	**Site plan** ▪ Introduction ▪ Necessity ▪ Elements to be shown in the site plan ▪ Scale & orientation of site plan ▪ Composition of drawing	0.5	2	2.5
5.	Prepare location plan.	**Location plan:** ▪ Introduction ▪ Necessity ▪ Technique of showing north direction ▪ Showing road & other important features ▪ Use of symbols	0.5	2	2.5
6.	Draw trench / foundation plan.	**Foundation plan:** ▪ Introduction ▪ Types ▪ Procedures to draw trench / foundation plan	0.5	3	3.5
7.	Draw floor plans.	**Roof plan:** ▪ Introduction ▪ Types ▪ Slope on roof ▪ Symbols used for sloped roofs & terraces	0.5	3	3.5
8.	Draw building details. (door/ window/ roof truss)	**Building details:** ▪ Necessity of detail drawing ▪ Scale used in detailed drawing ▪ Showing detailed drawing of door and window frame, shutter, and roof truss	0.5	4.5	5.0
	Sub-total II		**5**	**25**	**30**
	Total (Sub-total I +Sub-total II)		**14.0**	**76.0**	**90**

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

Module I: Detail Drawings of Building and Septic Tank

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot.
1.	Draw plan/elevation/ section of staircase.	**Staircase drawing:** ▪ Types of staircase ▪ Merits & demerits of different types of staircases ▪ Essential features of staircase	0.5	6	6.5
2.	Draw steel-bar diagram /schedule.	**Steel bar diagram:** ▪ Important of bar bending schedule ▪ Thumb rule for calculation of steel bars ▪ Spacing & diameter of steel bars ▪ Process of preparation of bar bending diagram	0.5	4	4.5
3.	Prepare doors/windows opening schedule.	**Opening schedule:** ▪ Importance ▪ Format of opening schedule ▪ Selection of sizes and types of door, windows, ventilation &other openings	0.5	3	3.5
4.	Draw septic tank/ soak pit.	**Septic tank drawing:** ▪ Introduction ▪ Functions ▪ Location ▪ Design criteria	1	6	7
5.	Draw plan/ elevation/ section/ location plan/ site plan of a 2-storied 4-roomed residential building.	**Building design:** ▪ Concept of design ▪ Design criteria	0.5	17	17.5
	Total I		**3**	**36**	**39**

Textbooks:

1. Civil Engineering Drawing; Gurcharan Singh, Standard Publishers distributers.

References:

1. Sushil Kumar; Building Construction, Standard Publishers Distributers.
2. Dr.B.C. Punmia, A.K.Jain, Arun Kr. Jain, Building Construction, Laxmi publication.
3. W.B. McKay, Building construction, Vols. I – IV, ELBS, LONGMAN.

4. **"**Building Drawing with an Integrated Approach to Build Environment" by Shah, Tata McGraw-Hill Education Pvt. Ltd.
5. Building Planning and Drawing", S S Bhavikatti and M V Chitawa, I K International Publishing House Pvt. Ltd.
6. Luzzadar W. I Fundamental of Engineering drawing. Prentice-Hall of India.
7. N. D. Bhatta and Panchal V.M. Engineering Drawing Charotar Publishing House India.
8. M. B. Shah and B.C. Rana, Engineering Drawing, Pearson India.

CONSTRUCTION MATERIALS AND CONSTRUCTION TECHNOLOGY

Total: 198 hours
Theory: 72 hours
Practical: 126 hours

Course Description:
This course consists of two parts. The first part intends to provide basic knowledge on various construction materials. It includes sources, quality and selection of various construction materials like stones, bricks, aggregates, lime, cement, steel, glass, plastic etc. In addition, this course also helps the students in acquainting knowledge on the locally available construction materials so that apprentices can apply the concept of low-cost construction technique, especially in rural area.
Similarly, the second part of this course is designed to provide knowledge and skills on foundation of civil engineering works in building construction. This course emphasizes on basic concept and techniques of masonry work, concreting work, bar-bending work, and joining work of wood. Moreover, Sector wise occupational safety and health component is also included here.

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

1. Enlist various construction materials used and available in Nepal;
2. Describe significance and uses of various construction materials;
3. Prepare various types of mortars;
4. Enforce occupational safety and health provisions in construction work;
5. Perform laboratory testing of various material;
6. Apply concrete batching, mixing, transportation and pouring techniques;
7. Construct stone, brick and hollow block masonry walls;
8. Apply timber measuring, marking and wooden joinery construction techniques; and
9. Perform bar-bending, bar-binding and for beams, columns, slabs and various RCC bands with stirrups considering development length.

Section A: Institute Based Training (15 Academic Weeks)
Part 1: Construction Materials
Module I: Construction Materials

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Identify various construction materials used in Nepal (traditional & modern construction materials)	**Construction materials:** ▪ Mud ▪ Stones ▪ Aggregate; Sand and Gravel ▪ Cement ▪ Water ▪ Lime ▪ Plastic ▪ Glass ▪ Asbestos Sheet ▪ Fiberglass/sheet ▪ Blocks	3	2	5

		▪ Bricks ▪ Steel ▪ Rebar ▪ Aluminium ▪ Timber ▪ Plywood ▪ Artificial wood ▪ Bamboo and cane ▪ Roofing materials (***Khar***, Straw, Slate, ***Khapada***, Tiles, Corrugated Galvanized Iron CGI sheet) ▪ Partition blocks/boards			
2.	Describe stone as construction material.	**Stones:** ▪ Introduction ▪ Source; River boulders, Stone Quarry ▪ Characteristics of good building stones ▪ Selection and use of stones for various construction according to shape ▪ Dressing, seasoning and stacking (Extraction and preparation for use)	2		2
3.	Describe aggregates as construction material.	**Aggregates:** ▪ Introduction ▪ Uses ▪ Classification; according to nature of formation, size, shape and texture ▪ Gradation of aggregate	2		2
4.	Describe bricks as construction material.	**Bricks:** ▪ Introduction ▪ Composition ▪ Manufacturing; Soil/mortar preparation, Molding, Drying, Burning ▪ Brick types and their uses ▪ Machine made and locally made bricks and their sizes	2		2
5.	Describe tiles as construction material.	**Tiles:** ▪ Introduction ▪ Soil preparation, Molding, Drying, Burning of tiles ▪ Types of tiles	1		1
6.	Describe Hollow block as a construction material.	**Hollow blocks:** ▪ Introduction ▪ Composition	1		1

		▪ Forms and sizes ▪ Types; Concrete, Clay ▪ Test (Concept only)			
7.	Describe lime as a construction material.	**Lime:** ▪ Introduction ▪ Types ▪ Uses ▪ Manufacturing process ▪ Setting time of lime ▪ Storage	2		2
8.	Describe cement as construction material.	**Cement:** ▪ Introduction ▪ Composition ▪ Manufacturing process ▪ Types ▪ Properties ▪ Setting time of cement ▪ Compressive strength, tensile strength and consistency ▪ Storage	2		2
9.	Describe asbestos as a construction material	**Asbestos:** ▪ Introduction ▪ Types of asbestos ▪ Properties ▪ Health hazards	1		1
10.	Describe glass as a construction material	**Glass:** ▪ Introduction ▪ Composition ▪ Classification ▪ Commercial forms	1		1
11.	Describe tar/bitumen/asphalt as construction materials.	**Tar/Bitumen/Asphalts:** ▪ Introduction ▪ Types ▪ Uses	0.5		0.5
12.	Describe paints/varnishes.	**Paints/Varnishes:** ▪ Definition ▪ Functions ▪ Classification and uses ▪ Composition ▪ Characteristics of good paints/varnishes	1.5		1.5
13.	Describe CGI sheet as a construction material.	**CGI sheet** ▪ Introduction ▪ CGI sheets ▪ Gauge of CGI sheet	1		1
14.	Describe reinforcing steel (Rebar) as construction materials	**Reinforcing steels:** ▪ Introduction ▪ Types	1		1

		▪ Properties ▪ Uses ▪ Commonly available reinforcement bar			
15.	Describe bamboo/cane.	**Bamboo/Cane:** ▪ Introduction ▪ Types ▪ Uses ▪ Common types used in constructional purposes	1		1
16.	Describe aluminium as a construction material	**Aluminium:** ▪ Introduction ▪ Types ▪ Uses	1		1
17.	Describe timber as a construction material.	**Timber:** ▪ Introduction ▪ Structure [cross section] of a tree ▪ Felling of trees ▪ Objective and methods of seasoning ▪ Timber defects and decaying ▪ Plywood and block board	2		2
	Sub-total I		**25**	**2**	**27**

Part II: Construction Technology

Module II: Occupational Safety and Health

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Use personal protective equipment (PPE).	**Personal protective equipment (PPE):** ▪ Introduction ▪ General provisions ▪ Types • Safety helmet • Clear or colored goggles • Protective gloves or gauntlets • Foot wares an appropriate type • Respiratory protective equipment • Safety harnesses • Life vests • Life preservers	1	1	2

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		• Reflective devices ▪ Methods of using PPEs			
2.	Apply workplace safety measures.	**Workplace safety measures:** ▪ Introduction ▪ General provisions ▪ Fire prevention and firefighting ▪ Lighting ▪ Signaling ▪ Work at heights ▪ Work over water ▪ Prevention against falls of materials, persons and collapse of structures ▪ Housekeeping ▪ Prevention of unauthorized entry ▪ Safety sins and notices	1		1
3.	Apply tools/equipment safety measures.	**Tools and equipment safety measures:** ▪ Introduction ▪ General provision ▪ Hand tools ▪ Equipment ▪ Construction machines	1		1
4.	Enforce electrical safety measures.	**Electrical safety measures:** ▪ Introduction ▪ General provision ▪ Regular inspection and maintenance ▪ Testing of electrical installations, machines, equipment, devices, apparatus and earth leakage	1		1
5.	Apply health hazards safety measures.	**Health hazards safety measures:** ▪ Introduction ▪ General provision ▪ Hazardous substances ▪ Dangerous atmosphere ▪ Radiation hazards ▪ Heat stress, cold and wet conditions ▪ Noise and vibration ▪ Biological agents	1		1
6.	Apply simple first aid treatment.	**First aid treatment:** ▪ Introduction	1.5	2	3.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ General provision ▪ Importance ▪ First aid for: • Bleeding • Burns • Fractures • Sprains • Nose bleeds • Fort bite • Bee stings • Snake bite • Drowning • Cardiac arrest ▪ First aid kit includes • Bandages, roller bandages and tape • Sterile gauze • Antiseptic wipes and swabs • Absorbent compresses • Antibiotic cream • Burn ointment • Mask for breathing (rescue breathing/CPR) • Chemical cold pack • Eye shield and eyewash • First aid reference guide that includes local phone number ▪ First aid procedures			
7.	Ensure occupational health services.	**<u>Occupational health services:</u>** ▪ Introduction ▪ General provision ▪ Various health services	0.5		0.5
8.	Ensure welfare services.	**<u>Welfare services:</u>** ▪ Introduction ▪ General provision ▪ Drinking water ▪ Sanitary facilities ▪ Washing facilities ▪ Cloakroom ▪ Facilities for food and drinks ▪ Shelter ▪ Living accommodations	1		1

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
	Sub-total II		**8**	**3**	**11**

Module III: Mortars

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Prepare mud mortar.	**Mortar:** ▪ Definition ▪ Types **Mud mortar:** ▪ Importance ▪ Uses ▪ Essential ingredients ▪ Batching and mixing procedure ▪ Importance of occupation health and safety ▪ Uses of personal Protective Equipment (PPE)	1	1	2
2.	Prepare lime sand mortar.	**Lime sand Mortar:** ▪ Importance ▪ Uses ▪ Ingredients and their ratio ▪ Batching and mixing: • Water Cement Ratio; Preparation; Batching, Mixing, Transporting and Placing ▪ Batching and mixing procedure	1	1	2
3.	Prepare cements and mortar.	**Cement sand mortar:** ▪ Importance ▪ Uses ▪ Ingredients and their ratio ▪ Batching and mixing: • Water Cement Ratio; Preparation; batching, Mixing, Transporting and Placing ▪ Ratio of mortar for different works ▪ Curing processes ▪ Batching and mixing procedure	1	2	3
		Sub-total III	**3**	**4**	**7**

Module VI: Plain Cement Concrete

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Batch cements concrete ingredients.	**Cement Concrete:** ▪ Definition ▪ Types ▪ Ingredients and their ratio ▪ Grade of concrete (M15, M20, and M25) **Batching** ▪ Definition ▪ Importance ▪ Types ▪ Procedure	1	1	2
2.	Prepare cement concrete.	**Cement concrete preparing:** ▪ Types of mixing ▪ Advantages of machine mixing ▪ Workability and strength of concrete ▪ Procedure	0.5	1	1.5
4.	Place /compact concrete.	**Concrete placing:** ▪ Method of pouring concrete ▪ Concrete level marking (using pipe level) ▪ Methods of vibrations ▪ Types and use of vibrators	0.5	1	1.5
5.	Perform curing	**Curing:** ▪ Meaning and importance of curing ▪ Types of curing ▪ Duration of curing ▪ Effects of climate in curing	0.5	0.5	1.0
	Sub-total IV		**2.5**	**3.5**	**6**

Module V: Stone Masonry

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Identify stone masonry walls.	**Masonry:** ▪ Definition ▪ Types: Random Rubble, Rubble, Ashlar and Dry ▪ Application	1	1	2

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
2.	Dress the face/bond corner stone for rubble/ashlar masonry works.	**Dressing:** ▪ Definition ▪ Types of dressing: Chisel and hammer dressing ▪ Purpose of dressing works ▪ Requirement of good corner stone for random rubble/ ashlar masonry works ▪ Dressing procedure	0.5	4	4.5
3.	Identify different walls.	**Wall structure:** ▪ Introduction ▪ Types of wall; External wall, Internal wall, partition wall, Load bearing and non-load bearing wall, Retaining wall, Cavity wall, Boundary wall, Screen Wall	1	2	3
4.	Handle level pipe/spirit level/plumb bob/mason thread.	**Tools and equipment handling:** ▪ Importance and use of level pipes, spirit levels and plumb bob and mason thread ▪ Handling procedures	0.5	1.5	2.0
5.	Build rubble/ashlar stone masonry footing with seismic bands.	**Stone Masonry:** ▪ Definition ▪ Types ▪ Importance ▪ Uses ▪ Use of Corner, Bond, Face and Filler stones ▪ Leveling the wall ▪ Joints and thickness ▪ Use of vertical reinforcement ▪ Use of corner stitches ▪ Procedure for stone laying down	1	3	4
6.	Build L shaped rubble/Ashlar stone masonry wall in cement/ lime/mud mortar with seismic bands.	**L shaped rubble/ashlar masonry:** ▪ Types of mortar ▪ Leveling the wall ▪ Joints and thickness ▪ Strength of mortar ▪ Use of vertical reinforcement ▪ Use of corner stitches ▪ Strength of mortar	1	3	4

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Procedure for stone laying down			
7.	Build T shaped rubble/Ashlar stone masonry wall in cement/ lime/mud mortar with seismic bands.	**T shaped rubble/ashlar masonry:** ▪ Joints and thickness ▪ Bonding of stones ▪ Use of vertical reinforcement ▪ Use of Dowel bars and stirrups ▪ Use of corner stitches ▪ Strength of mortar ▪ Procedure for stone laying down	1	4	5
8.	Build cross shaped rubble/Ashlar stone masonry wall in cement/ lime/mud mortar with seismic bands.	**Cross shape rubble/ashlar masonry:** ▪ Joints and thickness ▪ Bonding of stones ▪ Use of vertical reinforcement ▪ Use of Dowel bars and stirrups ▪ Use of horizontal bands ▪ Strength of mortar ▪ Procedure for stone laying down	0.5	5	5.5
		Sub-total V	**6.5**	**23.5**	**30**

Module VI: Brick and Block Masonry

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Identify brick masonry walls.	**Brick Masonry:** ▪ Definition ▪ Types of brick bond • Stretcher • Header • English • Flemish ▪ Brick bonding rules ▪ Brick bonding requirements ▪ Joints ▪ Application	1	1	2
2.	Cut the brick bats/closers.	**Brick bats:** **Footing:** ▪ Definition	1	1	2

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Importance **Seismic Bands:** ▪ Importance ▪ Function of ▪ Types: Foundation band, Sill, Lintel band, Plinth band, Roof band and Gable band			
3.	Construct brick masonry footing with seismic bands.	**<u>Brick masonry footing:</u>** ▪ Definition of terms: Half bat, 3/4 bat, beveled closer, king closer, queen closer, mitered closer and bull nose ▪ Use of bats and closers ▪ Methods of preparing Half bat, 3/4 bat, beveled closer, king closer, queen closer, mitered closer, bull nose ▪ Procedure for brick laying down	0.5	3.0	3.5
4.	Build L-shaped brick/concrete block wall using stretcher bond in cement/lime/mud mortar with seismic band.	**<u>L shaped brick/block masonry:</u>** ▪ Importance and use of level pipes, spirit levels and plumb bob and mason thread ▪ Method of discontinue the joints in stretcher bond ▪ Use of horizontal bands ▪ Use of 3,4,5 method to get L shape ▪ Method of discontinue the joints in corner joint in stretcher bond ▪ Use of corner band ▪ Procedure for brick/block laying down	0.5	3.0	3.5
5.	Build T shaped brick/block wall using stretcher bond in cement/lime/mud mortar with seismic band.	**<u>T shaped brick/block masonry:</u>** ▪ Use of 3,4,5 method to get T shape ▪ Method of discontinue the joints in T joint in stretcher bond ▪ Use of horizontal bands ▪ Alternative layers in T shaped stretcher bond ▪ Procedure for brick/block laying down	0.5	3.0	3.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
6.	Build Crossed brick/block wall using stretcher bond in cement/lime/mud mortar with seismic band.	**Cross shaped brick/block masonry:** ▪ Use of 3,4,5 method to get Cross shape ▪ Method of discontinue the joints in cross joint in stretcher bond ▪ Use of horizontal bands ▪ Importance of crossed wall ▪ Procedure for brick/block laying down	0.5	3.0	3.5
7.	Build L-shaped brick wall using English bond in cement/ lime/ mud mortar with seismic band.	**L shaped English bond brick masonry:** ▪ Use of 3,4,5 method to get L shape ▪ Use of Queen closer ▪ Method of discontinue the joints in English bond ▪ Use of corner band and vertical bars ▪ Procedure for brick laying down	0.5	3.0	3.5
8.	Build T shaped brick wall using English bond in cement/ lime/ mud mortar with seismic band.	**T shaped English bond brick masonry:** ▪ Use of 3,4,5 method to get T shape ▪ Use of horizontal bands ▪ Alternative layers in T shaped English bond ▪ Procedure for brick laying down	0.5	3.0	3.5
9.	Build crossed brick wall using English bond in cement/lime/mud mortar with seismic band.	**Cross shaped English bond brick masonry:** ▪ Use of 3,4,5 method to get cross shape ▪ Use of horizontal bands ▪ Importance of crossed Wall ▪ Use of horizontal and vertical bands ▪ Procedure for brick laying down	0.5	3.0	3.5
10.	Build an L shaped brick wall using Flemish bond in cement/ lime/ mud mortar with seismic band.	**L shaped Flemish bond brick masonry:** ▪ Use of 3,4,5 method to get L shape ▪ Use of Queen closer ▪ Method of discontinue the	0.5	3.0	3.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		joints in Flemish bond ▪ Use of corner band and vertical bars ▪ Procedure for brick laying down			
11.	Build T shaped brick wall using Flemish bond in cement/ lime/ mud mortar with seismic band.	**T shaped Flemish bond brick masonry:** ▪ Use of 3,4,5 method to get T shape ▪ Use of horizontal bands ▪ Alternative layers in T shaped Flemish bond ▪ Procedure for brick laying down	0.5	3.0	3.5
12.	Build crossed brick wall using Flemish bond in cement/lime/mud mortar with seismic band.	**Cross shaped Flemish bond brick masonry:** ▪ Use of 3,4,5 method to get cross shape ▪ Use of horizontal bands ▪ Importance of crossed Wall ▪ Use of horizontal and vertical bands ▪ Procedure for brick laying down	0.5	3.0	3.5
	Sub Total		**7**	**32**	**39**
Total (Sub-total I+ Sub-total II+ Sub-total III+ Sub-total IV+ Sub-total V + Sub-total VI)			**52**	**68**	**120**

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

Part 1: Construction Technology
Module I: Bar Bending (Reinforcement Bar)

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Identify commonly available reinforcements.	**Commonly available reinforcement:** ▪ Needs of Reinforcement in construction, ▪ Types of steel reinforcements ▪ Strength of different steel reinforcements ▪ Identification of different reinforcements	0.5	1	1.5
2.	Identify/enumerate/handle	**Tools and equipment used bar**	0.5	1	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
	tools and equipment.	**bending:** ▪ Identification and enumeration of different tools and equipment ▪ Uses of tools and equipment ▪ Tools and equipment handling technique ▪ Maintenance and record keeping of tools			
3.	Measure lengths of different steel bars /calculate weights.	**Length and weight measurement:** ▪ Different measurement units used in steel fixing ▪ System of measurements ▪ Standard weights and standards sizes of steel bars ▪ Recoding method of measurement of steel bar and their corresponding weights	0.5	0.5	1.0
4.	Make a steel working/bar bending bench.	**Bar bending bench:** ▪ Work bench, its components and their dimensions ▪ Characteristics of a work bench for steel fixer ▪ Working area for a steel fixer and the position of work bench along with stacking of prepared steel	0.5	1	1.5
5.	Cut Rebar in given various lengths.	**Rebar cuttings:** ▪ Cutting techniques of steel bars using local techniques ▪ Measurement and marking techniques on steel bars of various sizes ▪ Cutting techniques using cutting machines ▪ Working team spirit with required numbers of coworkers in cutting steel bars ▪ Storage of cut steel bars systematically in separate groups ▪ Safety precautions	0.5	1	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
6.	Cut the binding wire bundle into required length for the purpose of binding steel bars.	**Binding wire cuttings:** ▪ Minimum size of purpose of binding the steel bars together ▪ Calculation of double lengths of cut wire to be used in binding ▪ Cutting techniques using cutting machines ▪ Alternative method of binding steel bars together ▪ Storage of cut binding wires in a proper place ▪ Safety precautions	1.0	0.5	1.5
7.	Straighten supplied Rebars into straights.	**Rebar straightening:** ▪ Concept of straightening folded bars ▪ Use of bending keys one opposite other in opposite direction to straighten ▪ Team working spirit ▪ Procedure ▪ Safety precautions	0.5	1	1.5
8.	Bend Rebars.	**Rebar bending:** ▪ Types of different bends used in steel re bars for construction ▪ Methods of calculation of bend lengths of different bends ▪ Checking of bent shape and sizes on a template made from steel props ▪ Techniques of bending steel re bars Safety precautions	0.5	1	1.5
9.	Interpret bar bending schedule.	**Bar bending schedule:** ▪ Purpose of bar schedule ▪ Elements of a bar schedule ▪ Bar schedule as a summary of structural steel ▪ Meaning of bar marks Shape of bends and their total lengths	0.5	1.0	1.5
10.	Interpret structural drawings.	**Structural drawing:** ▪ Plan, elevation, sections in structural drawing	0.5	1.0	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Purpose of Bars marks in drawing ▪ Bars in sectional plan and elevations ▪ Spacing notation in drawing Types of bars used in various structural members			
11.	Bend Rebars for lapping in different positions in beam/ column/ slab.	**Rebar bending:** ▪ Necessity of lapping ▪ Lap lengths calculation of re bars for both tension and compression zone ▪ Use of bending key in making lap length ▪ Safety precaution Procedure	0.5	1.0	1.5
12.	Prepare stirrups of different size and shape.	**Stirrups preparing:** ▪ Functions of stirrups, ▪ Types of stirrups ▪ Shape and steel used for preparing stirrups ▪ Measuring steel bars and marking for bends ▪ Bending and finishing stirrups ▪ Safety precaution Procedure	0.5	1.0	1.5
13.	Bind stirrups on column/ beam Rebars.	**Stirrups binding:** ▪ Functions of stirrups, ▪ Calculation of spacing of stirrups on a column or a beam ▪ Read a structural drawing to see stirrups and their sizes and spacing ▪ Hooks of stirrups and their functions ▪ Safety precaution ▪ Procedure	0.5	1.0	1.5
14.	Fix cranked Rebars in beams.	**Rebar cranking:** ▪ Types of bars in a beam ▪ Functions of cranked bars ▪ Types of cranked bars, ▪ Hooks in main bars / u turn bend sin main bars ▪ Team work while placing cranked bars	0.5	1.0	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Safety precaution ▪ Procedure			
15.	Prepare chairs and legs for columns.	**Chairs and legs preparing:** ▪ Functions of chairs in reinforcement ▪ Types and sizes of chairs ▪ Re bars in columns, ▪ Functions of column bar legs ▪ Safety precaution ▪ Procedure	0.5	1.0	1.5
16.	Fix Rebars in isolated footing/ strip/ combined/ mat foundation.	**Rebar fixing in footing:** ▪ Interpret structural drawing of strip, isolated, combined and mat foundation ▪ Covers for each member ▪ Handling of cut bars for different members. ▪ Working with team members in an understanding way ▪ Holding column bars centered and erected with shoring ▪ Safety precaution ▪ Procedure	0.5	1.0	1.5
17.	Fix Rebars in column.	**Rebar fixing in column:** ▪ Interpretation of a column structural drawing ▪ Interpretation of foundation plan ▪ Setting of center lines on ground ▪ Plumbing techniques ▪ Shoring with roles ▪ Safety precaution ▪ Procedure	0.5	1.0	1.5
18.	Erect column Rebars in a given position (lay out).	**Column Rebar erecting:** ▪ Column re bars preparation ▪ Handling of column re-bars ▪ Lay out ▪ Center line transfer ▪ Safety precaution ▪ Procedure	0.5	1.0	1.5
19.	Prepare Rebars for a beam.	**Beam Rebars preparing:** ▪ Interpretation of structural drawing of a beam	0.5	1.0	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Spacing of stirrups ▪ Shape and size of stirrups ▪ Main bottom and top bars ▪ Safety precaution ▪ Procedure			
	Sub-total I		**10**	**18**	**28**

Module II: Carpentry (Woodwork)

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Identify/enumerate/handle tools /equipment.	**Tools and equipment handling:** ▪ Different tools and equipment used in carpentry ▪ Function of tools and equipment ▪ Care and maintenance of tools and equipment, ▪ Safety and precautions in handling tools and equipment ▪ Identification procedure of different tools and equipment	1	1	2
2.	Perform measuring/marking work.	**Measuring and marking:** ▪ Measurement system ▪ Conversion of units ▪ Marking system ▪ Identification of different measuring and marking tools and equipment ▪ Safety precaution ▪ Procedure of measuring and marking	0.5	1	1.5
3.	Perform sawing / slicing work.	**Sawing and slicing:** ▪ Sawing tools; Rip Saw, Back Saw, Cross-Cutting Saw and Key Saw. ▪ Parts of tools ▪ Safety precaution ▪ Procedure of sawing	0.5	1	1.5
4.	Perform planning / smoothing work.	**Planning and smoothing:** ▪ Definition ▪ Planning and smoothing tools; Jack Plane, Smoothing Plane, Block Plane.	0.5	1	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Parts of tools ▪ Safety precaution ▪ Procedure of planning and smoothing			
5.	Perform nailing on wooden members.	**Nailing:** ▪ Importance of nailing and its function ▪ Size of nail ▪ Safety precaution ▪ Procedure of nailing	0.5	1.0	1.5
6.	Perform drilling work.	**Drilling:** ▪ Definition ▪ Drilling tools; Hand drill and Ratchet Brace. ▪ Parts of drilling tools ▪ Bits (different types) ▪ Safety precaution ▪ Procedure of drilling	0.5	1	1.5
7.	Perform boring work.	**Boring:** ▪ Definition ▪ Boring tools, Mortise Chisel, Paring Chisel ▪ Hammering tools ▪ Parts of boring tool ▪ Safety precaution ▪ Procedure of boring	0.5	1	1.5
8.	Perform holding work.	**Holding:** ▪ Definition ▪ Holding tools (Bench vice, Clamp vice) ▪ Parts of holding tools ▪ Safety precaution ▪ Procedure of holding	0.5	1	1.5
9.	Maintain basic tools.	**Tools maintenance:** ▪ Importance of maintenance ▪ Tools and materials for general maintenance (saw set, sharpening stone, emery paper, oil and cooling agent) ▪ Chisel sharpening procedure ▪ Sharpening of saw teeth ▪ Safety precaution ▪ Procedure of maintenance	0.5	2	2.5
10.	Prepare work piece.	**Work piece:** ▪ Definition ▪ Safety precaution	0	1	1

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Procedure of preparing work piece			
11.	Make Tenon and Mortise joint / Butt joint / Lap joint / Dado joint/ Mitre joint / Dove tail joint	**Joints making:** ▪ Joints • Definition • Function ▪ Types; Butt joint, lap joint, Dado joint, Mitered joint, Tennon and mortise joint and dove tail joint ▪ Safety precaution ▪ Procedure of making joints	1	12	13
12.	Perform finishing work.	**Finishing:** ▪ Definition and function of: ▪ Glue ▪ Sand paper ▪ Putty ▪ Linseed oil ▪ Hardware [Nails, Screw, Hinge, Staple and Hasp] ▪ Procedure of finishing	0.5	1	1.5
13.	Perform polishing work.	**Polishing:** ▪ **Definition and function:** • Varnish • Shellac varnish • Enamel • Thinner • Procedure of polishing	0.5	1	1.5
	Sub-total II		**7**	**25**	**32**

Part 2: Construction Materials
Module III: Construction Materials Testing

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot.
1.	Conduct tests on aggregates: a. Sieve analysis of fine aggregate b. Sieve analysis of course aggregate c. Water absorption test d. Aggregate crushing value e. Aggregate impact value f. Aggregate abrasion	**Tests on aggregates:** ▪ Introduction ▪ Tests for • Sieve analysis of fine aggregate • Sieve analysis of course aggregate • Water absorption test • Aggregate crushing	1	2	3.0

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot.
	value	value • Aggregate impact value • Aggregate abrasion value ▪ Testing procedure			
2.	Conduct tests on brick: a. Compressive strength b. Water absorption test c. Efflorescence test d. Soundness	**Tests on brick:** ▪ Introduction ▪ Tests for • Compressive strength • Water absorption test • Efflorescence test • Soundness ▪ Testing procedure	0.5	1	1.5
3.	Conduct tests on cement: a. Fineness b. Soundness c. Consistency d. Initial and final setting time	**Tests on cement**: ▪ Introduction ▪ Tests for • Fineness • Soundness • Consistency • Initial and final setting time ▪ Field (Physical) test of cement ▪ Testing procedure	0.5	2	2.5
4.	Conduct tests on tar/ bitumen/ asphalt: a. Penetration test b. Ductility test c. Viscosity test	**Tests on tar/ bitumen/ asphalt:** ▪ Introduction ▪ Tests for • Penetration test • Ductility test • Viscosity test ▪ Testing procedure	0.5	1	1.5
5.	Conduct/observe on reinforcing steel (Rebar).	**Tests on Rebar:** ▪ Introduction ▪ Types of steel bars ▪ Test for • Tensile strength • Elongation • Ductility ▪ Testing procedure	0.5	2	2.5
	Sub-total III		**3**	**8**	**11**

Module IV: Plain Cement Concrete

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Batch cement concrete ingredients: a. Prepare 1:2:4 mix by volume b. Prepare 1: 1.5:3 mix by volume c. Prepare 1:1:2 mix by volume	**Cement concrete batching:** ▪ Cement concrete • Grade of concrete (M15, M20, and M25) ▪ Batching • Procedure	0.5	1.5	2
2.	Prepare Cement Concrete: a. Prepare M15 concrete by volume b. Prepare M20 concrete by volume c. Prepare M25 concrete by volume	**Cement concrete preparing:** ▪ Types of mixing ▪ Advantages of machine mixing ▪ Workability and strength of concrete ▪ Procedure	0.5	1.5	2
3.	Compact concrete: a. Compact manually b. Compact mechanically	**Compacting:** ▪ Method of pouring concrete ▪ Methods of vibrations ▪ Types and use of vibrators	0.5	1	1.5
4.	Perform curing: a. Cure column b. Cure beam c. Cure slab d. Cure masonry Wall	**Curing:** ▪ Duration of curing ▪ Effects of climate in curing ▪ Procedure	0.5	1.0	1.5
	Sub-total IV		**2**	**5**	**7**
Total (Sub-total I+ Sub-total II+ Sub-total III+ Sub-total IV)			**22**	**56**	**78**

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BUILDING CONSTRUCTION AND SERVICES

Total: 276 hours
Theory: 99 hours
Practical: 177 hours

Course Description:
This course is designed for the apprentices who are willing to specialize in Building construction under civil Engineering program. This course consists of two parts: the first part is focused on building construction; and it is designed to provide comprehensive knowledge and skills on earthquake resistant buildings construction techniques, including plastering, pointing, finishing and door and window fitting works. It intends to provide knowledge and skills on formwork, Scaffold building and retrofitting techniques. Similarly, the second part of this course emphasizes to help apprentices in imparting basic knowledge and skills in building services such as installation of Plumbing and Fixtures, Sanitary system and Building electrification with in industry practice.

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

1. Comprehend importance of building, types of building masonry and significance of earthquake resistant building construction techniques;
2. Identify the different components of buildings;
3. Interpret working drawings of various components and structures;
4. Engage in pre-building, building and post building phases of building construction activities;
5. Erect various types formwork and scaffolding structures;
6. Build load bearing masonry type of residential buildings with walls of stone masonry in mud mortar, stone masonry in cement sand mortar, brick wall in cement sand mortars and hollow block wall in cement sand mortar applying earthquake resistant building construction techniques;
7. Build frame structure residential and non-residential multi-storied complete buildings applying earthquake resistant building construction techniques;
8. Perform plastering, pointing and various finishing works;
9. Erect various types of door, window and ventilation frames of wood, aluminium, PVC and UPVC and fix their shutters;
10. Interpret electrical drawings, lay conduits, install and connect accessories of single-phase wiring system including complete electrification as per specifications in buildings;
11. Interpret sanitary drawings, layout and install water supply and sanitary systems including complete installation of plumbing fixtures, wall mixtures and sewerage system as per specifications in residential and non-residential buildings; and
12. Apply techniques of retrofitting for various components of different types of damaged buildings.

Section A: Institute Based Training (15 Academic Weeks)
Part I: Building Construction
Module I: Building Components and Reinforced Cement Concrete

S.N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Identify different components/parts of building.	**Building components:** ▪ Definition ▪ Types ▪ Uses ▪ General components of a building • Foundation • Plinth • Wall and columns • Floors • Lintel and chajjas • Roof • Door and windows • Stair and lift ▪ Technical terms used in buildings ▪ General requirements of parts of building ▪ General rules of Vaastu ▪ Acoustical and thermal insulation process of building construction	2.0	2.0	4.0
2.	Identify foundation types.	**Foundation:** ▪ Definition ▪ Purposes ▪ Shallow foundation and its types and their uses ▪ Deep foundation and its types (introduction only) ▪ Causes of failure of foundation and remedy ▪ Setting out of foundation ▪ Timbering of trenches ▪ Construction of foundation under water lodged area. ▪ Design example on masonry wall foundation ▪ Design example on brick pillar foundation ▪ Anti-termite work in foundation	2.0	2.0	4.0
3.	Identify Sill/Lintels/Arches.	**Sill, lintels and arches:**	1.0	2.0	3.0

S.N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Sill and its uses ▪ Lintels and its uses ▪ Types of lintels in terms of material used ▪ Arch and its uses ▪ Types of arches and materials of construction ▪ Construction of semicircular arches			
4.	Identify building roofs.	**Building roofs:** ▪ Types of roof • Slope or pitched roof * Lean to roof * Coupled roof * Scissors roof * King and Queen post roof truss • Flat roof * Mud terraced roof * Brick, glazed tiled roof * RCC Flat roof ▪ Roof covering • Thatch covering • Jhingati • Tile • A.C. and C.G.I. sheet • Slate ▪ Laying and fixing of roof coverings	1.0	3.0	4.0
5.	Prepare concrete mix.	**<u>Concrete and joints:</u>** ▪ Concrete and its constituents ▪ Properties of concrete (fresh & Hardened state) ▪ Density of concrete ▪ Water cement ratio ▪ Concrete mix • Nominal mix • Design mix ▪ Concreting processes • Batching of materials • Concrete mixing • Transportation of concrete	3.0	4.0	7.0

S.N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		• Placing of concrete • Compaction of concrete • Curing of concrete ▪ Concreting under water ▪ Placing concrete under cold weather ▪ Placing concrete in hot weather ▪ Steel reinforcement and its grade ▪ Reinforced cement concrete and its characteristics ▪ Advantages of reinforced cement concrete ▪ Durability of concrete ▪ Corrosion & its prevention of reinforcing bar in a concrete ▪ Concreting equipment and accessories ▪ Joints terminologies in concerting • Construction joints • Cold form joints • Expansion joints ▪ Causes of failure of reinforced concrete structure			
6.	Conduct tests on concrete.	**<u>Tests on concrete:</u>** ▪ Introduction ▪ Purpose ▪ Tests for • Compressive strength • Tensile strength • Shear strength • Bond strength • Bearing strength • Workability of concrete o Testing procedure	1.0	2.0	3.0
	Sub-total I		**10**	**15**	**25**

Module II: Earthquake Resistant Building Construction Technology

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Acquaint with earthquake/assess/observe earthquake effects.	**Earthquake effects:** ▪ Concept of earthquake • Introduction • Terminologies • Causes of earthquake • Measurement of Earthquake * Earthquake magnitude * Earthquake intensity • Seismicity of Nepal ▪ Earthquake effect • Ground effects • Effects of earthquake on buildings • Causes of failure of the structures	2	1	3
2.	Read/interpret Nepal National Building Code (NNBC).	**Nepal National Building Code (NNBC):** ▪ General Introduction (Background) ▪ Classification of buildings as per Building Act-2055 ▪ Provision of NNBC ▪ Classification of NNBC according to their use	1	2	3
3.	Apply general requirements for earthquake resistant construction.	**General requirements for earthquake resistant construction:** ▪ Proper site selection ▪ shape, size and proportion of a building ▪ Good foundation resting on a Firm Base ▪ Creating a Box Effect: The building has to act as a single unit for a good earthquake resistance: (Vertical reinforcement: − Horizontal bands well connected to the vertical reinforcements and embedded in masonry − Diagonal bracing (horizontal and vertical) − Lateral	2	1	3

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		restraints ▪ Better bonding within masonry units ▪ Controlled size and location of openings ▪ Light construction *Guidelines for earthquake resistant construction of earthen building (EB), low strength masonry building construction*			
4.	Construct seismic resistant components.	**Seismic resistant components:** ▪ Vertical reinforcement • Bamboo • Timber • Steel ▪ Horizontal bands • Bamboo band • Timber band • Reinforced Concrete band ▪ Dowels at corners and junctions ▪ Corner strengthening with stitches ▪ Gable band ▪ Diagonal bracing ▪ Lateral restrainers	1	4	5
5.	Construct seismic resistant load bearing stone masonry walls using mud mortar.	**Seismic resistant construction of load bearing masonry (stone masonry) walls/buildings:** ▪ Thickness, length and height of wall / building ▪ Appropriate size and location of openings ▪ Good quality of stone masonry laying ▪ Horizontal seismic bands (plinth band, sill, lintel, Gable band and their details) ▪ Vertical reinforcement at corners, junctions and sides of openings ▪ Corner strengthening with stitches ▪ Bands on pilasters and buttresses	2	4	6
6.	Construct seismic resistant load	**Seismic resistant construction of**	2	4	6

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
	bearing stone masonry walls using cement mortar.	**load bearing masonry (stone masonry) walls/buildings:** ▪ Thickness, length and height of wall / building ▪ Appropriate size and location of openings ▪ Good quality of stone masonry laying ▪ Horizontal seismic bands (plinth band, sill, lintel, Gable band and their details) ▪ Vertical reinforcement at corners, junctions and sides of openings ▪ Corner strengthening with stitches ▪ Bands on pilasters and buttresses:			
7.	Construct seismic resistant load bearing brick masonry walls using cement mortar.	**Seismic resistant construction of load bearing masonry (brick masonry) buildings:** ▪ Length and height of walls ▪ Appropriate size and location of openings ▪ Good quality materials, brick laying and bond ▪ Joints between orthogonal walls ▪ Horizontal seismic bands at different levels (plinth band, sill, lintel, band at floor and roof level, gable band and their details) ▪ Well strengthened corners and T-junctions with stitches and dowels ▪ Vertical reinforcement at corners, junctions and sides of openings	2	4	6
8.	Construct seismic resistant concrete block wall using cement mortar.	**Seismic resistant construction of load bearing block masonry buildings:** ▪ Length and Height of Walls ▪ Appropriate size and location of openings ▪ Good quality materials, block laying and bond	2	4	6

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Joints between orthogonal walls ▪ Horizontal seismic bands at different levels (plinth band, sill, lintel, band at floor and roof level, Gable band and their details) ▪ Well strengthened corners and T-junctions with stitches and dowels ▪ Vertical reinforcement at corners, junctions and sides of openings			
9.	Construct components of seismic resistant RC framed buildings.	**<u>Seismic resistant construction of reinforced concrete buildings:</u>** **Detailing of RC Frames** ▪ Foundation ▪ Beam • Dimensions • Longitudinal Reinforcement • Web reinforcement ▪ Column • Dimension • Longitudinal Reinforcement • Web reinforcement ▪ Beam column joint • Transverse Reinforcements ▪ Walls • Openings • Reinforcement at edge of opening • Wall reinforcement • Strengthening the junctions • Bands • Vertical reinforcement	2	5	7
	Sub-total II		**16**	**29**	**45**

Part 2: Building Service
Module III: Building Electrification

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Describe the concept of electricity.	**Concept of electricity** ▪ Concept of the atom, ions & matter • Atomic particles, atomic structure, free electrons • Charged body & coulomb • Electric current and conventional flow ▪ Faraday's law of electromagnetic induction ▪ Electricity • Introduction • Nature • Importance • History • sources • Uses	2	0	2
2.	Identify/enumerate/handle tools and instruments.	**Tools and Instruments:** ▪ Introduction ▪ Function ▪ Types ▪ Identification procedure ▪ Uses ▪ Care and maintenance	0.5	1	1.5
3.	Identify /draw electrical symbols/ codes.	**Electrical drawing and wiring symbols:** ▪ Introduction ▪ Importance as technician's language ▪ Use in electrical and electronics field ▪ Orientation of symbols ▪ Common wiring circuits ▪ Single line representation of wiring diagrams	1	1	2
4.	State the Ohm's law.	**Ohm's law:** ▪ Definition of current, voltage and resistance ▪ Statement of Ohm's law ▪ Relation among current, voltage and resistance	1	2	3

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Measurement units of current, voltage and resistance ▪ Mathematical expression as tools for circuit analysis ▪ Current law using pie-shape chart			
5.	Calculate current/voltage/resistance.	**Concept of Current, Voltage &Resistance:** ▪ Technique of solving the unknown values of current, voltage and resistance in the case of two of these values are given in the circuit parameters	0.5	2	2.5
6.	Measure resistance using Ohmmeter.	**Ohm meter:** ▪ Introduction ▪ Operation ▪ Connection diagram ▪ Reading procedure ▪ Safety precautions	0.5	2	2.5
7.	Measure voltage using Voltmeters.	**Volt meter:** ▪ Introduction ▪ Operation ▪ Connection Diagram ▪ Reading Procedure ▪ Safety precautions	0.5	2	2.5
8.	Measure current using Ampere meter.	**Ampere meter:** ▪ Introduction ▪ Operation ▪ Connection Diagram ▪ Reading procedure ▪ Safety precautions	0.5	2	2.5
9.	Verify Kirchhoff's Current (KCL) law.	**Kirchhoff's Current law:** ▪ Statement of law ▪ Mathematical expression ▪ Circuit diagram ▪ Verification table mentioning ammeter (A_1), ammeter (A_2), ammeter (A_3) and ($A_1 + A_2$) in amperes	0.5	1.5	2
10.	Verify Kirchhoff's Voltage (KCV) law.	**Kirchhoff Voltage:** ▪ Definition of closed loop ▪ Statement of law ▪ Mathematical expression	0.5	1.5	2

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Circuit diagram or closed loop diagrams ▪ Verification table mentioning one ammeter (A1), three-volt meters V1, V2 and V3 for reading voltages in the circuits and V1+V2 voltage drops			
11.	Construct electric circuit for analysis.	**Electric circuit:** ▪ Introduction ▪ Types (series, parallel & combined) ▪ Circuit Diagram ▪ Characteristic ▪ Condition of circuit (open, closed, short, earth leakage) ▪ Advantage & disadvantage	1	2	3
12.	Perform straight/T/Married joints of solid wire/cable.	**Stranded cable and joints:** ▪ Cable • Introduction • Parts of cable • Advantage • Insulation removing technique ▪ Joint • Introduction • Types ▪ Straight/T / Married joints • Introduction • Measurement of joint • Uses ▪ Procedure ▪ Safety precautions	1	2	3
13.	Make wire/cable eyelet.	**Cable eyelet:** ▪ Introduction ▪ Measurement of joint ▪ Uses ▪ Procedure ▪ Safety precautions	0.5	1	1.5
14.	Interpret electrical drawings.	**Electrical drawing:** ▪ Introduction ▪ Symbols ▪ Identification of current capacity of accessories, fittings and protective	0.5	1	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		devices ▪ Interpretation technique			
15.	Draw free hand plan/schematic diagram.	**Free hand plan /schematic diagram:** ▪ Introduction ▪ Importance ▪ Types ▪ Advantage ▪ Uses	0.5	2	2.5
16.	Draw layout diagram.	**Layout Diagram:** ▪ Introduction ▪ Importance ▪ Types ▪ Advantage ▪ Uses	0.5	2	2.5
17.	Draw wiring diagram.	**Wiring Diagram:** ▪ Introduction ▪ Importance ▪ Types ▪ Advantage ▪ Uses	0.5	2	2.5
18.	Install one lamp controlled from one point using T-connection and looping methods in wooden/plastic Listics.	**One lamp installation:** ▪ Methods of wiring ▪ System of wiring: ▪ T-system connection ▪ Loop system connection ▪ Advantages& disadvantage of loop in system ▪ Types of diagrams ▪ Wiring materials and accessories ▪ Installation procedure ▪ Testing of wiring installation ▪ Safety precautions	0.5	3	3.5
19.	Install two lamps controlled by individual Switches from two different points using loop in methods (system).	**Two lamps installation:** ▪ Layout diagram ▪ Wiring diagram ▪ Wiring materials and Accessories ▪ Installation procedure ▪ Testing of wiring installation ▪ Safety precautions	0.5	2	2.5
20.	Install three lamps and one socket outlet (Receptacle)	**Three lamps installation:** ▪ Layout diagram	0.5	2	2.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
	controlled by individual switches.	▪ Wiring diagram ▪ Wiring materials and Accessories including Socket outlet (Receptacle) ▪ Application ▪ Installation procedure ▪ Testing of wiring installation ▪ Safety precautions			
21.	Install one lamp, one fan and one socket controlled by individual switches.	**Lamp and fan installations:** ▪ Layout diagram ▪ Wiring diagram ▪ Wiring materials and Accessories • Lamps • Electrical appliances • Socket outlet ▪ Installation procedure ▪ Testing of wiring installation ▪ Safety precaution	0.5	2	2.5
	Sub-total III		**14**	**36**	**50**
	Total (Sub-total I+ Sub-total II+ Sub-total III)		**40**	**90**	**120**

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

PART 1: Building Construction
Module I: Site Preparation and Soil Test

S.N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1	Perform site clearance work.	**Site clearance:** ▪ Introduction ▪ Different materials and structures to remove	0.5	2	2.5
2	Perform building site layout.	**Building site layout:** ▪ Introduction ▪ Application of 3,4,5 method ▪ Marking techniques	0.5	4	4.5
3.	Explore soil using test pit method.	**Soil tests:** ▪ Site exploration and its purposes ▪ Preliminary soil investigation ▪ Methods of site investigation	2	2	4

S.N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Depth and spacing of trial pits or bore holes ▪ Bearing capacity of soil and methods of determination ▪ Safe bearing capacity values based on N.S and I.S. code. ▪ Methods of improving bearing capacity of soil			
	Sub-total I		**3**	**8**	**11**

Module II: DPC, Sill, Lintels, Arches, Cavity Wall and Fixing of Frames

S.N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Construct damp proofing course (DPC).	**Damp proofing course (DPC):** ▪ Dampness and its effects on construction works ▪ Causes and sources of dampness ▪ Methods of damp proofing ▪ Materials used for damp proofing ▪ Damp proofing treatment in • Foundation • Walls • Floors • Roofs • Parapet walls ▪ Dewatering	2	2	4
2.	Build Partition/Cavity walls.	**Partition and cavity walls:** ▪ Introduction ▪ Objectives of partition and cavity walls ▪ Types of partition walls ▪ Advantage of cavity wall ▪ Position of cavity ▪ Wall ties and construction details ▪ Precautions on cavity construction	1	2	3
3.	Construct Sill/ Lintels/ Arches	**Sill, lintels and arches:** ▪ Arch and its uses ▪ Types of arches and materials of construction	1	2	3

S.N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Construction of sill bands ▪ Construction of timber and RCC lintel ▪ Use of bat and closers ▪ Cutting of bricks in shape and size for arc wall ▪ Formwork for arc wall ▪ Construction of semicircular arches			
4.	Erect/fix door and window frames.	**Door and window frame:** ▪ Location of doors and door sizes ▪ Door frame ▪ Types of doors • Battened, ledged braced and framed door • Framed and Paneled door • Flush door • Sliding door • Revolving door • Collapsible steel door • Rolling steel shutter door ▪ Types of windows • Fixed window • Sliding window • Double hung window • Casement window • Sash or glazed window • Corner window • Bay window • Ventilators • Process of Erecting and fixing of door and window frames ▪ Fixtures and fastenings of door and windows	2	2	4
	Sub-total II		**6**	**8**	**14**

Module III: Plastering and Pointing

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Prepare cement sand mortar.	**Cement sand mortar:**	1	1	2

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Ingredients ratio ▪ Quality of mortar ▪ Use of batching box ▪ Types of batching ▪ Water cement ratio ▪ Effect of water in cement ▪ Batching and mixing procedure			
2.	Plaster the masonry wall.	**Plastering:** ▪ Concept of plastering ▪ Importance of plastering ▪ Thickness of plaster ▪ Preparation of mortar ▪ Procedure	0.5	1	1.5
3.	Plaster the column.	**Column plastering:** ▪ Importance of plastering ▪ Thickness of plaster ▪ Procedure	0.5	1	1.5
4.	Plaster on ceiling.	**Ceiling plastering:** ▪ Importance of plastering ▪ Thickness of plaster ▪ Procedure	0.5	1	1.5
5.	Perform panipatti plastering.	**Panipatti plastering:** ▪ Introduction ▪ Function of panipatti ▪ Effects of efflorescence	0.5	1	1.5
6.	Perform skirting.	**Skirting:** ▪ Introduction ▪ Function ▪ Thickness ▪ Skirting procedure	0.5	1	1.5
7.	Perform pointing.	**Pointing:** ▪ Introduction ▪ Function ▪ Types of pointing ▪ Thickness of joints ▪ Pointing procedure	0.5	1	1.5
	Sub-total III		**4**	**7**	**11**

Module IV: Finishing Works

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Perform ceiling finishing.	**Ceiling finishing:** ▪ Preparation of scaffolding ▪ Preparation of mortar ▪ Smoothening the ceiling surface ▪ mortar strength ▪ Safety and precautions	0.5	1	1.5
2.	Perform cladding finishing on wall.	**Cladding finishing:** ▪ Introduction ▪ Preparation of scaffolding ▪ Preparation of mortar ▪ Types of stone used in cladding ▪ Safety and precautions	0.5	1	1.5
3.	Perform cement floor finish.	**Cement flooring:** ▪ Introduction ▪ Base courses ▪ Leveling the ground ▪ Procedure of floor finishing	0.5	1	1.5
4.	Perform marble floor finish.	**Marble flooring:** ▪ Introduction ▪ Base courses ▪ Procedure of marble laying ▪ Use of adhesives and putty ▪ Floor grinding	0.5	1	1.5
5.	Perform tile floor finish.	**Tile flooring:** ▪ Introduction ▪ Base courses ▪ Quantity estimation ▪ Method of tiling	0.5	1	1.5
6.	Perform stone floor finish.	**Stone flooring:** ▪ Introduction ▪ Types of stones used in flooring ▪ Base courses ▪ Method of stone floor finishing ▪ Use of power tools ▪ Methods stone laying	0.5	1	1.5
		Sub-total IV	**3**	**6**	**9**
	Total (Sub-total I+ Sub-total II Sub-total III +Sub-total IV)		**16**	**29**	**45**

Part 2: Building Services
Module V: Water Supply and Plumbing

S. N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Calculate water demand	**Water demand:** ▪ Water requirements • Domestic demand • Fire demand • Per capita demand • Variation in water demand	2.0	1	3
2.	Observe/read water supply/distribution system building.	**Water supply and distribution system:** ▪ Distribution of cold and hot water in plumbing system ▪ Types of pipe used for distribution ▪ Localized water heating system	0.5	1	1.5
3.	Enumerate/identify plumbing materials/ fittings/valves fixtures.	**Plumbing, fittings, valves, fixtures and materials:** ▪ Functions of plumbing materials, fittings, valves and fixtures identification ▪ Function of fittings and valves ▪ Classification of various types of fittings ▪ Types of plumbing materials and their specification ▪ Grades and types of GI pipes ▪ Types of valves commonly available ▪ Types of fixtures ▪ Identification of plumbing materials, fittings, valves and fixtures ▪ Safety precautions	2	1	3
4.	Enumerate/identify/sketch plumbing and symbols.	**Plumbing symbols:** ▪ Concept of symbols and codes ▪ Enumeration of various types of plumbing symbols ▪ Identification of various types of plumbing symbols ▪ Application of symbols and	0.5	2	2.5

S. N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		codes ▪ Fee hand sketching technique			
5.	Measure/mark/file/saw work piece.	**Measuring, marking, filing and sawing:** ▪ Measurement system ▪ Conversion of units ▪ Marking system ▪ Safety precaution ▪ Procedures	0.5	1	1.5
6.	Apply Vernier caliper in dimension measurement.	**Vernier caliper:** ▪ Introduction & Features of Vernier caliper ▪ Reading scale & uses of Vernier caliper ▪ Least count & care of Vernier caliper	0.5	1	1.5
7.	Cut GI pipe.	**GI pipe cutting:** ▪ Types of cutting tools ▪ Safety precaution ▪ Procedure	0.5	1	1.5
8.	Thread GI pipe.	**Pipe threading:** ▪ Function of thread ▪ Thread length ▪ Lubricant use ▪ Flat threads ▪ Die set and accessories ▪ Procedure ▪ Safety precautions	0.5	1	1.5
9.	Perform the bending.	**Pipe bending:** ▪ Introduction to bending ▪ Types of bending ▪ Calculation of offsets ▪ Method of bending ▪ Safety precautions	0.5	1	1.5
10.	Drill a hole.	**Hole drilling:** ▪ Importance of drill machine ▪ Types of drill machine ▪ Drill bits & its types ▪ Importance of speed feed R.P.M. ▪ Calculation of R.P.M	0.5	1	1.5
11.	Join elbow/Tee/union/cross/plug with pipe	**Fitting Joining:** ▪ Concept of Z dimension ▪ Z dimension calculation ▪ Center to center dimension	0.5	1	1.5

S. N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Tightness of fitting ▪ Procedure ▪ Safety precautions			
12.	Join valves with GI pipe.	**Valves joining:** ▪ Various type of valves and faucets ▪ Function of various type of valves ▪ Tightness of valve ▪ Flow of water on valve ▪ Procedure ▪ Safety precautions	0.5	1	1.5
13.	Cut Pe pipe.	**Pe pipe cutting:** ▪ Introduction ▪ Properties of polyethylene materials ▪ Types of Pe pipe ▪ Cutting devices ▪ Procedure ▪ Safety precautions	0.5	1	1.5
14.	Make butt joint of Pe pipe.	**Butt joining:** ▪ Function of heating plate ▪ Method of joining ▪ Principle Teflon tape/marker ▪ Size of heating plate ▪ Welding temperature ▪ Procedure ▪ Safety precautions	0.5	1	1.5
15.	Make 90°/45°-bend/ elbow of Pe pipe.	**Bend and elbow making** ▪ Calculation of cutting angles ▪ Method of angle cutting ▪ Angle cutting devices ▪ Procedure ▪ Safety precautions	0.5	1	1.5
16.	Make Tee/Y Pe branch.	**Tee and Y making:** ▪ Calculation of cutting angle ▪ Method of angle cutting ▪ Angle cutting devices ▪ Procedure ▪ Safety precautions	0.5	1	1.5
17.	Make reducer socket/vent cowl of Pe. pipe.	**Reducer and socket making:** ▪ Calculation of cutting angle ▪ Method of angle cutting ▪ Angle cutting devices ▪ Procedure	0.5	1	1.5

S. N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Safety precautions			
18.	Interpret working drawing/catalog.	**Working drawing interpreting:** ▪ Introduction to working drawing and blueprint ▪ Importance of working drawing and catalog ▪ Components of working drawing ▪ Symbols used in working drawing and catalog ▪ Information included in working drawing and catalog ▪ Scale conversion	1.0	1	2.0
19.	Install sanitary fitting (Bend/Tee/Y/Socket) with pipe.	**Sanitary fitting installation:** ▪ Calculation of cutting angle ▪ Calculate cutting length of PVC pipe ▪ Procedure ▪ Safety precautions	0.5	1.5	2.0
20.	Join PPR fitting with pipe.	**PPR joining:** ▪ Introduction ▪ PPR pipe and fittings ▪ Calculation of cutting length ▪ Procedure ▪ Safety precautions	0.5	1	1.5
21.	Join PVC (UPVC & CPVC) fittings with pipe.	**PVC joining:** ▪ Introduction ▪ Types (UPVC & CPVC) ▪ Identification of jointing materials ▪ Fittings ▪ Calculation of cutting length ▪ Procedure ▪ Safety precautions	0.5	1.5	2.0
	Sub-total V		**14**	**23**	**37**

Module VI: Sanitary Engineering

S. N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Draw Sanitary layout diagram for a building.	**Sanitary layout diagram:** ▪ General introduction to NNBC 207	1	2	3
2.	Enlist techniques of disposal system of excreta in un-sewer	**Introduction:** ▪ Pit privy	1.0	1	2

S. N.	Tasks Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
	area.	▪ VIP latrine ▪ Pour flush latrine ▪ Septic tank and soak pit			
3.	Construct ventilated improved pit latrine (VIP).	**Improved pit latrine** ▪ Design guidelines for VIP latrine ▪ Pipe size & type ▪ Quantity of waste ▪ Material for superstructure. • Brick • Stone • Mud ▪ Lining of trenches	1.0	2	3
4.	Construct disposal system/ sanitary sewage.	**Disposal system:** ▪ Soil and waste pipe ▪ Soil water and waste water drain/pipe ▪ One pipe system fully vented ▪ Two pipe system fully vented ▪ Single stack system ▪ manhole, grease trap, septic tank, soak pit	1.0	2	3
	Sub-total VI		**4**	**7**	**11**

Module VII: Formwork

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Identify/enumerate/handle tools /equipment used for formwork.	**Tools and equipment:** ▪ Different tools and equipment used in formwork and their functions ▪ Care and maintenance of tools and equipment ▪ Handling procedure ▪ Safety precautions	0.5	1	1.5
2.	Identify structural elements/members of formwork/shuttering.	**Formwork elements and members:** ▪ Formwork • Introduction • Uses • Types	1	1	2

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Difference between formwork and shuttering ▪ Formwork and its use ▪ Function of formwork ▪ Types of formwork based on material use ▪ Elements and members of structure ▪ Functions of different structural elements and members ▪ Requirement of quality and strength of each members/ materials ▪ Identification procedure			
3.	Interpret working drawing of simple bamboo/wooden formwork.	**Working drawing:** ▪ Introduction ▪ Method of drawing interpretation ▪ Different elements and members showing on drawing	0.5	1	1.5
4.	Lengthen wooden members (as props, joists.) using half lap joint.	**Wooden members lengthen:** ▪ Concept of lengthening and joining ▪ Sawing the members ▪ Nailing the members ▪ Checking the straightness ▪ Procedure ▪ Safety precautions	0.5	1	1.5
5.	Erect members in horizontal and vertical alignments.	**Members erection:** ▪ Selecting the appropriate material ▪ Methods of marking ▪ Method of sawing ▪ Checking with spirit level and plumb line ▪ Procedure ▪ Safety precautions	0.5	1	1.5
6.	Assemble members at right angle to each other.	**Member assembling:** ▪ Assemble of the member ▪ Checking of bottom line of each member ▪ Right angle of each member on the assembly ▪ Use of L-square/tri-square	0.5	1	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Procedure ▪ Safety precautions			
7.	Prepare different shape of form work. (Rectangular, Square, Semicircular, Circular.)	**Formwork shape preparation:** ▪ Selecting the appropriate material. ▪ Concept of geometrical shape ▪ Use of drawing material as per different shape ▪ Concept of marking and sawing ▪ Concept of bottom line ▪ Concept of right angle ▪ Procedure ▪ Safety precautions	0.5	1	1.5
8.	Erect formwork/formwork for different types of foundation (Isolated, Strap, and Combined).	**Formwork for foundation**: ▪ Need of reading working drawing in formwork works ▪ Building profiles (Setting the center lines according to drawing) ▪ Center lines fixing using building profiles ▪ Plumb bob and its application ▪ Use of bracket to strengthen sides ▪ Use of spacers to hold sides ▪ Marking of thickness of concrete ▪ Procedure ▪ Safety precautions	0.5	1	1.5
9.	Erect formwork for rectangular/square column.	**Formwork for columns**: ▪ Centering and side fixing techniques for columns ▪ Plumbing techniques ▪ Colors and starters ▪ Cubes for cover to provide in columns, slabs and beams ▪ Procedure ▪ Safety precautions	0.5	1	1.5
10.	Erect formwork for a wall.	**Formwork for wall**: ▪ Function of ledger ▪ Function of shoring ▪ Functions of cleats	0.5	1	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Techniques of erecting formwork sides of a wall ▪ Procedure ▪ Safety precautions			
11.	Erect formwork for a beam /slab.	**Formwork for beam and slab**: ▪ Use of steel props with screws and bolts ▪ Uses of topping props for supporting sides of beams/ slabs. ▪ Uses of plywood for bottom and cutting techniques, ▪ Importance of level and level checking ▪ Providing depths of slabs and beams as required. ▪ Procedure ▪ Safety precautions	0.5	1	1.5
12.	Erect formwork for a cantilever beam/slab.	**Formwork for cantilever structure**: ▪ Levels of slab, beam and cantilever (refer previous tasks) ▪ Columns heights and slab or beam junction ▪ Procedure ▪ Safety precautions	0.5	1	1.5
13.	Erect formwork for circular columns.	**Formwork for circular column**: ▪ Centering and side fixing techniques for columns ▪ Plumbing techniques ▪ Colors and starters ▪ Cubes for cover to provide in columns, slabs and beams ▪ Procedure ▪ Safety precautions	0.5	1	1.5
14.	Erect formwork for arch lintel/ arc slab.	**Formwork for lintel and arc**: ▪ Concept of geometrical shapes ▪ Marking the work piece as per drawing ▪ Importance of starting and ending point of waist slab and landing	0.5	1	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Procedure ▪ Safety precautions			
15.	Erect formwork for staircase/ Check width/ rise/ tread/ straightness of soffit.	**Formwork for staircase**: ▪ Centering and side fixing techniques for staircase ▪ Importance of plumb line ▪ Definition of riser and treads ▪ Introduction of waist slab ▪ Procedure ▪ Safety precautions	0.5	1	1.5
16.	Erect formwork for beam/slab using steel members.	**Formwork for beam and slab**: ▪ Use of steel props with screws and bolts ▪ Use of steel props elongated by sliding and hooking the members with bolts ▪ Procedure ▪ Safety precautions	0.5	1	1.5
17.	Dismantle beam/column/slab formwork.	**formwork dismantling:** ▪ Time for strength development of various concrete ▪ Stacking of dismantled members of formwork ▪ Procedure ▪ Safety precautions in handling formwork members	0.5	1	1.5
	Sub-total VII		**9**	**17**	**26**

Module VIII: Scaffolding

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Identify materials/fittings needed for scaffolding.	**Materials and fittings:** ▪ Scaffolding • Introduction • Uses • Types ▪ Materials of scaffold ▪ Different materials & fittings used in scaffolding ▪ Function of fittings ▪ Uses of different materials	1	1	2

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		& fittings ▪ Care of materials & maintenance of fitting ▪ Safety and precaution in handling materials and fitting ▪ Identification procedure of different materials and fittings			
2.	Identify/enumerate/handle tools /equipment used for preparing/erecting scaffolding.	**Tools and equipment:** ▪ Different tools and equipment used in scaffolding ▪ Function of tools and equipment ▪ Care and maintenance of tools and equipment, ▪ Safety and precautions in handling tools and equipment ▪ Identification procedure of different tools and equipment	0.5	1	1.5
3.	Prepare site for scaffolding.	**Scaffolding site preparation:** ▪ Topography of ground ▪ Situation of ground ▪ Preparation procedure	0	1	1
4.	Perform marking / sawing / slicing / file work.	**Making, sawing, slicing and filing:** ▪ Introduction • Marking • Sawing • Slicing • Filing ▪ Identification and use of different marking, sawing and filing tools ▪ Procedure ▪ Safety precautions	0.5	1	1.5
5.	Prepare ledger/ transom/ standards/ brace.	**Components preparation:** ▪ Function of different components ▪ Characteristics of good and strong materials like bamboo and timber logs ▪ Procedure	0.5	1	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Safety precautions			
6.	Prepare a ladder.	**Ladder preparation:** ▪ Introduction to a ladder, its use, and requirements ▪ Components of ladder, handrail, risers, treads ▪ Pitch of ladder ▪ Rugs ▪ Procedure ▪ Safety precautions	0.5	1	1.5
7.	Tie ledger/ standard/ transom with jute rope.	**Components tying:** ▪ Various techniques of tying transom, standard and ledger ▪ Procedure ▪ Safety precautions	0.5	1	1.5
8.	Prepare trestle scaffold.	**Trestle scaffold:** ▪ Concept of trestle scaffold ▪ Use of trestle ▪ Timber sizes and timber joins ▪ Procedure ▪ Safety precautions	0.5	1	1.5
9.	Erect bamboo / timber used dependent scaffold.	**Dependent scaffold:** ▪ Concept of dependent scaffold ▪ Good materials for making scaffold ▪ Requirements of a scaffold ▪ Components of scaffold ▪ Situation where dependent scaffold is erected ▪ Rope tying techniques ▪ Various technique of leveling standard, ledger transom & guard rail ▪ Procedure ▪ Safety precautions	0.5	1	1.5
10.	Erect standard ledgers/ transom/ brace using fittings.	**Components erection:** ▪ Various techniques of tying standard, ledger transom &brace ▪ Procedure ▪ Safety precautions	0.5	1	1.5
11.	Fix safety net.	**Safety net:** ▪ Identification different safety net materials & tools	0.5	1	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Importance of the safety net ▪ Type of safety net & its loading capacity ▪ Various techniques to tie the net supporting frame to scaffolding member ▪ Procedure ▪ Safety precautions			
12.	Erect bamboo / Timber used independent scaffold.	**Independent scaffold:** ▪ Concept of independent scaffold ▪ Situation where independent scaffold is erected ▪ Safe working platform ▪ Safe working condition ▪ Procedure	0.5	1	1.5
13.	Erect simple birdcage tower scaffold.	**Birdcage tower scaffold:** ▪ Concept of simple birdcage tower scaffold ▪ Situation where simple birdcage tower is erected ▪ Safe working platform ▪ Safe working condition ▪ Procedure	0.5	2	3.5
14.	Erect simple fixed tower scaffold.	**Fixed tower scaffold:** ▪ Concept of simple fixed tower scaffold ▪ Situation where simple fixed tower is erected ▪ Safe working platform ▪ Safe working condition ▪ Procedure	0.5		
15.	Erect simple mobile tower scaffold.	**Mobile tower scaffold:** ▪ Concept of simple mobile tower scaffold ▪ Situation where simple mobile tower is erected ▪ Safe working platform ▪ Safe working condition ▪ Procedure	0.5		
16.	Dismantle erected simple fixed tower scaffold.	**Fixed tower scaffold:** ▪ Precautions to be taken in dismantling scaffold ▪ Dismantling process of cantilever scaffold	0.5		

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Safe landing of members and fittings ▪ Storing of the dismantled materials			
17.	Dismantle erected simple mobile tower scaffold.	**Mobile tower scaffold:** ▪ Precautions to be taken in dismantling scaffold ▪ Dismantling process of cantilever scaffold ▪ Safe landing of members and fittings ▪ Storing of the dismantled materials	0.5	1	2.5
18.	Dismantle erected cantilever type tower scaffold.	**Cantilever scaffold:** ▪ Precautions to be taken in dismantling scaffold ▪ Dismantling process of cantilever scaffold ▪ Safe landing of members and fittings ▪ Storing of the dismantled materials	0.5		
	Sub-total VIII		**9**	**15**	**24**

Module IX: Earthquake Resistant Structures and Retrofitting

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	**P**	**Tot**
1.	Identify the material used for Repair/ Restoration/Retrofitting.	**Repair/restoration/retrofitting materials:** ▪ Concept of Repair, Restoration and Retrofitting ▪ Need of Retrofitting ▪ Material used for retrofitting • Most common materials * Cement Slurry * Cement Mortar * Expansive Cement * Quick setting Cement * Gypsum Cement * Steel Reinforcement * GI wires * Rolled Steel sections • Advanced materials * Epoxy resin/epoxy	1.5	1	2

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		Mortar * Polymer Modified Cementitious Products * Fiber Reinforcement Polymers. ▪ Tools and equipment required for retrofitting ▪ General methods of retrofitting ▪ Safety precautions			
2.	Retrofit for foundation of RCC building.	**Retrofitting for foundation:** ▪ Concept of retrofitting for foundation ▪ Assessment of building ▪ Methods of retrofitting for RCC building foundation ▪ Safety precautions	0.5		
3.	Retrofit for column.	**Retrofitting for column:** ▪ Concept of retrofitting for column ▪ Assessment of building ▪ Methods of retrofitting for column ▪ Safety precautions	0.5	2	4
4.	Retrofit for beam.	**Retrofitting for beam:** ▪ Concept of retrofitting for beam ▪ Assessment of building ▪ Methods of retrofitting for beam ▪ Safety precautions	0.5		
5	Retrofit for beam column joint.	**Retrofitting for beam column joint:** ▪ Concept of retrofitting ▪ Assessment of building ▪ Methods of retrofitting for beam column joint ▪ Safety precautions	0.5		
6.	Retrofit for slab/diaphragm.	**Retrofitting for slab/diaphragm:** ▪ Concept of retrofitting ▪ Assessment of building ▪ Methods of retrofitting for slab ▪ Safety precautions	0.5	1	2
7	Retrofit for infill wall of RCC Building.	**Retrofitting for infill wall:** ▪ Concept of retrofitting RCC building	0.5		

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Assessment of building ▪ Methods of retrofitting for infill wall ▪ Safety precautions			
8	Retrofit for masonry building.	**Retrofitting for masonry building:** ▪ Concept of retrofitting for masonry building ▪ Assessment of masonry building ▪ Tools and equipment required ▪ Methods of retrofitting for masonry (stone and brick) building ▪ Safety precautions	0.5	2	5
9	Retrofit for foundation of masonry building.	**Retrofitting for foundation of MB:** ▪ Concept of retrofitting for foundation ▪ Assessment of building ▪ Methods of retrofitting for masonry building foundation ▪ Safety precautions	0.5		
10	Retrofit for structural (Load bearing) wall of Masonry Building.	**Retrofitting for load bearing wall:** ▪ Concept of retrofitting for wall ▪ Assessment of building ▪ Methods of retrofitting for wall of Masonry building ▪ Connection improvement between wall to wall ▪ Tying of parapet wall ▪ Tying of gable wall ▪ Safety precautions	0.5		
11	Retrofit for Floor/Roof/Diaphragm of masonry building.	**Retrofitting for floor/roof/diaphragm:** ▪ Concept of retrofitting for floor/roof/diaphragm ▪ Assessment of building ▪ Methods of retrofitting for floor/roof/diaphragm of masonry building ▪ Connection improvement between wall to floor and wall to roof ▪ Safety precautions	0.5		

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
12	Retrofit of earthen building.	**Retrofitting for earthen building:** ▪ Concept of retrofitting of earthen building ▪ Assessment of earthen building ▪ Tools and equipment required ▪ Methods of retrofitting for earthen building ▪ Safety precautions	0.5		
	Sub-total IX		**7**	**6**	**13**
	Total (Sub-total I to Sub-total IX)		**59**	**97**	**156**

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ENGINEERING SURVEYING

`Total : 155 hrs.
Theory: 36 hrs.
Practical: 119 hrs.

Course Description:
This course is designed to impart basic knowledge and skill in surveying techniques. It consists of fundamentals of surveying along with principle of surveying and handling minor and major instruments for conducting various types of surveys and preparing necessary drawings/maps; detailed surveying such as chain surveying, compass traversing, leveling and theodolite traversing. It also deals with acquainting and handling the sophisticated surveying instruments such as total station and techniques as per the latest technological innovations.

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

1. Comprehend significance and concept of surveying;
2. Identify various minor and major survey instruments;
3. Illustrate the basic principle of surveying;
4. Perform fundamental works of surveying;
5. Conduct different detailed surveying such as chain surveying, compass traversing, leveling and theodolite traversing;
6. Perform various survey data plotting works;
7. Conduct topographic survey for proposed building construction site; and
8. Perform setting out of complete foundation plan various buildings.

Section A: Institute Based Training (15 Academic Weeks)
Module 1: Fundamentals of Surveying

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Acquaint with surveying.	**Concept of surveying:** ▪ Definition ▪ History ▪ Primary division of survey ▪ Classification and types ▪ Objective of surveying	1.0		1.0
2.	Illustrate the basic principles of surveying.	**Principles of surveying:** ▪ Principles of surveying	0.5		0.5
3.	Describe accuracy and errors.	**Accuracy and errors**: ▪ Definition of accuracy, precision and error ▪ Types and sources of errors	0.5		0.5
4.	Enlist units of measurement.	**Units of measurement:** ▪ Units of measurement ▪ Unit conversion	0.5	0.5	1.0
5.	Carry out scale conversion.	**Scale conversion** ▪ Introduction ▪ Types of scale	0.5	1.5	2.0

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Scale conversion			
6.	Measure distance using pacing factor.	**Distance measurement:** ▪ Introduction ▪ Determination of pacing factor ▪ Measurement of distance using pacing factor	1.0	2.0	3.0
7.	Handle minor survey instruments (using Measuring tape, Peg, Plumb-bob, Ranging rods, Arrow, Level-pipe, and Optical Square).	**Survey instruments:** ▪ Basic survey instruments (Major and minor) ▪ Function of survey instruments ▪ Handling procedure ▪ Safety precautions	2.0	4.0	6.0
8.	Measure linear distance ((using Measuring Tape, Peg, Plumb-bob, Ranging rods, Arrow, Level-pipe, and Optical Square).	**Linear measurements:** ▪ Horizontal distance ▪ Methods of distance measurements (Direct and indirect only) ▪ Tools and equipment used for measurement ▪ Linear and angular measurement. ▪ Measurement procedure in plain and sloped surface ▪ Tape correction for absolute length ▪ Direct and indirect ranging	2.0	4.0	6.0
9.	Transfer level using Level pipe.	**Level transferring:** ▪ Definition ▪ Plumb line ▪ Level line ▪ Selection of reference points ▪ Multi step level transfer using Level-pipe	2.0	4.0	6.0
10.	Set out simple building foundation with measuring tape and other instruments.	**Setting out:** ▪ Concept ▪ Perpendicular offsetting by 3-4-5 method and Optical square	1.0	5.0	6.0
11.	Conduct chain surveying using measuring tape and pegs/arrows	**Chain surveying:** ▪ Definition ▪ Principles ▪ Terminologies	2.0	10.0	12.0

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Establishment of base line ▪ Check line ▪ Tie line ▪ Offset and offset taking procedure ▪ Obstacles in chaining (accessible) ▪ Reference points			
12.	Plot chain survey data.	**Chain survey data plotting:** ▪ Procedure ▪ Scales in plotting ▪ Plot chain survey data ▪ Maps and legends	1.0	4.0	5.0
13.	Calculate land area.	**Land measurements:** ▪ Division of land into Well-conditioned triangles (Triangulation) ▪ Measure of all sides of triangles ▪ Formula to calculate area of triangle when all sides known ▪ Conversion of calculated land area to local system (Ropani-Aana-Paisa-Daam and Bigha-Katha-Dhur-Kanwa)	2.0	4.0	6.0
14.	Set up/ handle compass.	**Compass setting and traversing:** ▪ Definition ▪ Terminologies ▪ Function ▪ Types of compass ▪ Setting and handling of compass ▪ Compass traversing • Introduction • Technical terms (meridians, bearing and angles) • Systems of bearing (Fore and back bearing) • Prismatic and Surveyor's compass	2.0	2.0	4.0
15.	Set up/ handle plane table.	**Plane table setting up:**	2	4	6

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Definition ▪ Terminologies ▪ Principles ▪ Functions ▪ Instruments and accessories ▪ Setting up ▪ Methods of plane tabling			
16.	Perform plane table surveying. (Radiation and Intersection methods)	**Plane tabling:** ▪ Working operations • Temporary adjustment • Orientation ▪ Errors in plane table surveying ▪ Merits and demerits of plane table surveying ▪ Setting up plane table ▪ Radiation method ▪ Intersection method ▪ Procedure	1	8	9
17.	Perform level surveying.	**Leveling:** ▪ Definition and terminologies ▪ Objectives ▪ Auto level ▪ Staff ▪ Datum line ▪ Back slight, intermediate sight, foresight. ▪ Line of collimation ▪ Parallax elimination ▪ Reduced Level (R.L. ▪ Procedure in leveling ▪ Types of leveling ▪ Level book and entry procedure.	4.0	12.0	16.0
	Total		**25**	**65**	**90**

Section B: Institute Based Training One Day Per Week (78 Days/13 Academic Weeks)
Module I: Engineering Surveying

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Perform Two Peg Test.	**Two Peg Test:** ▪ Introduction ▪ Propose ▪ Procedure	0.5	1	1.5
2.	Calculate the level survey data.	**Level survey data:** ▪ Method of calculation (Rise & fall method and HI method). ▪ Arithmetic check and its application	0.5	3	3.5
3.	Plot longitudinal profile.	**Longitudinal profile:** ▪ Definition and types ▪ Procedure ▪ Plotting scales ▪ Plot longitudinal profile	1.0	5.0	6.0
4.	Plot cross section profile.	**Cross section profile:** ▪ Definition ▪ Procedure ▪ Plotting scales ▪ Plot cross section profile	1.0	5.0	6.0
5.	Perform contour surveying.	**Contouring:** ▪ Definition (contour, contour interval, contour index, horizontal equivalent, vertical equivalent) ▪ Criteria for selection of contours ▪ Characteristics of contours ▪ Interpolation and its methods ▪ Methods of contouring (direct and indirect) ▪ Uses of contouring	2.0	5.0	7.0
6.	Set out Theodolite over a given point.	**Theodolite setting up:** ▪ Introduction ▪ Functions ▪ Set up (Orientation, Centering and Leveling)	1.0	3.0	4.0
7.	Measure angles using Theodolite.	**Angle measurement:** ▪ Measure horizontal angles ▪ Measure vertical angles	1.0	1.0	2.0
8.	Perform traversing using	**Traversing:**	2	14.0	16.0

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
	Theodolite.	▪ Traversing (definition, purpose and types) ▪ Field works ▪ Methods (closed traverse only) ▪ Angular misclosure and its adjustment ▪ Traverse computation (consecutive coordinates and independent coordinates) ▪ Closing error and relative precision ▪ Balancing misclosure (Bowditch method and Transit method)			
9.	Plot traversing data.	**Traversing data:** ▪ Plotting scales ▪ Preparation of grid ▪ Plotting traverse ▪ Maps and legends ▪ Detailing ▪ Procedure	1.0	6.0	7.0
10.	Handle Total Station.	**Total Station (TS):** ▪ Introduction ▪ Set up ▪ Measurement of distance using TS ▪ Measurement of angles using TS	1.0	3.0	4.0
11.	Perform traversing using TS.	**TS traversing:** ▪ Procedure		8.0	8.0
		Total I	**11**	**54**	**65**

Textbooks:

1. R. Agor, "Surveying and Leveling", Khanna Publication New Delhi.
2. Dhakal B.B. and Karki B.K., "Engineering Surveying I &II", Heritage Publishers and Distributers Pvt. Ltd., Kathmandu, Nepal.

References:

1. N Basnet and M Basnet, "Basic Surveying – I & II", Benchmark Education Support Pvt. Ltd., Tinkune Kathmandu and Rajmati Press, Lalitpur.
2. S K Duggal, "Surveying" Vol I and II, Tata MC Graw Hill Publishing.
3. Dr. B. C Punmia, " Surveying " Vol I and II, Laxmi Publication, New Delhi.

ESTIMATING COSTING AND SUPERVISION

Total : 114 hrs.
Theory: 80 hrs.
Tutorial: 114 hrs.

Course Description:
This course is designed into two parts **viz.,** Estimating and costing and Supervision**.** The first part intends to provide knowledge and skills in calculating quantities and costs of simple engineering structures. It also provides knowledge and skills on analyzing the rate of construction items including specifications. The second part, deals with supervisory techniques necessary to carrying out at construction sites and construction activities as well. It also imparts knowledge and skills about properties valuation

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

1. Acquaint with units of various items, measurement units of civil construction work and district rates systems;
2. Calculate quantities estimate and abstract of cost of simple engineering structures;
3. Apply current government accounting format and procedures for construction sites;
4. Analyze rates of different items of construction works;
5. Prepare complete quantities estimate and abstract of cost of load bearing building and simple RCC frame structure building;
6. Acquaint the concept of properties valuation system; and
7. Apply supervisory techniques for managing construction sites and controlling quality of construction works.

Section A: Institute Based Training (15 Academic Weeks)
Module1: Estimating Items of Construction Works (Quantity Estimate)

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Describe procedures of estimating.	**Procedures:** ▪ Introduction ▪ Types of estimate ▪ Unit of measurement for different items ▪ Purpose of estimating ▪ System of measurements ▪ Data required for estimating	1	1	2
2.	Illustrate/convert measurement units/systems.	**Measurement units:** ▪ Types of measuring units ▪ Concept of S.I units ▪ Conversion from imperial to metric system and vice versa.	1	2	3
3.	Calculate geometrical shapes/sizes.	**Geometrical shapes:** ▪ Perimeter	1	2	3

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Area of rectangle, triangle, Trapezoid and circle ▪ Volume of cube, Sphere, Pyramid, Cone, Cylinder ▪ Area & Volume of irregular shapes			
4.	Measure construction materials/items.	**Construction materials/items:** ▪ Measurement Units of Construction Materials/Items ▪ Measurement of dimension of Construction Materials/Items	1	3	4
5.	Estimate quantity of earthwork.	**Earthwork:** ▪ Drawing and specification ▪ Format for detailed estimate, taking out dimensions, and quantity ▪ Estimating methods (long wall, short wall & center line)	1	4	5
6.	Estimate quantity of masonry footings.	**Masonry footing:** ▪ Drawing and specification ▪ for masonry (wall) footings ▪ Items of work for footing construction, soling, PCC, brickwork, offsetting ▪ T, 2T and 2T+300 for footings ▪ Estimating methods (long wall, short wall &center line)	1	5	6
7.	Estimate quantity of superstructure wall of a building.	**Superstructure wall:** ▪ Drawing and specification of wall ▪ Deduction (door and window opening) items ▪ Estimating methods (long wall, short wall &Centre line)	1	2	3
8.	Estimate quantity of flooring works.	**Flooring works:** ▪ Drawing and specification of the flooring works ▪ Estimate of different types of flooring	0.5	2	2.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		(Concrete, Tiles, Timber & Marbles)			
9.	Estimate quantity of RCC works.	**RCC works:** ▪ Density of R-Bar and concrete ▪ Reinforcement details of Beam / Lintel/ Column /Slab ▪ Reinforcement spacing, lapping, Hook, and bends ▪ Development length ▪ Procedure	1	1	2
10.	Estimate quantity of plastering / punning/ pointing/skirting works.	**Finishing works:** ▪ Drawing and specification ▪ Procedure	0.5	3	3.5
11.	Estimate quantity of CGI sheet roofing works.	**CGI sheet:** ▪ Drawing and specification of roof works ▪ Size of gauze of CGI sheet available in the market ▪ Procedure	1	3	4
12.	Estimate quantity of a single room/ two roomed building/ multi roomed residential building (Masonry/RCC).	**Masonry and RCC works:** ▪ Drawing and specification ▪ Position of DPC, doors and windows, beams ▪ Long wall and short wall method ▪ Center line method	1	4	5
	Sub-total I		**11**	**32**	**43**

Module II: Rate Analysis

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Illustrate rate analysis format/parameters.	**Rate analysis parameter:** ▪ Definition ▪ Current district rate or rate of material ▪ Format for rate analysis ▪ Factor affecting rate analysis ▪ Transportation rate related to capacity of vehicle ▪ Procedure of rate analysis	1	2	3
2.	Analyze rate for earthwork in excavation.	**Earthwork:** ▪ Types of earth works	1	2	3

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Water charge, tools & plants, overhead, contingency and VAT			
3.	Analyze rate of Plain Cement Concrete (PCC) works.	**PCC works:** ▪ Adopted ratios of PCC ▪ Dry volume and wet volume quantities of ingredients ▪ Norms and current district rates ▪ Explanation of water charge, tools & plants, overhead, contingency and VAT	1	3	4
4.	Analyze rate for steel reinforcement works.	**Reinforcement works:** ▪ Drawing and specification ▪ Procedure of Cutting, Bending, Binding and positioning of the steel reinforcement works ▪ Tools & plants, overhead, contingency and VAT	1	3.5	4.5
5.	Analyze rate for centering/formwork.	**Centering and formwork:** ▪ Providing, fixing and dismantling centering and formwork ▪ Explanation of water charge, tools & plants, overhead, contingency and VAT	1	2.5	3.5
6.	Analyze rate for rubble stone masonry in cement sand mortar.	**Ruble stone masonry:** ▪ Drawing and specification ▪ Water charge, tools & plants, overhead, contingency and VAT	1	2	3
7.	Analyze rate of brick soling.	**Brick soling:** ▪ Units of measurement ▪ Water charge, tools & plants, overhead, contingency and VAT	1	2	3
8.	Analyze rate for brick masonry work.	**Brick masonry** ▪ Number of bricks in per m3 ▪ Ratio of volume of bricks and mortar ▪ Norms and current district rates	2	2	4

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		▪ Water charge, tools & plants, overhead, contingency and VAT			
9.	Analyze rate for Blocks/Aluminium/Grill Works/ Railing Works/ UPVC/Painting/Tiles flooring/Marble flooring/Water proofing.	**Miscellaneous works:** ▪ Drawing and specification ▪ Water charge, tools & plants, overhead, contingency and VAT	2	2	4
	Sub-total II		**11**	**21**	**32**
	Total (Sub-total I + Sub-total II)		**22**	**53**	**75**

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

Module I: Property Valuation

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Acquaint with property valuation.	**Introduction:** ▪ Definition ▪ Purpose of valuation ▪ Principle of valuation ▪ Factor affecting the valuation	1	4	5
2.	Prepare the valuation report of property (land and Building).	**Valuation report:** ▪ Methods of valuation ▪ Gross income, Net income, ▪ Outgoing, Scrap value, Salvage value ▪ Sinking fund and depreciation	3	9	12
	Sub-total I		**4**	**13**	**17**

Module II: Supervision

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Describe role of supervisor.	**Roles of supervisor:** ▪ Supervisor as • A builder's or employee's agent • Duties of supervisor • Relationships between client, consultant and contractor	0.5		0.5

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
2.	Prepare progress report/keep builder's diary.	**Progress report:** ▪ Daily work progress report ▪ Monthly progress report ▪ Definition of builder's diary ▪ Supervisor's daily diary ▪ Methods to entry diary	0.5	1	1.5
3.	Prepare/maintain logbook.	**Logbook:** ▪ Log book and its uses ▪ Format of log book ▪ Maintaining site order book ▪ Maintain lab Test log book	0.5	1	1.5
4.	Prepare muster roll.	**Muster roll:** ▪ Muster roll ▪ Entry methods ▪ Types of workers (daily, seasonal and permanent) ▪ Payment process of muster roll	0.5	1	1.5
5.	Fill measurement book (M.B.).	**Measurement book:** ▪ Definition of measurement book. ▪ Importance of MB ▪ Size of MB ▪ Precautions in data entry in MB ▪ Endorsement procedure of MB	1	2	3
6.	Prepare work schedule.	**Work schedule:** ▪ Introduction ▪ Purpose ▪ Method (Gantt/Bar chart)	1	1	2
7.	Prepare running bill.	**Running bill:** ▪ Definition of bill ▪ Types of bill ▪ Definition of bill of quantities ▪ Definition of abstract of cost ▪ Retention money ▪ Procedure	1	2	3
8.	Participate in tendering/contract award procedures.	**Tendering/contract award:** ▪ Definition of contract and agreement ▪ Definition of tender/tender notice and tender document ▪ Difference between bid	1	2	3

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		bond and performance bond ▪ Procedure of bidder's evaluation ▪ Contract approval procedure ▪ Contract award ▪ Contract clauses			
9.	Prepare final bill.	**Final bill:** ▪ Definition of final bill ▪ Condition of final bill ▪ Comparative chart (contract quantity and final bill quantity) ▪ Payment procedure of government	1	2	3
10.	Prepare work completion certificate.	**Completion certificate:** ▪ Virtual completion certificate ▪ Midterm completion certificate ▪ Final completion certificate	0.5	1	1.5
11.	Carry out testing/commissioning of the construction works.	**Testing and commissioning:** ▪ Definition of maintenance period ▪ Types of maintenance ▪ Reimbursement of performance bond, bank guarantee and retention money ▪ Testing and commissioning the work done (procedure)	0.5	1	1.5
	Sub-total II		**8**	**14**	**22**
	Total (Sub-total I+ Sub-total II)		**12**	**27**	**39**

References:

1. Amarjit Aggarwal "Civil estimating quantity surveying and valuation" Katson Publishing House, Ludhiyana, 1985.
2. P.K. Guha "Quantity Surveying" (Principles and application Khanna Publishers.
3. M. Charkraborti "estimating, costing, specifications and valuation in civil engineering"
4. G.S. Berdie "text book of estimating and costing."
5. B.N Dutta "Estimating and costing, specification and valuation."

COMPUTER APPLICATION AND COMPUTER AIDED DRAFTING

Total: 95 hours
Theory: 20 hours
Practical: 75 hours

Course Description:

This course is designed into two parts. The first part of this course intends to impart the knowledge and skills on basic computing. It includes the use of documents, spreadsheets and presentations slides by using computer application packages.

Similarly, the second part of this course is designed to provide knowledge and skills on CAD software application techniques for designing, developing, creating and constructing various technical and building drawings.

Course Objectives:

After completion of this course, apprentices will able to:

1. Acquaint concept of computer system computer peripheral, operating system and application software;
2. Use different computer application packages;
3. Prepare documents, spreadsheets, presentations slides and database management sheets;
4. Describe the significant of CAD software in the engineering;
5. Apply CAD software designing, developing, creating and constructing various technical and building drawing; and
6. Apply CAD software in editing objects and annotate various drawings.

Section A: Institute Based Training (15 Academic Weeks)

Part I: Computer Application
Mode I: Computer System

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Identify computer peripheral.	**Fundamentals of computer:** ▪ Input and output devices ▪ Central processing unit (CPU) ▪ Memory unit ▪ Auxiliary storage devices ▪ Various ports	0.5	1.0	1.5
2.	Install operating system.	**Operating system:** ▪ Operating system	0.5	3.5	4.0

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		• Definition • Role • Types • Installation process ▪ Function of DOS Commands (COPY, REN, DIR, TYPE, CD, MD and BACKUP)			
3.	Install Application/Driver software.	**Application/driver software:** ▪ Difference between application software and device driver ▪ Introduction of Office package and various applications under it ▪ Uses of antivirus program. ▪ Installation process of application/driver software ▪ Features of Control Panel	0.5	2.0	2.5
	Sub-total I		**1.5**	**6.5**	**8.0**

Module II: Preparing Document Using Word Processing Packages

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Perform document typing.	**Document typing:** ▪ Word Processing application • Concept • Toolbar / Menu • Open and saving document and exit • Process of typing document • Concept of font, size, paragraph, headings, justification	0.5	2.00	2.5
2.	Setup Page in Word Processing.	**Word processing:** ▪ Features and attributes of "Page Setup" Box. ▪ Page margins,	0.5	1.00	1.5

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		orientation and columns ▪ Use of Breaks, Line numbers and Hyphenation			
3.	Insert Object/picture/photos.	**Object/picture /photo:** ▪ Process of Inserting Object/Picture/Photo	1.0	1.0	3.5
4.	Insert Header and Footer.	**Header and footer:** ▪ Difference between Header and Footer ▪ Application of different header and footer in different pages		1.00	
5.	Insert table.	**Table:** ▪ Concept of row and column ▪ Process to inserting table ▪ Table borders and shades		1.00	
	Sub-total II		**2.0**	**6.00**	**8.0**

Module III: Preparing Spreadsheets Using Spreadsheet Package

S. N.	Task Statements	Related technical knowledge	Time (Hrs.)		
			T	P	Tot
1.	Create worksheet.	**Spreadsheet application:** ▪ Concept and uses ▪ Interface ▪ Open and saving spreadsheet and exit ▪ Concept of column, row, cell, workbook, worksheet, labels, borders, values, dates and formulas	0.5	1.00	1.5
2.	Analyze data using basic formula/function.	**Formula and function:** ▪ Definition of operators ▪ Function/formula • Introduction • Use • Types ▪ Cell Reference • Relative	0.5	1.00	1.5

S. N.	Task Statements	Related technical knowledge	Time (Hrs.)		
			T	P	Tot
		• Absolute			
3.	Create Chart/Graph.	**Chart and graphs:** ▪ Graph and Charts • Concepts • Types • Process	1.0	1.00	5.0
4.	Filter data.	**Data filter:** ▪ Filter • Concept • Applications of filter		1.00	
5.	Sort data.	**Data sorting:** ▪ Sorting • Concept • Purposes and benefits of sorting		1.00	
6.	Setup page in spreadsheet.	**Page setup:** ▪ Features and attributes of "Page Setup" Box ▪ Page margins, orientation, size and columns		1.00	
	Sub-total III		**2.00**	**6.00**	**8.0**

Module IV: Presentation Creation Using Presentation Package

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Prepare master slide.	**Master slide:** ▪ Presentation Application • Concept and use • Tools and Menu • Introduction of slides and master slides • Use of master slide • Process to prepare master slide including formatting and editing	1.00	1.00	2.0
2.	Prepare slides.	**Slides:** ▪ Process to insert Text, Pictures/Objects/	0.5	1.00	15

		Sound and Graphs and Charts			
3.	Animate the content of slide.	**Animation:** ▪ Definition ▪ Application ▪ Difference between transition and animation.	0.5	1.00	1.5
4.	Perform On-screen presentation.	▪ On screen projection. ▪ Device connection process		1.00	1.0
	Sub-total IV		**2.0**	**4.00**	**6.0**
	Total (Sub-total I+ Sub-total II+ Sub-total III Sub-total IV)		**7.0**	**23.0**	**30.0**

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

Part II: Computer Aided Drafting (CAD)
Module: I Introduction to Computer Aided Drafting (CAD) Software

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Install the CAD Software.	▪ Computer Aided Drafting • Introduction • Different type of CAD Software • System required for CAD	0.5	4.0	4.5
2.	Startup Computer Aided Drafting (CAD) software.	▪ Introduction of CAD start menu ▪ Display modification ▪ Toolbar Arrangement ▪ Management of unit & limit ▪ Start, organize and save file ▪ Introduction of CAD graphics window including screen layout, pull-down menus, screen icons, command line and dialogue boxes	0.5	1.5	2.0
3.	Setup a drawing.	▪ Starting a drawing from scratch, using wizard and, using & creating a template file ▪ Preferences Setting (units & scale)	0.5	1.00	1.5
	Sub-total I		**1.5**	**6.5**	**8.0**

Module II: Creating Geometric Shapes using Draw Command Tools CAD Software

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Draw line.	**Line drawing:** ▪ Coordinate systems ▪ Types of activating draw command ▪ Start & end point of line ▪ Methods of drawing line ▪ Process to draw line	2.0	1.0	2.0
2.	Draw rectangle.	**Rectangle drawing:** ▪ Method of drawing rectangle		1.0	1.0
3.	Draw arc.	**Arc drawing:** ▪ 3 points method ▪ Start Center method ▪ Start End method ▪ Center Start method		1.0	1.0
4.	Draw circle.	**Circle drawing:** ▪ Center Radius method ▪ Center Diameter method ▪ 2P method ▪ 3P method ▪ Tan, Tan Radius method ▪ Tan, Tan, Tan method		1.0	1.0
5.	Draw polygon.	**Polygon drawing:** ▪ Center ▪ Edge ▪ Inscribed and circumscribed		1.0	1.0
6.	Draw ellipse.	**Ellipse drawing:** ▪ Ellipse in rectangular snap ▪ center radius method ▪ Center diameter method ▪ Ellipse in isometric method		1.0	1.0
	Sub-total II		**2.0**	**6.0**	**8.0**

Module III: Editing of Objects Using CAD Software

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Relocate object using Move command.	**Move command:** ▪ Object selection method ▪ Functions of commands • Erase, Trim, Break, Copy,	1.0	1.0	2.0

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Extend, Chamfer, Fillet			
2.	Relocate object using rotate command.	**Rotate command:** ▪ Definition of rotation angle ▪ Reference Point		1.0	1.0
3.	Duplicate object using Copy command.	**Copy command:** ▪ Differences between multiple copy and Single copy ▪ Process for duplicating object using copy command	0.5	1.0	1.5
4.	Duplicate object using Mirror command.	**Mirror command:** ▪ Purpose ▪ Method and Options available	0.5	1.0	1.5
5.	Duplicate object using Offset command	**Offset command:** ▪ Options available ▪ Methods of offsetting	0.5	1.0	1.5
6.	Duplicate object using Array command	**Array command:** ▪ Difference between Rectangular Array and Polar Array ▪ Description of Rows, Columns ad Distance, Center point, number, angle and rotation ▪ Methods of arraying	1.0	3.0	4.0
7.	Modify object using trim command.	**Trim command:** ▪ Cutting edge ▪ Options available for trimming object (project, edge, undo)	0.5	1.0	1.5
8.	Modify object using extend command.	**Extend command:** ▪ Definition boundary edge ▪ Procedure for modifying object using extend command	0.5	1.0	1.5
9.	Modify object using fillet/chamfer command.	**Chamfer and fillet commands:** ▪ Free hand sketch of fillet ▪ Difference between Chamfer and Fillet ▪ Options available for filleting object	0.5	1.0	1.5
		Sub-total III	**5**	**11**	**16**

Module IV: Annotating a Drawing with Text, Hatching and Dimensioning

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Create a Layer.	**Layers:** ▪ Definition ▪ Attributes and properties of a Layer (Line type, line weight, Global Scale Factor, Current Object Scale, Names, Of/Off, Freeze/Thaw, Lock/unlock, Color, Plot style, Plot/don't plot) ▪ Process for creating a layer	1.0	3.0	4.0
2.	Create text styles.	**Text style:** ▪ Difference between Single line text [TEXT] and Multiline Text [MTEXT] ▪ Explanation of Style name, Font Name, Style and Height ▪ Description of Font effect, Width factor and Oblique angle ▪ Procedure for creating text styles	1.0	3.0	4.0
3.	Fill area with hatching.	**Hatching:** ▪ Define ▪ Importance ▪ Differences of ISO Hatch Pattern, User Defined Hatch Pattern, Pre-Defined Hatch and Associative Hatch ▪ Explanation of Boundary set, copying of hatch properties, pick point, hatch angle, scale, pattern, and object selection	1.0	3.0	4.0
4.	Add dimensions to a drawing.	**Dimensioning:** ▪ Interpretation of dimension elements (dimension text, lines and arrowheads, leader, extension lines, units, tolerance and center marks) ▪ Types of dimension (linear, aligned, ordinate, radius, diameter, angular, baseline and continue)	1.0	4.0	5.0
	Sub-total IV		**4**	**13**	**17**

Module V: Creating Output

S.N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
1.	Work with layout.	**Layouts:** ▪ Properties ▪ Arranging paper size ▪ Prepare margin and title ▪ Use and properties of viewport	1	4.0	5.0
2.	Configure Plotters/Printers.	**Configuration:** ▪ Plotter Manager ▪ Plot Style Manager ▪ Printer/Plotter installation process	1	4.0	5.0
3.	Plot the drawing.	**Drawing plotting:** ▪ Paper size and paper units, drawing orientation, plot area and plot scale, plot offset ▪ Process for printing a drawing	1	3.0	4.0
	Sub-total V		**3**	**11**	**14**

Module VI: Project Works

S. N.	Projects /Task Statements	Time (Hrs.)		
		T	P	Tot
1.	Draft the Simple architectural drawing of single storeyed two roomed residential building including four elevations, plan, and section in standard paper size with name plate of municipal standard using above commands.		**10**	**10**
	Sub-total VI		**10**	**10**
	Total (Sub-total I+ Sub-total II+ Sub-total III+ Sub-total IV+ Sub-total V +Sub-total VI)	**14.0**	**51.0**	**65.0**

Textbooks:

1. Rajaraman, "*Fundamentals of Computers*", Prentice-Hall of India.
2. Mastering Auto CAD 2019 and AutoCAD LT 2019 by George Omura, SYBEX Publisher.

References:

3. B Ram, "*Computer Fundamentals*", Willey Eastern Publishers.
4. S Saxena, "*A First Course in Computers"*, Vikash Publishing
5. Winn Rosch, " Harware Bible."
6. Noel Kalicharan, "Introduction to computer Studies", Cambridge Low Price Edition
7. P.K Sinha, "Computer Fundamentals."
8. Autodesk AutoCAD 2019 Fundamentals by Elise Moss, SDC Publications.

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			**5.75**	**4.08**	**9.83**
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 of entrepreneurs • Nature of entrepreneurs	0.67	0.83	1.5
4	Assess entrepreneur's characteristics.	**Assessment of entrepreneur's characteristics:** • List of human	0.5	1.0	1.5

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		characteristics • Assessment of entrepreneurial characteristics			
5	Compare entrepreneur with other occupations.	**Entrepreneur and other occupations:** • Comparison of entrepreneur with other occupations • Types and styles of entrepreneurs	1.0		1.0
6	Differentiate between entrepreneur and employee.	**Entrepreneur and employee:** • Difference between entrepreneur and employee • Benefit of doing own business	0.5	0.5	1.0
7	Assess "Self.'	**"Self" assessment:** • Understanding "self" • Self-disclosure and feedback taking	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 of innovation	0.83	0.67	1.5
11	Transfer ideas into action.	**Transformation of idea into action:** • Concept of transferring idea into action • Self-assessment of creative style	1.0	0.5	1.5
12	Assess personal entrepreneurial tasks.	**Personal entrepreneurial tasks:** • Concept of entrepreneurial tasks • Assessing personal entrepreneurial tasks	0.5	1.0	1.5
13	Assess personal risk-taking	**Risk taking attitude:**	1.5	1.0	2.5

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
	attitude.	• Concept of risk • Personal risk-taking attitude • Do and don't do while taking risk			
14	Make decision.	**Decision making:** • Concept of decision making • Personal decision-making attitude • Do and don't do while making 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 potential business idea. • Analyze strength, Weakness, Opportunity and Threat (SWOT) of business idea.	**Identification and selection of potential business:** • Sources of business ideas • Points to be considered while selecting business idea • Business selection process • Potential business selection among different businesses • Strength, Weakness, Opportunity and Threats (SWOT) analysis of business idea • Selection of viable business idea 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 and marketing • 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 business management • Elements of business management ▪ Planning ▪ Organizing ▪ Executing ▪ Controlling	1.58	1.67	3.25

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
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 operation plan.	**Business plan/Business operation plan:** • Concept of business operation plan • Steps of business operation plan • 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 taken while collecting information ▪ Sample questions for market survey ▪ Questions to be asked to the customers ▪ Questions to be asked to the retailer ▪ Questions to be asked to the 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:**	1.0	2.0	3.0

S. N.	Task Statements	Related Technical Knowledge	Time (Hrs.)		
			T	P	Tot
		• Concept and need of book keeping • Methods and types of book keeping • Keeping and maintaining of day book and sales records			
	Total:		**30**	**48**	**78**

Textbooks:

क) प्रशिक्षकहरुका लागि निर्मित निर्देशिका तथा प्रशिक्षण सामग्री, प्राविधिक शिक्षा तथा व्यावसायिक तालीम परिषद् २०६९

ख) प्रशिक्षार्थीहरुका लागि निर्मित पाठ्यसामग्री तथा कार्यपुस्तिका, प्राविधिक शिक्षा तथा व्यावसायिक तालीम परिषद् (अप्रकाशित), २०६९

Reference book:

Entrepreneur's Handbook, Technonet Asia, 1981.

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) as he/she involves in construction of all components of buildings with emphasizing on the earthquake resistant building constructions and building services from the building construction related industries. It also helps the apprentices to enhancing employability, adoptability, confidentiality, independency 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 to work in building construction companies or firms as the apprentices under the supervision of In-company Trainer, whereas industrial practice & related occupational tasks/competencies and skills will be learned. The nature of 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 a week and they should come back in the training institute for rest of 1 day per week during the second phase of whole training period.

Moreover, apprentices will engage in Building Construction and Services specialization area, along with civil engineering core subjects such as Construction Materials and Construction Technology, Engineering Drawing (Computer Aided Drafting), Engineering Surveying; and Estimating Costing and Supervision as well. The sponsoring industries or companies will provide industrial practice platforms to the agreed apprentices for the above-mentioned duration. Furthermore, the sponsoring industries 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, workers and government and non-government agencies;
3. Apply acquired knowledge, skills and attitude in problem based exercises in real life industrial projects;

4. Provide occupational tasks learning platforms in the form of work-based learning;
5. Make apprentices familiar with the future occupation/ job platforms;
6. Provide platforms for learning and experiencing professional, organizational, team building, analytical and personal life skills;
7. Make apprentices familiar with the day to day administrative / management activities applicable in their related occupation;
8. Establish the strong linkage between industries and institution;
9. Match the technical skills learned at the institute with the needs of the employer;
10. Ensure the relevant degree coursework and training programs conducted according to the expectations of the industry, to ensure the subject contents are relevant and up to date;
11. Provide opportunity for apprentice to acquire interpersonal skills and ability for team work through interaction with professionals in their field of study;
12. Enhance employability, adoptability, confidentiality, independency and social and emotional intelligence;
13. Provide an opportunity for apprentices to learn about the industry of their discipline and related environment;
14. Provide an opportunity for the industry to identify potential employees and to feedback comments on the pre-diploma program at large;
15. Provide opportunity to obtain knowledge and skills on of how to make optimal decisions to resolve work challenges;
16. Earn ethics in the industries;
17. Learn accepted safety practices in the industry;
18. Increase better chances for career mobility;
19. Ensure workforce development according to the company's needs; and
20. 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 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 program are as follows.

1. Orient apprentices regarding the agreement terms and conditions that will be implemented during 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 be conducted from training providing institute;
6. Make familiar to apprentices about mandatory rules, regulation and code of conducts to be followed;
7. Orient apprentices about their attendance and daily dairy/logbook fill-up.
8. Orient apprentices about industry based continuous assessments (at the interval of three months 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 subjects that they are offered in industrial practice;
10. Inform apprentices about final practical examination criteria and venue of the industrial practice 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 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 training agreement 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, colleagues and 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 could willing 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 be appreciative 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 medical certificate 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 your work.
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 company Supervisor after you have put in your best effort.
11. Take note on any advice given to you in your log book so that you do not need to ask your colleagues 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 minimum guidelines at the end of their industrial practice.

- A hardcopy of 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 construction 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.

CONSTRUCTION MATERIALS AND CONSTRUCTION TECHNOLOGY

Total Duration: 13 Weeks (520 Hours)
Part I: Construction Technology
Module 1: Stone Masonry
Duration: 60 Hours

S.N.	Task Statements/Project Works	Time (Hrs.)		
		T	P	Tot
1.	Construct a rubble/ashlar stone masonry footing wall with seismic bands (As per drawing).			15
2.	Build L shaped rubble/Ashlar stone masonry wall in cement/ lime/mud mortar with seismic bands (As per drawing).			15
3.	Build T shaped rubble/Ashlar stone masonry wall in cement/ lime/mud mortar with seismic bands (As per drawing).			15
4.	Build Cross shaped rubble/Ashlar stone masonry wall in cement/ lime/mud mortar with seismic bands (As per drawing).			15
	Sub-total I			**60**

Module II: Brick and Block Masonry
Duration: 165 Hours

S.N.	Task Statements	Time (Hrs.)		
		T	P	Tot
1.	Cut the brick bat and closers. (As per drawing).			15
2.	Construct brick masonry foundation footing with seismic bands. (As per drawing).			15
3.	Build L shaped brick/concrete block wall using stretcher bond in cement/lime/mud mortar with seismic band (As per drawing).			15
4.	Build T shaped brick/block wall using stretcher bond in cement/lime/mud mortar with seismic band (As per drawing).			15
5.	Build Crossed brick/block wall using stretcher bond in cement/lime/mud mortar with seismic band (As per drawing).			15
6.	Build L-shaped brick wall using English bond in cement/ lime/ mud mortar with seismic band (As per drawing).			15
7.	Build T shaped brick wall using English bond in cement/ lime/ mud mortar with seismic band (As per drawing).			15
8.	Build Crossed brick wall using English bond in cement/lime/mud mortar with seismic band (As per drawing).			15
9.	Build an L shaped brick wall using Flemish bond in cement/ lime/ mud mortar with seismic band (As per drawing).			15
10.	Build T shaped brick wall using Flemish bond in cement/ lime/ mud mortar with seismic band (As per drawing).			15
11.	Build Crossed brick wall using Flemish bond in cement/ lime/ mud mortar with seismic band (As per drawing).			15
	Sub-total II			**165**

Module III: Reinforcement (Rebar) Works
Duration: 265 Hours

S.N.	Task Statements	Time (Hrs.)		
		T	P	Tot
1.	Prepare the mesh for foundation base.			20
2.	Prepare the column.			15
3.	Prepare tie beam/beam.			15
4.	Prepare slab bars.			15
5.	Prepare stirrups of different size /shape.			15
6.	Bind stirrups on column/ beam re bars.			15
7.	Fix cranked re bars in beams.			15
8.	Prepare chairs/legs for columns.			15
9.	Fix re bars in isolated footing/ strip/ combined/ mat foundation.			20
10.	Erect column re bars in a given position (lay out).			15
11.	Prepare re bar for a beam.			20
12.	Prepare re bars for floor slab.			20
13.	Prepare re bars for a cantilever beam/slab.			15
14.	Prepare re bars for base slab/ shear walls.			15
15.	Prepare re bars for an arch slab /place in position.			15
16.	Prepare Rebars for a given stair / place in position.			20
	Sub-total III			**265**

Module IV: Carpentry (Woodwork)
Duration: 30 Hours

S.N.	Task Statements	Time (Hrs.)		
		T	P	Tot
1.	Make Tenon and Mortise joint/Butt joint/Lap joint/Dado joint/Mitre joint/Dove tail joint.			22
2.	Perform finishing work.			5
3.	Perform polishing work.			3
	Sub-total IV			**30**
Total (Sub-total I+ Sub-total II + Sub-total III + Sub-total IV)				**520**

BUILDING CONSTRUCTION AND SERVICES

Total Duration: 28 Weeks (1120 Hours)
Part I: Building Construction
Module I: Earthquake Resistant Building Construction Technology
Duration: 236 Hours

S. N.	Task Statements	Time (Hrs.)		
		T	P	Tot
1.	Read/interpret Nepal National Building Code (NNBC).			6
2.	Apply general requirements for earthquake resistant construction.			10
3.	Construct vertical seismic resistant bands.			20
4.	Construct horizontal seismic resistant components.			20
5.	Construct seismic resistant load bearing stone masonry walls/buildings using mud mortar.			20
6.	Construct seismic resistant load bearing stone masonry walls/buildings using cement mortar.			30
7.	Construct seismic resistant load bearing brick masonry walls/buildings using cement mortar.			40
8.	Construct seismic resistant concrete block wall using cement mortar.			20
9.	Construct components of seismic resistant RC framed buildings.			70
	Sub-total I			**236**

Module II: Formwork
Duration: 100 Hours

S. N.	Task Statements	Time (Hrs.)		
		T	P	Tot
1.	Identify/enumerate/handle tools /equipment used for formwork.			3
2.	Describe formwork/identify structural elements/members.			3
3.	Interpret working drawing of simple bamboo/wooden formwork.			2
4.	Lengthen wooden members (as props, joists.) using half lap joint.			4
5.	Erect members in horizontal and vertical alignments.			4
6.	Assemble members at right angle to each other.			4
7.	Prepare different shape of form work. (Rectangular, Square, Semicircular, Circular.)			3
8.	Erect formwork for different types of Foundation (Isolated, Strap and Combined.)			6
9.	Erect formwork for rectangular/square column.			6
10.	Erect formwork for a wall.			6
11.	Erect formwork for a beam /slab.			8
12.	Erect formwork for a cantilever beam/slab.			9
13.	Erect formwork for circular columns.			6
14.	Erect formwork for arch lintel/ arc slab.			6
15.	Erect formwork for staircase/ Check width/ rise/ tread/ straightness of soffit.			8

S. N.	Task Statements	Time (Hrs.)		
		T	P	Tot
16.	Erect formwork for beam/slab using steel members.			6
17.	Dismantle beam/column/slab formwork.			6
	Sub-total II			**100**

Module III: Scaffolding
Duration: 117 Hours

S. N.	Task Statements	Time (Hrs.)		
		T	P	Tot
1.	Identify materials/fittings needed for scaffolding.			3
2.	Identify/enumerate/handle tools /equipment used for preparing/erecting scaffolding.			3
3.	Perform marking / sawing / slicing / file work.			2
4.	Prepare ledger/ transom/ standards/ brace.			3
5.	Prepare a ladder.			3
6.	Tie ledger/ standard/ transom with jute rope.			3
7.	Prepare Trestle scaffold.			3
8.	Erect bamboo / Timber used dependent scaffold.			10
9.	Erect standard ledgers/ transom/ brace using fittings.			3
10.	Check horizontal/vertical level of scaffold members.			3
11.	Fix safety net.			3
12.	Erect bamboo / Timber used independent scaffold.			15
13.	Erect simple birdcage tower Scaffold.			15
14.	Erect simple fixed tower Scaffold.			15
15.	Erect simple mobile tower Scaffold.			15
16.	Dismantle erected simple fixed tower scaffold.			6
17.	Dismantle erected simple mobile tower scaffold.			6
18.	Dismantle erected cantilever type tower scaffold.			6
	Sub-total III			**117**

Module IV: DPC, Sill, Lintels, Arches, Cavity Wall and Fixing of Frames
Duration: 90 Hours

S. N.	Tasks Statements	Time (Hrs.)		
		T	P	Tot
1.	Construct Damp Proofing Course.			14
2.	Build Partition/Cavity walls.			16
3.	Construct Sill/ Lintels/ Arches.			17
4.	Construct cavity wall showing 3" thick cavity using butterfly wall ties providing cavity clean using cavity clean batten or board, dry bond only.			16

S. N.	Tasks Statements	Time (Hrs.)		
		T	P	Tot
5.	Fix holdfast in frame.			9
6.	Level the opening for frame fixing			9
7.	Erect/fix door and window frames.			9
	Sub-total IV			**90**

Module V: Plastering and Pointing
Duration: 60 Hours

S. N	Task Statements	Time (Hrs.)		
		T	P	Tot
1.	Prepare cement sand mortar.			6
2.	Plaster the masonry wall.			10
3.	Plaster the column.			8
4.	Plaster on ceiling.			10
5.	Perform panipatti plaster.			8
6.	Perform skirting.			8
7.	Perform Pointing.			10
	Sub-total V			**60**

Module VI: Components Construction
Duration: 42 Hours

S. N.	Tasks Statements	Time (Hrs.)		
		T	P	Tot
1.	Construct RCC stairs.			20
2.	Construct roofs.			22
	Sub-total VI			**42**

Module VII: Finishing Works
Duration: 100 Hours

S. N.	Tasks Statements	Time (Hrs.)		
		T	P	Tot
1.	Perform ceiling finishing.			7
2.	Perform cladding finishing on wall.			6
3.	Construct Floors/ Floor finishes.			18
4.	Perform cement floor finish.			6
5.	Perform marble floor finish.			6
6.	Perform tile floor finish.			6
7.	Perform stone floor finish.			7
8.	Carryout building Finishing works.			24
9.	Construct false ceiling/ Plaster of Paris works/barricade.			20
	Sub-total IV			**100**

Module VIII: Earthquake Resistant Structures and Retrofitting
Duration: 135 Hours

S. N.	Task Statements	Time (Hrs.)		
		T	P	Tot
1.	Identify the material used for Repair/ Restoration/Retrofitting.			10
2.	Retrofit for foundation of RCC Building.			11
3.	Retrofit for column.			11
4.	Retrofit for beam.			8
5	Retrofit for beam column joint.			8
6.	Retrofit for slab/Diaphragm.			8
7	Retrofit for infill wall of RCC Building.			8
8.	Retrofit for Masonry Building.			22
9	Retrofit for foundation of Masonry Building.			13
10	Retrofit for structural (Load bearing) wall of Masonry Building.			13
11	Retrofit for Floor/Roof/Diaphragm of Masonry Building.			13
12	Retrofit of earthen building.			10
	Sub-total VIII			**135**
Total (Sub-total I + Sub-total II + Sub-total III + Sub-total IV + Sub-total V + Sub-total VI + Sub-total VII + Sub-total VIII)				**880**

Part II: Building Services
Module IX: Water Supply and Plumbing
Duration: 58 Hours

S. N.	Tasks Statements	Time (Hrs.)		
		T	P	Tot
1.	Layout Bathroom.			9
2.	Layout Kitchen.			6
3.	Install multilayer composite tube.			6
4.	Install Tap (bib cock/CP tap/fixture**).**			6
5.	Install shower.			6
6.	Install fixtures (commode/cistern/pan**).**			8
7.	Install electrical geyser.			6
8.	Install water pump.			5
9.	Layout/Install roof tank.			6
	Sub-total IX			**58**

Module X: Sanitary Engineering
Duration: 30 Hours

S. N.	Tasks Statements	Time (hrs.)		
		T	P	Tot
1.	Construct ventilated improved pit latrine (VIP)			14
2.	Construct disposal system and sanitary sewage			16
	Sub-total X			**30**

Module XI: Building Electrification
Duration: 152 Hours

S. N.	Task Statements	Time (Hrs.)		
		T	P	Tot
1.	Install stair-case wiring circuit switching on and off from ground floor and first floor (Two-way switch controlled from two different positions). **Stair-case wiring circuit installation includes:** ▪ Layout diagram ▪ Wiring diagram ▪ Wiring materials and accessories • Lamps • Two way switching and its operation • Socket outlet ▪ Testing of wiring installation ▪ Safety precautions			7
2.	Install an electric bell at our different locations using 4 electromagnetic bell indicators and four push switches different place. **Electric bell installation includes:** ▪ Wiring materials and accessories ▪ Lamps ▪ Alarming units and indicators including its function ▪ Push button switch Safety precautions			7
3.	Install a stairway lighting installation controlling the light from three different switching points using (1) Intermediate Switch (2) two ways switches as intermediate switch, wooden batten/plastic wiring system. **Stairway lighting installation includes:** ▪ Layout diagram ▪ Wiring diagram ▪ Wiring materials and Accessories • Lamps			6

S. N.	Task Statements	Time (Hrs.)		
		T	P	Tot
	• Two way switching • Intermediate switching ▪ Testing of wiring Installation ▪ Safety precautions			
4.	Repair / replace main circuit / branch- circuit's junction boxes of wiring system. **Repairing/replacing main circuit includes:** ▪ Faults • Introduction • Types • Identification of location ▪ Testing of wiring installation ▪ Maintenance of lighting installation ▪ Safety precaution			8
5.	Repair / replace fluorescent lighting wiring. **Repairing/replacing fluorescent tube light includes:** ▪ Fluorescent tube light • Introduction • Construction • Working principle • Component of complete set of fluorescent tube light ▪ Function of choke &starter ▪ Use of series test lamp ▪ Common faults in fluorescent tube ▪ Testing of electrical installation ▪ Safety precautions			8
6.	Repair /replace switch of wiring system. **Repairing/replacing switches includes:** ▪ Switches • Introduction • Function • Types • Advantages • Uses • Common faults • Testing • Safety precautions			6
7.	Repair / replace socket outlets / plugs of the wiring system. **Repairing/replacing socket outlets/plugs includes:** ▪ Socket outlets/plugs • Introduction • Types • Component • Switch socket combination			6

S. N.	Task Statements	Time (Hrs.)		
		T	P	Tot
	• Common fault ▪ Earthing • Earth electrodes • Earth conductors ▪ Testing the installation ▪ Safety precautions			
8.	Perform troubleshooting of the lamps/tubes/doorbells. **Troubleshooting includes:** ▪ Lamps • Introduction • Types ▪ Bell • Introduction • Working principle • Types • Main component • Types of fault ▪ Dismantling and reassembling methods of bells and lamps ▪ Safety precaution			6
9.	Repair / replace ceiling rose. **Repairing/replacing ceiling rose includes:** ▪ Ceiling rose/box • Introduction • Types • Installation method • Advantage • Disadvantage • Testing of installation			6
10.	Install / connect earthing electrode. **Earthing connection includes:** ▪ Definition • Earth wire • Earth electrodes (strip electrodes) • Earthing lead • Leakage ▪ Earthing • Introduction • Purpose • Importance • Types • Method of earthing • Earthing materials • Advantage ▪ Use of insulation testing meter			10

S. N.	Task Statements	Time (Hrs.)		
		T	P	Tot
	▪ Use of megger ▪ Safety precautions			
11.	Lay PVC pipe for conceals wiring. **Conceal wiring includes:** ▪ Conceal wiring • Introduction • Importance • Advantage ▪ Preparation of cement mixture ▪ Construction tools • Introduction ▪ PPEs • Introduction ▪ PVC pipe ▪ Safety precautions			8
12.	Draw wire/cable through PVC pipe using fish wire. **Wire cable drawing includes** ▪ Fish wire/tape • Introduction • Advantage • Application technique • Safety precautions			8
13.	Install/ connect accessories/fittings/protective devices/ distribution board. **Installation/ connection accessories includes:** ▪ Distribution board • Introduction • Types ▪ Load • Introduction • Types ▪ Bus bar • Introduction • Types • Size ▪ Protective devices • Introduction • Types • Ampere capacity • Determination of protective devices Amperage capacity ▪ Earthing and its conductors ▪ Energy meter ▪ Introduction • Working principle			12

S. N.	Task Statements	Time (Hrs.)		
		T	P	Tot
	• Types • Capacity ▪ Testing instrument • Introduction • Use • Safety precautions			
14.	Install outdoor lighting in garden/ trees/' shrubs/ flowers/ decks/ walkways and existing (project work). **Outdoor lighting installation includes:** ▪ Introduction • The garden and nighttime living area • Lighting and the Sense of sight • Lighting Terms • Light Levels of Brightness • The History outdoor lighting • Modern prospective on lighting ▪ Tools and Techniques • Down lighting & Safety lighting ▪ Up lighting& security lighting • Area lighting & Grazing light • Cross lighting & Spotlighting • Water lighting for Garden, pools, Fountains and Streams • Water lighting for swimming pools & Mirror lighting ▪ Use of materials for outdoor lightings ▪ Safety precautions			10
15.	Install SMART HOUSE wiring system (project work). **SMART HOUSE wiring installation includes:** ▪ Project carrying out guidelines ▪ Load assessment ▪ Size of wires and use of formula ▪ Estimating and Costing of Materials ▪ Arrangement of Switch Board and Distribution Board ▪ Testing • Insulation resistance test • Continuity test • Polarity test • Earth resistance test ▪ Safety precautions			24
16.	Install solar electrical systems (project work). **Solar electric system installation includes:** ▪ Solar module • Introduction • Construction			20

S. N.	Task Statements	Time (Hrs.)		
		T	P	Tot
	• Working principle • Type ▪ Lamps • Introduction • Types ▪ Charge controller • Introduction • Types ▪ Battery: • Introduction • Types • Physical inspection • Measurement technique of battery voltage • Measurement technique of specific gravity of battery acid ▪ Hydrometer • Introduction • Use ▪ Negative impact of disposal of Battery to the environment and human life ▪ Wire size and its type ▪ DC/DC converters ▪ DC/AC inverters ▪ Safety precautions			
	Sub-total X			**152**
	Total (Sub-total IX + Sub-total X + Sub-total XI)			**240**

ENGINEERING SURVEYING

Total Duration: 10 Weeks (400 Hours)
Module: Chain, Leveling, Plane tabling, Contouring and Traversing

S. N.	Task Statements/Projects	Time (Hrs.)		
		T	P	Tot
1.	Handle minor survey instruments (using Measuring tape, Peg, Plumb-bob, Ranging rods, Arrow, Level-pipe, and Optical Square).			10
2.	Measure linear distance ((using Measuring Tape, Peg, Plumb-bob, Ranging rods, Arrow, Level-pipe, and Optical Square).			10
3.	Transfer level using Level pipe.			10
4.	Perform chain surveying/detailing.			40
5.	Calculate land area.			10
6.	Perform level surveying (Longitudinal section and cross section of building access road/ hill road). **Leveling surveying includes:** ▪ Instrument (Auto-level) ▪ Method (Fly-leveling) ▪ Leveling misclosure: 25√K mm, where K = Circuit distance in Km. ▪ Longitudinal sectioning at 15 m regular interval ▪ Cross-sectioning up to 10m left and 10m right from Centre line. ▪ Plotting scale: L- sectioning: H scale: 1:1000, V scale: 1:100 ▪ X- sectioning: H and V scale: 1:200			40
7.	Perform contouring on a sloped ground by indirect method (grid method)			60
8.	Perform plane tabling/detailing			20
9.	Perform traverse survey. (Theodolite/Total station). **Requirements**: - Minimum 6 control points - 1 hectare of land with semi built up area **Traversing:** ▪ Performance of detailed topographic survey of given area ▪ Horizontal control points • Instrument (Theodolite/ Total station) • 1 set horizontal angles readings • Allowable difference between FL and FR observations = 1800 ±2*Least Count • Angular Accuracy =1.5'√n			80

S. N.	Task Statements/Projects	Time (Hrs.)		
		T	P	Tot
	• Linear accuracy = 1:100 • Plotting scale= 1:500 ▪ Vertical control points • Instrument (Auto-level) • Method (Fly-leveling) • Leveling misclosure: 25√K mm, where K = Circuit distance in Km. • Plotting scale: L- sectioning: H scale: 1:1000, V scale: 1:100 X- sectioning: H and V scale: 1:200 ▪ Detailing by Theodolite/Total station ▪ Process and plot the data in Auto-cad			
10.	Set out simple building foundation with measuring tape and other instruments.			30
11.	Set out a complete foundation plan of a building (Theodolite/Total station). **Foundation setting out:** ▪ Setting out the foundation plan for a building as per the drawing ▪ Instruments – Theodolite/Total station			70
12.	Determine building height. **Building height measurement:** ▪ Determination of building height by using Auto level ▪ Check for leveling misclosure which shall be less than 25√K mm, where K = Circuit distance in Km ▪ Apply necessary error adjustments ▪ Calculate the data in MS- Excel			20
	Total			**400**

ESTIMATING COSTING AND SUPERVISION

Total Duration: 9 Weeks (360 Hours)
Module: Quantity Estimating, Costing and Supervision

S.N.	Task Statements/Projects	Time (Hrs.)		
		T	P	Tot
1.	Perform quantity survey and cost estimation of septic tanks and soak pits (as per given drawings).			30
2.	Estimate the quantities of all the construction materials and detailed cost of stone masonry buildings (at least 2 roomed single storeyed residential buildings)			50
3.	Estimate the quantities of all the construction materials and detailed cost of 2 and half storeyed RCC framed residential buildings with 4 rooms as per drawing.			50
4.	Estimate the quantities of all the construction materials and detailed cost of multi-storeyed RCC framed residential building with 6 rooms/flat as per drawing.			50
5.	Estimate the quantities of all the construction materials and detailed cost of multi-storeyed RCC framed no-residential buildings as per drawing.			60
6.	Prepare progress report/keep builder's diary.			20
7.	Prepare/maintain logbook.			20
8.	Fill measurement book (M.B.).			20
9.	Prepare work schedule.			10
10.	Prepare running bill.			20
11.	Participate in tendering/contract award procedures.			10
12.	Prepare work completion certificate.			10
13.	Carry out testing/commissioning of the construction works.			10
	Total			**360**

COMPUTER APPLICATION AND COMPUTER AIDED DRAFTING

Total Duration: 5 Weeks (200 Hours)
Module: Auto-CAD

S. N.	Task Statements/Projects	Time (Hrs.)		
				Tot
1.	Prepare detailed drawings of septic tank and soak pit (at least 2 projects)			12
2.	Prepare topographic maps from survey data and generate contours using SWDTM software and Auto-CAD.			12
3.	Prepare two and half storeyed municipal drawings of at least two residential buildings with minimum 4 rooms including four elevations, plans, sections, site plan and location map (Load Bearing or frame structure) (at least two projects).			24
4.	Prepare two and half storeyed detailed working drawings of at least two residential buildings with minimum 4 rooms including trench plan, foundation details, and door windows details (Load Bearing and frame structure) (at least two projects).			24
5.	Prepare multi-storeyed municipal drawings of at least one residential building with minimum 6 rooms/ flat or a non-residential building including four elevations, plans, sections, site plan and location map (Frame structure) (at least two projects).			24
6.	Prepare detail working drawing of multi-storeyed building with minimum 6 rooms/flat or non-residential building including trench plan, foundation details, and door windows details (Frame structure) (at least two projects).			24
7.	Prepare a multi-storeyed drawing of non-residential buildings including detailed working drawing (at least two projects)			80
	Total			**200**

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: _____

Sign 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.

Mark Scale	**Very Poor**	**Poor**	**Fair**	**Good**	**Very Good**
	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 multi tasks	…/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 multi tasks	…/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:	
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