

CURRICULUM
TSLC
Civil Engineering
(Post-SLC Intake Program)



Council for Technical Education and Vocational Training
Curriculum Development Division

Sanothimi, Bhaktapur

Development 1995, Second Revision, 2008
(Third Revision 2014)

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Introduction:

This course is designed to prepare competent general civil sub-overseers equipped with knowledge, skills and attitude especially, in the area construction Engineering & Technology of building construction, water supply, irrigation and road and trail bridges sectors. They can provide services in the growing infrastructure development industries (civil construction companies and consulting firms) government institutions (centre and local level), local as well as international non-governmental organisations or can start their own business. These technicians can provide services in the growing infrastructure development industries, government institutions (centre and local level), and local as well as international non-governmental organisations or can start their own business in the country as well as abroad.

Aim:

The programme aims to prepare competent civil sub-overseer in the area of construction technology, water supply, road and trail bridges and irrigation sectors.

Objectives:

After completing this curriculum program, the graduates will be able:

1. To provide services as a basic level technician in the field of civil engineering;
2. To conduct detailed surveying works for the establishment of small scale rural water supply and hill irrigation scheme;
3. To draw drawing of small scale rural scale rural water supply scheme, small scale irrigation structures and minor residential building.;
4. To supervise civil construction works such as building construction, water supply, road and trail bridge in growing infrastructure development industries, government institutions (centre and local level), local as well as international non-governmental organisation; and
5. To create self-employment opportunity to reduce the unemployment problems this helps to alleviate the poverty in the country.

Programme Description:

The Council for Technical Education and Vocational Training CTEVT has been running its post SLC intake general construction (Civil Sub-Overseer) programme since 2052 V.S. (1995 AD). This course is designed to prepare competent general civil sub-overseers equipped with knowledge, skills and attitude especially, in the area construction Engineering & Technology of building construction, water supply, irrigation and road and trail bridges sectors. They can

provide services in the growing infrastructure development industries (civil construction companies and consulting firms) government institutions (centre and local level), local as well as international non-governmental organisations or can start their own business.

The program is designed on the basis of 20% theory classes and 80% practical classes.

During this revision, the structure of the curriculum has been changed from the previous curriculum. Although it follows the same contents as of older version new tasks are added according to new innovation in this field.

The provision of On-the- Job Training (OJT) is included to establish a linkage with employers and provides hands on work experience to students and promote employability of graduates.

Course Duration:

This course will be completed within 15 months (12 months on institution + 3 months OJT). The duration will be 52 weeks/1560 hours on institution and 12 weeks/ 480 hours on-the-job assignment for issuing successful completion of the course.

Target Group:

The target group for this training will be all the interested individuals of the country with academic qualification of SLC pass. Preference will be given to the individuals of rural, poor, female, Dalit, Janjati, Disadvantaged Groups (DAGs), conflict affected people and the disables.

Target Location:

The target location of this training program will be all over Nepal.

Group Size:

The group size of this training program will be not more than 40.

Medium of Instruction:

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

Pattern of Attendance:

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

Entry Criteria:

Individuals who meet the following criteria will be allowed to enter into this program:

- SLC pass

- Students should pass entrance examination administered by CTEVT
- They should submit the following documents at the time of application
 - SLC pass certificate
 - Character certificate
 - Citizenship certificate (for the name, parents' name, age, date of birth and address verification purpose only)
- Final selection will be made on the basis merit list.
- The quota for different category of students will be as per the enrollment policy of CTEVT

Focus of the Programme:

This is a competency based curricular program. This program emphasizes on competent performance of the task specified in it. In this programme, 80% time is allotted to the competencies and remaining is allotted to the related technical knowledge. Therefore, this curriculum is designed focussing on the performance of the specified competencies/tasks /skills included in this program.

Teacher and Student Ratio:

- Overall ratio of teacher and student must be 1:10 (at the institution level).
- Teacher and student ratio must be for practical demonstration 1:12
- Teacher and student ratio must be for bench work 1:6
- Minimum of 75% of the teachers must be fulltime.

Instructional Media and Materials:

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

- Printed Media Materials (Assignment sheets, Case studies, Handouts, Information sheets, Individual training packets, Procedure sheets, Performance Check lists, Textbooks etc.).
- Non-projected Media Materials (Display, Models, Photographs, Flip chart, Poster, Writing board etc.).
- Projected Media Materials (Opaque projections, Overhead transparencies, Slides etc.).
- Audio-Visual Materials (Audiotapes, Films, Slide-tape programs, Videodiscs, Videotapes etc.).

- Computer-Based Instructional Materials (Computer-based training, Interactive video etc.) or training institution).

Teaching Learning Methodologies:

The methods of teachings for this curricular program will be a combination of several approaches. Such as Illustrated Lecture, Group Discussion, Demonstration, Simulation, Guided practice, Practical experiences, Fieldwork, Report writing, Term paper presentation, Case analysis, Tutoring, Role-playing, Heuristic and Other Independent learning.

- Theory: Lecture, Discussion, Assignment, Group work.
- Practical: Demonstration, Observation and Self-practice.
- OJT

Evaluation Details:

- Continuous evaluation of the students' performance is to be done by the related instructor/trainer to ensure the proficiency over each competency under each area of a subject specified in the curriculum.
- Related technical knowledge learnt by students will be evaluated through written tests.
- Students must score a minimum mark of 40% in theory test and 60% in practical test in all subjects.
- There will be three internal assessments and one final examination in each subject. Moreover, the mode of an assessment and an examination includes both theory and practical or as per the nature of instruction as mentioned in the course structure.
- Students should pass internal assessments both in theory and practical tests in all subjects.
- The ratio between the theory and practical tests will be 20:80 in case of a practical nature subject.
- Out of 100%, 50% weightage is allotted for the internal assessments and the remaining is allotted for the final examination
- The on-the-job training has to be evaluated keeping 300 as full marks. The evaluation of the performance of the student is to be carried out by the three agencies; **the concerned institute, industry/organization where the student worked and the CTEVT** unless otherwise directed by office of the controller of examinations /Technical Division of the CTEVT. Here also the student has to score 60% or above for successful completion of the course.

Grading System:

The grading system will be as follows:

<u>Grading</u>	<u>Overall marks</u>
Distinction	80% or above
First division	75% or above
Second division	65% or above
Third division	Pass aggregate to below 65%

Certificate Requirements:

The council for technical education and vocational training will award certificate in “**Technical School Leaving Certificate in Civil Engineering**” to those students who successfully complete all the requirements as prescribed by the curriculum.

Career Path:

The graduates will be eligible to work in the position of civil sub-overseer in the government related organizations as prescribed by the Public Service Commission or the concerned authorities of the Republic of Nepal

Curriculum Structure of TSLC in Civil Engineering

S. No.	Subjects	Nature	Class/Week	Total Class/Year	Full Marks		
			Total	Total	T	P	Total
1.	Computer Aided Drafting	P	2	78	0	50	50
2.	Construction Materials	T	2	78	50	0	50
3.	Construction Technology	T+P	6	234	50	100	150
4.	Engineering Drawing	P	4	156	0	100	100
5.	Engineering Surveying	T+P	6	234	25	125	150
6.	Entrepreneurship Development	T+P	2	78	20	30	50
7.	Estimating, Costing & Supervision	T+P	4	156	25	75	100
8.	Road & Trail Bridge	T+P	4	156	50	50	100
9.	Water Supply, Sanitary and Irrigation Engineering	T+P	4	156	50	50	100
10.	Workshop Practice	P	6	234	0	150	150
	Sub Total		40	1560	270	730	1000
	On-the-Job Training	P	12	480			300
	Total			2040			1300

Computer Aided Drafting

Total	78 hrs
Theory	8 hrs
Practical	70 hrs

Course Description:

This course intends to impart the knowledge and skills on creating of two dimensional (2D) drawing and drafting using Computer Aided Drafting (CAD) software with a focus mainly on *civil engineering drawings*. The course is designed to fulfill specific needs of student who wants the transition from a paper to electronic drawing world by means of using CAD as a drafting tool. Students develop competencies mainly on different features such as Geometric shapes, Layers and Line types, Annotating a drawing with Text, Hatching and Dimensioning and creating output.

Prerequisite:

- Engineering Drawing
- Basic Computer Application

Module: 1 Introduction to Computer Aided Drafting (CAD) Software

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
1.	Startup Computer Aided Drafting (CAD) software	<ul style="list-style-type: none"> ▪ Introduction ▪ Enlist different types of CAD software. ▪ System required for CAD ▪ Startup CAD by start menu ▪ Modify Display ▪ Introduce & arrange toolbar ▪ Managing unit & limit ▪ Start, organize and save file ▪ Interpret CAD graphics window including screen layout, pull-down menus, screen icons, command line and dialogue boxes. 	0.25	0.75

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
2.	Setup a Drawing	<ul style="list-style-type: none"> ▪ Explain how to start drawing from scratch, using wizard and, using and creating a template file. ▪ Describe setting preferences (units and scale) 	0.25	0.75
	Sub total		0.50	1.50

Module: 2 Creating Geometric Shapes using CAD Software

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
3.	Draw line	<ul style="list-style-type: none"> ▪ Different coordinate system ▪ Start & end point of line ▪ Methods of drawing line ▪ State the procedure to draw line 	0.50	0.50
4.	Draw rectangle	<ul style="list-style-type: none"> ▪ Method of draw rectangle ▪ Explain the procedure for drawing rectangle 		0.50
5.	Draw arc	<ul style="list-style-type: none"> ▪ Identify arc among various types of geometric shapes. ▪ Describe different method for drawing arc (3 points method, Start Center method, Start End method, Center Start method) 	0.50	1.00
6.	Draw circle	<ul style="list-style-type: none"> ▪ Describe different method for drawing arc (Center Radius method, Center Diameter method, 2P method, 3P method, Tan, Tan Radius method, Tan, Tan, Tan method) 		0.50
7.	Draw polygon	<ul style="list-style-type: none"> ▪ Describe different method for drawing polygon (center, edge) 		0.50
8.	Draw ellipse	<ul style="list-style-type: none"> ▪ Ellipse in rectangular snap ▪ center radius method 		1.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		<ul style="list-style-type: none"> ▪ Center diameter method ▪ Ellipse in isometric method 		
	Sub total		1.00	4.00

Module: 3 Editing of objects using CAD Software

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
9.	Relocate object using Move command	<ul style="list-style-type: none"> ▪ Object selection method ▪ Explain the functions of following commands Erase, Trim, Break, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Extend, Chamfer, Fillet. 	0.50	0.50
10.	Relocate object using rotate command	<ul style="list-style-type: none"> ▪ Define rotation angle ▪ Explain Reference Point. 		0.50
11.	Duplicate object using Copy command	<ul style="list-style-type: none"> ▪ Differentiate Multiple copy and Single copy. ▪ Explain the procedure for duplicating object using copy 		0.50
12.	Duplicate object using Mirror command	<ul style="list-style-type: none"> ▪ State the purpose of Mirror. ▪ Explain First point and Second point of mirror line ▪ Second point of mirror line ▪ Describe options available in mirror command 	0.50	1.00
13.	Duplicate object using Offset command	<ul style="list-style-type: none"> ▪ Describe options available ▪ Offset distance 		1.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
14.	Duplicate object using Array command	<ul style="list-style-type: none"> ▪ Differentiate Rectangular Array and Polar Array ▪ Explain Rows, Columns and Distance, Center point, number, angle and rotation 	0.25	1.00
15.	Modify object using trim command	<ul style="list-style-type: none"> ▪ Define Cutting edge ▪ Explain the options available for trimming object (project, edge, 	0.25	0.50
16.	Modify object using extend command	<ul style="list-style-type: none"> ▪ Define Boundary edge ▪ State the procedure for modifying object using Extend command. 	0.25	1.00
17.	Modify object using fillet command	<ul style="list-style-type: none"> ▪ Draw a free hand sketch of fillet ▪ Differentiate Chamfer and Fillet. ▪ Explain the options available for 	0.25	0.50
	Sub total		2.00	6.50

Module: 4 Annotating a drawing with Text, Hatching and Dimensioning

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
18.	Create a Layer	<ul style="list-style-type: none"> ▪ Define Layer. ▪ Explain different 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) ▪ Explain the procedure for creating a layer. 	1.00	2.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
19.	Create text styles.	<ul style="list-style-type: none"> ▪ Differentiate Single line text [TEXT] and Multiline Text [MTEXT] ▪ Explain Style name, Font Name, Style and Height ▪ Describe Font effect, Width factor and Oblique angle ▪ Explain the procedure for creating text styles. 	0.50	1.00
20.	Add Single line text to a drawing			1.00
21.	Add Multiline text to a drawing			1.00
22.	Fill area with hatching	<ul style="list-style-type: none"> ▪ Define hatching. ▪ Importance of hatching ▪ Differentiate ISO Hatch Pattern, User Defined Hatch Pattern, Pre-Defined Hatch and Associative Hatch ▪ Explain Boundary set, copying of hatch properties, pick point, hatch angle, scale, pattern, and object selection. 	0.50	2.00
23.	Add dimensions to a drawing	<ul style="list-style-type: none"> ▪ Interpret dimension elements (dimension text, lines and arrowheads, leader, extension lines, units, tolerance and center marks) ▪ Describe dimension types (linear, aligned, ordinate, radius, diameter, angular, baseline and continue) 	0.50	2.00
	Sub total		2.50	9.00

Module: 5 Creating output

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
24.	Configure Plotters/Printers	<ul style="list-style-type: none"> ▪ Define Plotter Manager ▪ Explain Plot Style Manager ▪ State the Printer/Plotter Installation process 	0.5	1.0
25.	Plot drawing	<ul style="list-style-type: none"> ▪ Explain paper size and paper units, drawing orientation, plot area and plot scale, plot offset. ▪ Describe the procedure for printing a drawing. 	0.5	1.0
	Sub total		1.00	2.00

Project works

26.	<p>Following drawings are to be prepared and submitted (e-copy and hard copy both) using CAD software.</p> <ul style="list-style-type: none"> • Simple architectural drawing of one storey residential building including four elevations, plan, section, site plan and location map). • Staircase • Cross section of foundation-Masonry wall, RCC columns (isolated) 		43.00
	Sub total	0	43
	Total	8	70
	All total	78	

Suggested texts and references:

Recent CAD packages available in the market

Construction Materials

Total	78 hours
Theory	78 hours

Course Description:

This course is designed to provide basic knowledge in various construction materials. It intends to provide information on the sources and quality on various construction materials like stones, bricks, aggregates, lime, cement, steel, glass, plastic etc. The students will be acquainted with the locally available construction materials according to the concept of low cost in construction especially suitable to our rural requirement.

Course Objectives:

After completion of this course, the students will be able:

1. To enlist and identify various construction materials different geographical regions of Nepal; and
2. To explain various construction materials in the view of their application.

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
1.	Enlist various construction materials used in Nepal	<ul style="list-style-type: none"> ▪ Mud ▪ Stones ▪ Aggregate; Sand and Gravel ▪ Cement ▪ Lime ▪ Plastic ▪ Glass ▪ Asbestos Sheet ▪ Fibreglass/sheet ▪ Blocks ▪ Bricks ▪ Steel ▪ Aluminum ▪ Timber ▪ Plywood 	2	

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ Artificial wood ▪ Bamboo and cane ▪ Roofing materials (<i>Khar</i>, Straw, Slate, <i>Khapada</i>, Tiles, Corrugated Galvanized Iron CGI sheet) 		
2.	Explain Mud as construction material	<ul style="list-style-type: none"> ▪ Selection ▪ Consistency and Shrinkage test ▪ Soil stabilization ▪ Ramming technique ▪ Adobe block 	4	
3.	Explain Stone as construction material.	<ul style="list-style-type: none"> ▪ Formation of rocks; Igneous, Sedimentary and Metamorphic ▪ Source; River boulders, Stone Quarry ▪ Characteristics of good building stones ▪ Shape; Rounded, irregular, angular and flaky ▪ Selection and use of stones for various construction ▪ Dressing, seasoning and stacking (Extraction and preparation for use) 	10	
4.	Explain Aggregates as construction material.	<ul style="list-style-type: none"> ▪ Classification; according to nature of formation, size and shape ▪ Test (concept only) ▪ Testing of sand; Silt content ▪ Sieve Analysis (Concept only) 	5	
5.	Explain Brick/Tiles construction material.	<ul style="list-style-type: none"> ▪ Composition(mud, cement) ▪ Manufacturing; Soil/mortar 	10	

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		preparation, Molding, Drying, Burning <ul style="list-style-type: none"> ▪ Environmental concern. ▪ Brick types and their uses ▪ Machine made and locally made bricks and their sizes ▪ Testing of bricks (concept only) ▪ Molding of tiles ▪ Types of tiles ▪ Test of tiles (concept only) 		
6.	Explain Hollow block as a construction material.	<ul style="list-style-type: none"> ▪ Composition ▪ Forms and sizes ▪ Types; Concrete, Clay ▪ Test (Concept only) 	2	
7.	Explain Lime as a construction material.	<ul style="list-style-type: none"> ▪ Sources ▪ Manufacturing procedure ▪ Types ▪ Uses ▪ Storage ▪ Setting ▪ Test (concept only) 	4	
8.	Explain Cement as a construction material.	<ul style="list-style-type: none"> ▪ Composition ▪ Manufacturing process ▪ Types ▪ Test (concept only) ▪ Storage ▪ Setting 	7	
9.	Explain mortar	<ul style="list-style-type: none"> ▪ Definition ▪ Types ▪ Water Cement Ratio Preparation; batching, mixing, transporting and placing ▪ Curing processes 	5	

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
10.	Explain Concrete as a construction material.	<ul style="list-style-type: none"> ▪ Definition ▪ Types: PCC, RCC ▪ Water Cement Ratio ▪ Preparation: Batching and Mixing, Transporting, Placing, Compacting, Curing ▪ Grade/Strength ▪ Tests (Concept only): Slump test, Compression test 	8	
11.	Explain Plastic/fibre glass & asbestos as a construction material	<ul style="list-style-type: none"> ▪ Definition ▪ Classification: Thermoplastics and Thermosets ▪ Uses ▪ Types of joints 	2	
12.	Explain Glass as a construction material	<ul style="list-style-type: none"> ▪ Definition ▪ Composition ▪ Classification ▪ Commercial forms 	2	
13.	Explain Tar/Bitumen/Asphalt as a construction material	<ul style="list-style-type: none"> ▪ Definition ▪ Types ▪ Uses ▪ Tests (Concept only) 	4	
14.	Explain Paint/Varnishes	<ul style="list-style-type: none"> ▪ Definition ▪ Classification ▪ Composition ▪ Characteristics of good paints/varnishes 	4	
15.	Explain CGI sheet/reinforcing Steel as a construction material	<ul style="list-style-type: none"> ▪ Classification ▪ CGI sheets ▪ Gauge of CGI sheet ▪ Reinforcing steel bars ▪ Test of bars (Concept only) 	4	
16.	Explain Bamboo/Cane	<ul style="list-style-type: none"> ▪ Uses and importance ▪ Types 	3	

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ Characteristics ▪ Common types used in constructional purposes 		
17.	Explain Aluminum as a construction material	<ul style="list-style-type: none"> ▪ Definition ▪ Types ▪ Uses 	2	
	Total		78	0

Suggested texts and references:

१. Galami T.B. *A Text Book of Construction (Part -I)*, CTEVT.
२. Singh Surendra, *Engineering Materials (Latest Edition)*, Vikas Publishing House Pvt.Ltd.
३. Rangwala, *Engineering Material (Latest Edition)*
४. Kumar S., *Engineering Materials (Latest Edition)*
५. Singh Gurucharan, *Material of Construction (Latest Edition)*
६. Davis H.E., *Testing and Inspection of Engineering Materials (Latest Edition)*
७. शाक्य रत्नमान, मर्सानी अमृतप्रसादऔद्योगिकशिक्षा, कक्षा ९ र १०, पाठ्यक्रमविकास केन्द्र २०५६ ।
८. शाक्य रत्नमान, वाग्ले माधवप्रसाद र लम्साल जयप्रसाद, *बेत बांस शिल्पशिक्षाकक्षा ९*, पाठ्यक्रमविकास केन्द्र २०५६ ।
९. व्यनजनकार मोहनमान , गाहो लगाउने प्रविधि २०४८ ।

Construction Technology

Total	234 hours
Theory	58 hours
Practical	176 hours

Course Description:

This course is designed to impart basic knowledge and skills about civil construction works. The course has been designed in systematic way beginning from the simple subject to the specific work items. This course intends to provide skills in choosing appropriate constructional material for various constructional purposes. This course provides skills focusing on masonry, concreting, flooring, finishing, building components construction, temporary construction as well as rural technology and alternative energy. It also deals with concept of earthquake resistant building construction technique.

According to the nature and volume of the practical tasks, the students can work in groups.

Course Objectives:

After completion of this course, the students will be able:

1. To be familiar with masonry, concrete, flooring and finishing works;
2. To perform stones, brick and hollow block masonry works;
3. To perform concreting, flooring and finishing works;
4. To be familiar with construction of different building components;
5. To be familiar with the concept of rural technology and alternative energy along with micro hydro.

Module1: Masonry works

S.No.	Tasks Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
1.	Explain stone masonry works	<ul style="list-style-type: none"> ▪ Introduction ▪ Types of stone masonry: Random Rubble, Rubble, Ashlar and Dry 	1	0	1
2.	Identify the tools for stone masonry works	<ul style="list-style-type: none"> ▪ Commonly used tools and equipment for stone masonry works ▪ Tools for dressing ▪ Use and care of tools and equipment ▪ Handling procedure including safety requirements 	1	1	2

S.No.	Tasks Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
3.	Dress the face/bond corner stone for Rubble masonry works	<ul style="list-style-type: none"> ▪ Types of dressing: Chisel and hammer dressing ▪ Purpose of dressing works ▪ Requirement of good corner stone for random rubble masonry works ▪ Safety 	1	7	8
4.	Dress the face/bond corner stone for Ashlar masonry works	<ul style="list-style-type: none"> ▪ Requirement of good face/bond stone for Ashlar masonry works ▪ Requirement of good corner stone for Ashlar masonry works ▪ Dressing procedure 	1	6	7
5.	Identify different walls	<ul style="list-style-type: none"> ▪ 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 	2	2	4
6.	Build random rubble/rubble/Ashlar stone masonry wall in cement sand/mud mortar.	<ul style="list-style-type: none"> ▪ Terminologies used in stone masonry ▪ General principle to be observed in stone masonry construction ▪ Procedure for building stone masonry wall ▪ Joints and thickness ▪ Filling stones ▪ Strength of mortar 	1	6	7
7.	Build a Rubble/Ashlar stonewall for opening in cement sand/mud mortar.	<ul style="list-style-type: none"> ▪ Typical opening sizes for doors, windows and ventilators 	0.5	4	4.5
8.	Build brick wall in stretcher bond in ½ Brick thick.	<ul style="list-style-type: none"> ▪ Procedure for building stretcher bond wall 	0.5	4	4.5
9.	Build one, one and half and two brick thick English Bond wall in lime mortar	<ul style="list-style-type: none"> ▪ Terminologies used in brick masonry works ▪ Types of brick bonds; Stretcher, Header, English and Flemish bonds ▪ Procedure for making English bond in 1 Brick thick wall ▪ Joint thickness in walls ▪ Tools and equipment used in 	2	8	10

S.No.	Tasks Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		brick masonry works			
10.	Build one, one and half and two brick thick Flemish Bond wall in lime mortar	<ul style="list-style-type: none"> ▪ Types of Flemish bonds ▪ Procedure for making Flemish bond in different thickness 	1	8	9
11.	Build typical dry brick spread footing	<ul style="list-style-type: none"> ▪ Procedure for building brick footing ▪ Offset provision 	1	4	5
12.	Build typical hollow block wall in lime mortar	<ul style="list-style-type: none"> ▪ Sizes of the block ▪ Procedure for building hollow block wall 	0.5	4	4.5
13.	Apply protective measures in building construction against dampness and termite	<ul style="list-style-type: none"> ▪ Definition of dampness ▪ Causes of dampness ▪ Methods of damp proofing (water proofing compounds and cavity wall) ▪ Effect of dampness ▪ Efflorescence ▪ Introduction to Anti-termite treatment ▪ Types of treatment (pre construction and post construction treatment) 	1.5	1	2.5
	Sub-total		14	55	69

Module: 2 Concrete work

S.No.	Tasks Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
14.	Lay Lime/Surkhi/sand Concrete (PCC)	<ul style="list-style-type: none"> ▪ Definition of PCC & Lime concrete ▪ Ingredients and its quality ▪ Water Cement Ratio and Strength ▪ Batching, Mixing, Transporting, Placing, Compacting and Curing 	2	2	4
15.	Construct Reinforced Cement Concrete (RCC) Column/Beam/Slab/Sill /Lintel	<ul style="list-style-type: none"> ▪ Definition of Sill ▪ Function of Sill ▪ Definition of Lintel ▪ Function of Lintel ▪ Types; RCC, Stone, Timber, Brick and Steel ▪ Definition of RCC 	3	6	9

S.No.	Tasks Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<ul style="list-style-type: none"> ▪ Role of concrete and steel in RCC ▪ Covers; End and side ▪ Bond Length ▪ Binding and bending of steel ▪ Form works ▪ Maximum and minimum steel in beam and slab ▪ Main bar and distribution bar 			
16.	Construct RCC column.	<ul style="list-style-type: none"> ▪ Definition ▪ Concept of short and long column ▪ Types and sizes ▪ Load in column ▪ Minimum steel requirement in a RCC column ▪ Form works ▪ Composition of drawing. 	2	6	8
17.	Identify the reinforced steel arrangement for staircase.	<ul style="list-style-type: none"> ▪ Steel requirement for staircase ▪ Fabrication and handling procedure ▪ Placement of main and distribution bars 	1	1	2
18.	Assess Pre-cast RCC slab	<ul style="list-style-type: none"> ▪ Definition of Pre-cast structures ▪ Uses 	1	3	4
	Sub-total		9	18	27

Module: 3 Flooring works

S.No.	Tasks Statements	Related Technical Knowledge	Time(hrs)		
			T	P	Tot
19.	Enlist types of floor	<ul style="list-style-type: none"> ▪ Definition ▪ Types ▪ Functions of different layers of a floor 	1	1	2
20.	Build mud floor	<ul style="list-style-type: none"> ▪ Advantages and disadvantages ▪ Flooring procedure 	0.5	2	2.5
21.	Build timber floor	<ul style="list-style-type: none"> ▪ Advantages and disadvantages ▪ Flooring procedure 	0.5	3	3.5

22.	Build brick floor	<ul style="list-style-type: none"> ▪ Types of brick floor ▪ Advantages and disadvantages ▪ Flooring procedure 	0.5	3	3.5
23.	Build Flagstone floor	<ul style="list-style-type: none"> ▪ Advantages and disadvantages ▪ Flooring procedure 	0.5	3	3.5
24.	Prepare Cement Concrete for flooring	<ul style="list-style-type: none"> ▪ Advantages and disadvantages ▪ Flooring procedure 	0.5	3	3.5
25.	Lay Tile/Terrazzo/Mosaic /Marble floor	<ul style="list-style-type: none"> ▪ Advantages and disadvantages ▪ Flooring procedure 	0.5	4	4.5
	Sub-total		4	19	23

Module: 4 Finishing works

S.No.	Tasks Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
26.	Perform plastering works	<ul style="list-style-type: none"> ▪ Definition ▪ Functions ▪ Material used in plastering ▪ Mix proportion ▪ Procedure for plastering ▪ Required tools 	1	6	7
27.	Perform pointing works	<ul style="list-style-type: none"> ▪ Definition ▪ Function ▪ Types ▪ Material used in pointing ▪ Mix proportion ▪ Procedure for pointing 	1	6	7
28.	Perform wall/ceiling coloring works	<ul style="list-style-type: none"> ▪ Purpose ▪ Materials ▪ Procedure for painting ▪ Required tools 	1	6	7
29.	Perform enamel painting works	<ul style="list-style-type: none"> ▪ Purpose ▪ Materials ▪ Procedure for painting ▪ Required tools 	1	6	7
30.	Evaluate Plaster-of-Paris works /wall Putty work	<ul style="list-style-type: none"> ▪ Purpose ▪ Materials 	1	6	7

		<ul style="list-style-type: none"> ▪ Procedure for plaster of Paris ▪ Required tools 			
31.	Perform brick/stone/marble/tiles cladding works	<ul style="list-style-type: none"> ▪ Purpose ▪ Materials ▪ Procedure for laying of bricks, stone, marble and tiles ▪ Required tools 	1	6	7
32.	Identify common construction problems	<ul style="list-style-type: none"> ▪ Cracks ▪ Construction joints/Expansion joints/cold joint ▪ Floor Sinking ▪ Remedial measures (Grouting, Sealing materials) 	1	2	3
Sub-total			7	38	45

Module 5: Construction of building components

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
33.	Be familiarize with building	<ul style="list-style-type: none"> • Introduction • Types of buildings • Loads on building (general idea on dead, live and wind load.) • Components of the building • Considerations in building design 	1		1
34.	Erect step/strip foundation	<ul style="list-style-type: none"> • Introduction of foundation • Function of foundation • Essential requirement of good foundation • Types of foundation (General concept of shallow foundation) • Footing at different level (step & strip foundations) 	1	4	5
35.	Design dog-legged stair	<ul style="list-style-type: none"> • Definition of stair • Technical terminologies • Requirement of good stair • Classification of stairs • Design criteria (except 	1	2	3

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		structural design)			
36	Make stone/ brick piers/arches/breast wall /retaining wall	<ul style="list-style-type: none"> Types of arch (Semicircular arch Segmental arch) Types of piers (attached and detached piers). 	1	4	5
37	Fix door/window	<ul style="list-style-type: none"> Introduction Location of door/window Terminologies Sizes and types of door/window Ventilator and sky lights 	1	2	3
38	Identify roof and roof coverings.	<ul style="list-style-type: none"> Introduction Requirement of roof Types of roof (Pitched or sloping roof only) Identification procedure 	0.5	2	2.5
39	Identify ceiling	<ul style="list-style-type: none"> Purpose of ceilings Materials used Advantage and disadvantages Identification procedure 	0.5	2	2.5
	Sub-total		7	14	21

Module: 6 Earthquake Resistant Building Construction

S.No.	Task Statements	Related Technical Knowledge	Time		tot
			T	P	
40	Be familiar with earthquake resistant construction technology	<ul style="list-style-type: none"> Concept of earthquake Terminologies used in earthquake Seismic hazards and risks Risk assessment Basic factors contributing to seismic safety of building Earthquake resistant feature for rural masonry houses Appropriate construction materials 	2	1	3
41	Be familiar with earthquake resistant design of load bearing masonry building	<ul style="list-style-type: none"> Concept of load bearing masonry building Different types of stone masonry houses Main factor for achieving seismic 	2	3	5

S.No.	Task Statements	Related Technical Knowledge	Time		tot
			T	P	
		safety • Construction of stone masonry house			
42	Be familiar with earthquake resistant design of reinforced concrete frame building	• Concept of reinforced concrete frame building • Requirements of reinforcement for foundation • Requirement of reinforcement for beam • Requirement of reinforcement for column • Requirement of reinforcement for beam column joint • Requirement of reinforcement for RCC slab • Quality of concrete	2	3	5
43	Apply retrofitting techniques of existing building	• Concept of retrofitting in existing building • Assessment of building damage • Repair and strengthening of different components of building	1	4	5
	Sub-total		7	11	18

Module: 7 Temporary constructions

S.No	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
44.	Erect shoring	• Introduction • Types • Procedure • Safety precautions	1	3	4
45.	Erect scaffolding (depended & independent)	• Introduction • Types and its uses • Component parts • Procedure • Safety precautions	1	6	7

46.	Erect formwork for slab/beam/column/stair	<ul style="list-style-type: none"> • Introduction • Materials used for formwork • Requirement of good formwork • Formwork for slab / beam/column • Procedure • Safety precautions 	1	6	7
Sub-total			3	15	18

Module: 8 Rural technology and alternative energy

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
47.	Illustrate the benefits of appropriate use of local(Indigenous) materials	<ul style="list-style-type: none"> • Introduction • Classification of local materials • Transportation cost • Status of the local skill. • Durability of the constructions made from local materials 	1		1
48.	Be familiar with prevailing indigenous technologies.	<ul style="list-style-type: none"> • Working principle of जाँतो, ढिक्कि, कोल, पानी घट्ट इत्यादी 	1	1	2
49.	Be familiar with improved cooking stove.	<ul style="list-style-type: none"> • Introduction • Function of different parts • Airflow. • Regulation of oxygen. • Prevention of false draft • Prevention of smoke entering the room. • Advantages and disadvantages of smokeless stoves. 	1.5	1	2.5
50.	Be familiar with biogas technology.	<ul style="list-style-type: none"> • Introduction • Sources of bio-gas • Types of plants (Chinese and Indian) • Parts of biogas plant • Working principle • Advantages and disadvantages 	1	1	2
51.	Be familiar with solar energy technology.	<ul style="list-style-type: none"> • Introduction • Working principle (thermal and electrical) • Parts of solar energy set-up • Appropriate area • Advantages and disadvantages 	1	1.5	2
52.	Be familiar with micro hydro.	<ul style="list-style-type: none"> • Concept of micro hydro • Functional division of micro hydro 	1.5	1.5	2.5

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<ul style="list-style-type: none"> ▪ Generation division ▪ Transmission and Distribution division ▪ Consumption division • Components of generation • Components of distribution • Components of consumption 			
	Sub-total		7	6	12
	Total		58	176	234

Suggested texts and references:

1. Galami T.B., *A Text Book of Construction (Module -I)*, CTEVT.
2. Arya A.S., *Masonry and Timber Structure including Earth* (Latest Edition)
3. Jain, *Plain Cement Concrete, Vol I & II* (Latest Edition)
4. Punmia B.C. Dr., *Reinforced Concrete Structure, Vol. I & II* (Latest Edition)
5. ब्यन्जनकार मोहनमान, गाढो लगाउने प्रविधि
6. चौधरी महेश कुमार, गाढो लगाउने प्रविधि
7. अधिकारी राजेन्द्र प्रसाद र के.सी. अर्जुन भवननिर्माण, प्रा.शि.तथाव्या.ता परिषद् २०५४ .
8. Punmia B.C. Dr., *Building Construction* (Latest Edition).
9. Kumar Sushil *Building Construction* (Latest Edition).
10. Sharma S.K. & Kaul B.K., *Building Construction* (Latest Edition).
11. Singh Gurucharan, *Building Planning & Design* (Latest Edition)
12. Department of Urban Development, *Nepal Building Code*
13. C.R.Dargan, *Electrical Drawing and Estimating*
14. Heinz Graff, *Electrical Installation*
15. Code of Practice for Electrical Wiring Installation, CTEVT
16. S.K.Malice, *Electric Trade Theory and Practical*
17. Skill Standard Level 2 & 3 (construction), CTEVT
18. B.L. Thereja, *Text Book of Electrical Technology*
19. Existing Micro hydro and Pico hydro Standards of Nepal (AEPC/ESAP Publications)

Engineering Drawing

Total	156 hours
Theory	32 hours
Practical	124 hours

Course Description:

This course is designed to impart basic knowledge and skills on engineering drawing. It especially provides skills focusing on Fundamentals of drawing along with handling tools for preparing drawings, Different technical drawings, Building drawings and Coping of drawing. It also deals with drawing drawings and sketches other different constructional activities.

Course Objectives:

After completion of this course, the students will be able:

1. To be familiar with engineering drawing;
2. To draw various technical drawing along with fundamentals of drawing;
3. To draw detailed drawings of simple residential building; and
4. To copy drawing into the various form such as tracing, ammonia print and photocopying.

Module 1: Technical drawings

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
1	Handle basic drawing tools/equipment.	<ul style="list-style-type: none"> ▪ Concept used and importance of drawing ▪ Drawing tools & instruments & their uses. ▪ Function of different tools & instruments ▪ Handling techniques of drawing tools and instrument. 	1	2	3
2	Prepare drawing sheet with title block.	<ul style="list-style-type: none"> ▪ Drawing sheets and their standard sizes. ▪ Border lines and title blocks. 	0.5	3	3.5
3	Draw free hand sketches.	<ul style="list-style-type: none"> ▪ Sketch & sketching techniques of different figures. <ul style="list-style-type: none"> • Straight lines(horizontal, vertical and inclined) 	1	3	4

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<ul style="list-style-type: none"> • Circles • Arcs & curves ▪ Uses of sketches. ▪ Difference between drawing & sketch. 			
4	Apply different scales	<ul style="list-style-type: none"> ▪ Types of scales; Plain and diagonal, Reducing and Enlarging scale ▪ Representative Fraction ▪ Different types of measuring systems and its conversions. 	1	2	3
5	Draw different types of lines.	<ul style="list-style-type: none"> ▪ Different types of lines: 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	3	4
6	Write English letter numbering script	<ul style="list-style-type: none"> ▪ Different lettering; Single-stroke letters and Gothic Letters & their writing rules. ▪ Essential features of lettering. 	1	4	5
7	Construct different regular geometrical figures; rectangle, square, triangles, parallelogram, rhombus, circle)	<ul style="list-style-type: none"> ▪ Angle & their types. ▪ Triangle & their types. ▪ Quadrilaterals & their types. 	1	4	5
8	Construct regular polygons. (Pentagon, Hexagon, Octagon)	<ul style="list-style-type: none"> ▪ Regular polygon & their types. ▪ Construction methods. 	1	4	5
9	Bisect a straight line	<ul style="list-style-type: none"> ▪ Procedure for bisection. 	1	4	5
10	Divide a straight line into equal parts.	<ul style="list-style-type: none"> ▪ Procedure of division of straight line into equal parts. 			
11	Bisect / Divide an angle.	<ul style="list-style-type: none"> ▪ Angles & their types. ▪ Procedure of bisection of an angle. 			
12	Bisect circular arc.	<ul style="list-style-type: none"> ▪ Different engineering curves. ▪ Procedure of bisection of circular arc. 			
13	Find the center point of a circular arc.	<ul style="list-style-type: none"> ▪ Procedure of finding center point of an circular arc 			
14	Draw a parabola.	<ul style="list-style-type: none"> ▪ Construction procedure of parabola. 	1	4	5

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<ul style="list-style-type: none"> ▪ Tangent, rectangle, offset method 			
15	Draw an ellipse.	<ul style="list-style-type: none"> ▪ Concept of conic sections. ▪ Concentric circle & Arc of circle methods 			
16	Dimension the drawing	<ul style="list-style-type: none"> ▪ Dimension types ▪ Procedure for dimensioning 	0.5	2	2.5
17	Perform orthographic projection of simple object. (I & III angle projection)	<ul style="list-style-type: none"> ▪ Projection & their types. ▪ Methods of orthographic projection (I & III angle projection) ▪ Glass box (Projection box) 	1	4	5
18	Draw isometric views.	<ul style="list-style-type: none"> ▪ Isometric projection ▪ Isometric scale. ▪ Process of preparation of isometric drawing. ▪ Free hand sketch of isometric view 	1	4	5
19	Draw oblique views.	<ul style="list-style-type: none"> ▪ Rules of preparation of oblique views. 	1	3	4
20	Draw sections.	<ul style="list-style-type: none"> ▪ Introduction of sectioning. ▪ Cutting plane or section plane. ▪ True shape of a section. ▪ Section lines. 	1	3	4
21	Draw development	<ul style="list-style-type: none"> ▪ Introduction of development ▪ Method of surface development(parallel and radial line method) 	1	4	5
	Sub-total		15	53	68

Module 2: Building drawings

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
22	Draw plan of simple building.	<ul style="list-style-type: none"> ▪ Types of buildings. ▪ Building plans. ▪ Standard sizes of rooms. ▪ Location of rooms. ▪ Plinth area of building. ▪ Openings in building. ▪ Dimensioning & their rules. 	1	4	5
23	Draw elevations of simple building.	<ul style="list-style-type: none"> ▪ Different elevations. ▪ Flat & sloped roof elevations. 	1	4	5

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<ul style="list-style-type: none"> ▪ Position of elevations in drawing sheet. 			
24	Prepare site plan.	<ul style="list-style-type: none"> ▪ Site plan & its necessity. ▪ Elements to be shown in the site plan. ▪ Scale & orientation of site plan. ▪ Composition of drawing. 	1	4	5
25	Prepare location plan.	<ul style="list-style-type: none"> ▪ Location plan and its use. ▪ Technique of showing north direction. ▪ Showing road & other important features. ▪ Use of symbols. 	1	3	4
26	Draw plan of 4 roomed residential building with open spaces.	<ul style="list-style-type: none"> ▪ General principle of building planning. ▪ Building terminology ▪ Points to be considered before starting building drawing. ▪ Preparation of plan from line diagram. ▪ Location of rooms. 	1	4	5
27	Draw elevation of 4 roomed residential building.	<ul style="list-style-type: none"> ▪ Positions of doors, windows. 	0.5	4	4.5
28	Draw trench / foundation plan.	<ul style="list-style-type: none"> ▪ General types of foundation. ▪ Procedures to draw trench / foundation plan. 	0.5	4	4.5
29	Draw roof plan.	<ul style="list-style-type: none"> ▪ Roof their types. ▪ Slope on roof. ▪ Symbols used for sloped roofs & terraces. 	1	3	4
30	Draw section of building.	<ul style="list-style-type: none"> ▪ Section plan in building plan. ▪ Foundation type & its detail. ▪ G.L., P.L., D.P.C. Sill level, lintel level, sun shade/ chhajjah, walls, roof, & its type roof covering. ▪ Symbols used for wall, concrete, timber, glass, sections 	1.5	4	5.5
31	Draw building details. (door, window, roof truss)	<ul style="list-style-type: none"> ▪ Necessity of detail drawing. ▪ Scale used in detailed drawing. ▪ Showing detailed drawing of door and window frame, 	1	4	5

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		shutter, and roof truss			
32	Draw plan, elevation, and section of staircase.	<ul style="list-style-type: none"> ▪ Types of staircase. ▪ Merits & demerits of different types of staircases. ▪ Essential features of staircase. 	1	4	5
33	Draw doors and windows (including various shutters)	<ul style="list-style-type: none"> ▪ Types of doors & windows. ▪ Selection of doors & windows. ▪ Sizes of doors & windows. 	1	4	5
34	Draw steel-bar diagram /schedule.	<ul style="list-style-type: none"> ▪ Important of bar bending schedule ▪ Thumb rule for calculation of steel bars. ▪ Spacing & diameter of steel bars. ▪ Process of preparation of bar bending diagram. 	1.5	3	4.5
35	Prepare doors, windows & opening schedule.	<ul style="list-style-type: none"> ▪ Format of opening schedule. ▪ Selection of sizes and types of door, windows, ventilation & other openings. 	1	3	4
	Sub-total		14	2	66

Module 3: Copying of drawing.

S.No.	Tasks Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
36.	Carry out tracing of drawing.	<ul style="list-style-type: none"> ▪ Tracing paper and their type. ▪ Technique of tracing work. ▪ Points to be considered while performing tracing work. ▪ Use of lamp and glass for tracing work. 	1.5	2	3.5
37.	Prepare ammonia print.	<ul style="list-style-type: none"> ▪ Use of ammonia print. ▪ Ammonia paper. ▪ Ammonia gas. ▪ Types of ammonia printing machine; <ul style="list-style-type: none"> • Electrical • Solar 	1	2	3
38.	Prepare photocopy of full size drawing sheet with help of A4 size photocopy machine.	<ul style="list-style-type: none"> ▪ Cut & paste technique. ▪ Reference lines. ▪ Distribution of errors. 	0.5		0.5
	Sub-total		3	4	7

S.No.	Tasks Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
39	Project Work <i>Preparing complete drawing of the following works.</i> <ul style="list-style-type: none"> – Irrigation, water supply, sanitary works – Road, culvert and trail bridge 			15	15
	Sub-total		0	12	12
	Total		32	124	156

Suggested texts and references:

1. NewaDilli Raj *Technical Drawing* CTEVT 2050.
2. Bhatt N.D., *Elementary Engineering Drawing (Latest Edition)*, Chartor Publishing House India.
3. Lakshminarayan V., *A Text Book on Practical Geometry (Latest Edition)*.
4. Singh Gurucharan, *Civil Engineering Drawing (Latest Edition)*.
5. Malice S.K., *Civil Engineering Drawing (Latest Edition)*.
6. Singh Gurucharan *Text book of Engineering Drawing (Latest Edition)*

Engineering Surveying

Total: 234 hrs

Theory: 52 hrs

Practical: 182 hrs

Course Description:

This course is designed to impart basic knowledge and skill in engineering surveying. It provides knowledge on introductory surveying along with principle of surveying. It provides skills focusing on fundamentals of surveying along with principle of surveying and handling tools and equipment for conducting various types of survey and preparing necessary drawings/maps; detailed surveying such as compass traversing, plane tabling, leveling, tachometric for road, canal, water supply and trail bridge alignments survey; and simple contour mapping. It also provides knowledge on acquainting the sophisticated surveying tools and techniques as per the latest technological innovations.

Course Objectives:

After completion of this course, the students will be able:

1. To be familiar with engineering surveying;
2. To illustrate the basic principle of surveying;
3. To carry out fundamental works surveying;
4. To conduct different detailed surveying such as compass traversing, plane tabling, leveling, tachometric for road, canal, water supply and trail bridge alignments survey; and
5. To prepare simple contour map.

Module 1: Fundamentals of surveying

S.No.	Task	Related Technical Knowledge	Time		
			T	P	
1	Be familiar with surveying.	<ul style="list-style-type: none">▪ Definition▪ Classification and types▪ Objective of surveying▪ Precision, accuracy, errors and tolerance	2		2
2	Illustrate the basic principle of surveying.	<ul style="list-style-type: none">▪ Principal of surveying	1	0.5	1
3	Enlist units of measurement.	<ul style="list-style-type: none">▪ Units of measurement▪ Unit Conversion	0.5	0.5	1
4	Carry out scale conversion.	<ul style="list-style-type: none">▪ Introduction of scale	0.5	2	3

S.No.	Task	Related Technical Knowledge	Time		
			T	P	
		<ul style="list-style-type: none"> ▪ Types of scale ▪ Vernier and digital ▪ Scale conversion systems 			
5	Handle surveying tools/equipment. (i.e., tape, chain, ranging poles, arrow and pins, Optical square, Builders level, Plumb-bob, Speedometer, Pedometer etc.)	<ul style="list-style-type: none"> ▪ Basic survey tools and equipment. ▪ Function of tools and equipment ▪ Handling procedure ▪ Safety precautions 	1	3	4
6	Measure distance (Using tools and equipment as listed in task 5)	<ul style="list-style-type: none"> ▪ Tools and equipment used for measurement ▪ Linear and angular measurement. ▪ Measurement procedure in plain and sloped surface ▪ Various corrections (pulling, sagging temperature and tape standardization) ▪ Error adjustment ▪ Direct and indirect ranging ▪ Signaling procedure 	2	4	6
8	Establish altitude points/ Bench mark.	<ul style="list-style-type: none"> ▪ Definition. ▪ Plumb line ▪ Selection of reference points/Bench mark ▪ Different type of tools (Altimeter, Barometer and Clinometers) and their handling procedure. ▪ Measurement correction. ▪ Error adjustment 	2	3	5
9	Set out simple building foundation with tape and other tools separately.	<ul style="list-style-type: none"> ▪ Concept ▪ Types of building ▪ Methods of setting out ▪ Tools for setting out(Tape, Optical Square and Sight rail) 	1	8	9
10	Conduct chain survey	<ul style="list-style-type: none"> ▪ Definition ▪ Principle ▪ Terminologies ▪ Establishment of base line ▪ Check line ▪ Offset and offset taking procedure ▪ Field book and its types ▪ Reference point 	2	12	14

S.No.	Task	Related Technical Knowledge	Time		
			T	P	
11	Plot chain survey data	<ul style="list-style-type: none"> ▪ Calculating data and error adjustment ▪ Scale ▪ Selection of paper and layout ▪ Map legend 	1	6	7
12	Calculate area/volume.	<ul style="list-style-type: none"> ▪ Purpose ▪ Geometry of figure ▪ Area and Volume of different regular and irregular figures ▪ Measurement of area and volume (Graphical methods) ▪ Simple trigonometric function. 	2	4	6
13	Conduct Abney Level survey.	<ul style="list-style-type: none"> ▪ Introduction ▪ Types ▪ Principle ▪ Different Modules and their function ▪ Handling procedure ▪ Closing the survey and accuracy limits 	1	6	7
14	Calculate/Plot Abney level survey data	<ul style="list-style-type: none"> ▪ Introduction ▪ Calculation procedure ▪ Reduced level and slope distance ▪ Plotting for layout 	1	4	5
Total			18	52	70

Module 2: Detailed surveying

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
1	Perform compass traversing.	<ul style="list-style-type: none"> ▪ Terminologies ▪ Function and handling of compass. ▪ Simple and Prismatic compass ▪ Instrument setting procedure ▪ Measurement of bearing and angle with prismatic and surveyor's compass ▪ Conversion from WB to RB and vice versa ▪ Angle of dip and declination ▪ Local attractions 	2	12	14

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
2	Plot compass survey data.	<ul style="list-style-type: none"> ▪ Scale selection ▪ Selection of paper and layout ▪ Map legend ▪ Bearing corrections 	1	6	7
3	Perform plain table surveying (Radiation, intersection and traversing methods)	<ul style="list-style-type: none"> ▪ Terminologies ▪ Objectives ▪ Accessories ▪ Orientation of plane table ▪ Methods of plain table surveying ▪ Setting up procedure for plain table surveying ▪ Closing errors and corrections 	6	14	20
4	Perform level survey.	<ul style="list-style-type: none"> ▪ Definition and terminologies ▪ Objectives ▪ Auto level and its parts ▪ Staff and its types according to their use ▪ Datum line ▪ Back sight, intermediate sight, foresight. ▪ Line of collimation ▪ Parallax elimination ▪ Reduced Level (R.L.) ▪ Calculation of R.L. using HI and rise-fall method ▪ Procedure in leveling ▪ Types of leveling ▪ Level book and entry procedure. 	8	14	22
5	Calculate the level survey data.	<ul style="list-style-type: none"> ▪ Method of calculation. ▪ Data checking method ▪ Error minimization. 	3	2	5
6	Plot longitudinal profile	<ul style="list-style-type: none"> ▪ Definition and types of profile ▪ Plotting guide lines. ▪ Checking the data. ▪ Practical scales in plotting 	1	6	7
7	Plot cross section profile	<ul style="list-style-type: none"> ▪ Concept. ▪ Practical scales in plotting 	1	6	7
8	Set out a Theodolite over a given point	<ul style="list-style-type: none"> ▪ Introduction of Theodolite ▪ Theodolite and functions of its parts. ▪ Types ▪ Orientation 	2	8	10

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<ul style="list-style-type: none"> ▪ Centering ▪ Leveling 			
9	Perform tacheometric survey	<ul style="list-style-type: none"> ▪ Introduction ▪ Objective ▪ Terminologies ▪ Cross hair ▪ Horizontal and vertical angles and distance. ▪ Simple trigonometric relationship ▪ Safety measures 	2	17	19
10	Carryout road/canal/water supply/trail bridge alignments survey.	<ul style="list-style-type: none"> ▪ Definition of alignment ▪ Reconnaissance survey, Pegging, Detail Survey, Booking, Gradient and Plotting 	2	17	19
11	Set out simple curves (one linear method)	<ul style="list-style-type: none"> ▪ Definition ▪ Coordinates ▪ Chord arcs ▪ Deflection angle ▪ Tangent points ▪ Simple calculations ▪ Procedures to set out the curves. 	2	8	10
12	Prepare contour map	<ul style="list-style-type: none"> ▪ Introduction ▪ Importance ▪ Terminologies ▪ Characteristics of contour ▪ Use of contour map ▪ Plotting procedure 	1	12	13
13	Handle EDM	<ul style="list-style-type: none"> ▪ Introduction ▪ EDM machine parts ▪ Coordinates ▪ Terminologies ▪ Procedure 	1	2	3
14	Perform hydrographic survey	<ul style="list-style-type: none"> ▪ Concept ▪ Purpose ▪ Importance ▪ Types of measurement ▪ Introduction ▪ Terminologies ▪ Depth of flow ▪ Velocity of flow ▪ Cross sectional area of streams 	2	8	10

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<ul style="list-style-type: none"> ▪ Discharge calculation procedure. 			
	Sub -total		34	132	166
	Total		52	182	234

Suggested texts and references:

1. Ager. R. Surveying and levelling
2. Jordan Thomas D. Jr. *Handbook of Gravity Flow Water System*, United Nations Children's Fund, Kathmandu, 1987.
3. श्रेष्ठ माधव नारायण (अनु.) सर्वेक्षण भवन, सडक र पुलतथाखानेपानी र सिंचाई, CTEVT and UMN २०५२।
4. Punamia B.C., *Surveying and Levelling Vol I & II* (Latest Edition).
5. Kanitekar T.P., *Surveying* (Latest Edition).
6. Basak N.N., *Surveying and Levelling* (Latest Edition).
7. प्रधानांग तीर्थबहादुर, *जमीन सर्वेक्षण* साभाप्रकाशन।
8. Hussain and Nagraj, *Surveying and Levelling* (Latest Edition)

Entrepreneurship Development

Total: 78 hrs
Theory: 30 hrs
Practical: 48 hrs

Course description

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

Course objectives

After completion of this course students will be able to:

1. Understand the concept of business and entrepreneurship
2. Explore entrepreneurial competencies
3. Analyze business ideas and viability
4. Formulate business plan
5. Learn to manage small business

S.No.	Task statements	Related technical knowledge	Time (hrs)		
			T	P	Tot
Unit 1: Introduction to Entrepreneurship			5.75	4.08	9.83
1	Introduce business	Introduction of business: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Definition of entrepreneur • Definition of entrepreneurship • Entrepreneurship development process 	0.5	0.5	1.0
3	Describe entrepreneur's characteristics	Entrepreneur's characteristics: <ul style="list-style-type: none"> • Characteristics of entrepreneurs • Nature of entrepreneurs 	0.67	0.83	1.5

4	Assess entrepreneur's characteristics	<u>Assessment of entrepreneur's characteristics:</u> <ul style="list-style-type: none"> List of human characteristics Assessment of entrepreneurial characteristics 	0.5	1.0	1.5
5	Compare entrepreneur with other occupations	<u>Entrepreneur and other occupations:</u> <ul style="list-style-type: none"> Comparison of entrepreneur with other occupations Types and styles of entrepreneurs 	1.0		1.0
6	Differentiate between entrepreneur and employee	<u>Entrepreneur and employee:</u> <ul style="list-style-type: none"> Difference between entrepreneur and employee Benefit of doing own business 	0.5	0.5	1.0
7	Assess "Self"	<u>"Self" assessment:</u> <ul style="list-style-type: none"> Understanding "self" Self disclosure and feedback taking 	0.6	0.4	1.0
8	Entrepreneurial personality test: <ul style="list-style-type: none"> Assess "Self" inclination to business 	<u>Entrepreneurial personality test:</u> <ul style="list-style-type: none"> Concept of entrepreneurial personality test Assessing self entrepreneurial inclination 	0.67	0.83	1.5
Unit 2: Creativity and Assessment			6.5	4.0	10.5
9	Create viable business idea	<u>Creativity:</u> <ul style="list-style-type: none"> Concept of creativity Barriers to creative thinking 	1.67	0.33	2.0
10	Innovate business idea	<u>Innovation:</u> <ul style="list-style-type: none"> Concept of innovation SCAMPER Method of innovation 	0.83	0.67	1.5
11	Transfer ideas into action	<u>Transformation of idea into action:</u> <ul style="list-style-type: none"> Concept of transferring idea into action Self assessment of creative style 	1.0	0.5	1.5
12	Assess personal entrepreneurial competencies	<u>Personal entrepreneurial competencies:</u> <ul style="list-style-type: none"> Concept of entrepreneurial competencies Assessing personal entrepreneurial competencies 	0.5	1.0	1.5
13	Assess personal risk taking attitude	<u>Risk taking attitude:</u> <ul style="list-style-type: none"> Concept of risk 	1.5	1.0	2.5

		<ul style="list-style-type: none"> • Personal risk taking attitude • Do and don't do while taking risk 			
14	Make decision	<p><u>Decision making:</u></p> <ul style="list-style-type: none"> • Concept of decision making • Personal decision making attitude • Do and don't do while making decision 	1.0	0.5	1.5
Unit 3: Identification and Selection of Viable Business Ideas			0.83	3.42	4.25
15	<p>Identify/ select potential business idea</p> <ul style="list-style-type: none"> • Analyze strength, Weakness, Opportunity and Threat (SWOT) of business idea 	<p><u>Identification and selection of potential business:</u></p> <ul style="list-style-type: none"> • 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
Unit 4: Business Plan			16.67	36.58	53.25
16	Assess market and marketing	<p><u>Market and marketing:</u></p> <ul style="list-style-type: none"> • Concept of market and marketing • Marketing and selling • Market forces • 4 Ps of marketing • Marketing strategies 	1.33	0.75	2.08
17	<p>Business exercise:</p> <p>Explore small business management concept</p>	<p><u>Business exercise:</u></p> <ul style="list-style-type: none"> • Business exercise rules • Concept of small business management • Elements of business management <ul style="list-style-type: none"> • Planning • Organizing • Executing • Controlling 	1.58	1.67	3.25
18	Prepare market plan	<p><u>Business plan/Market plan</u></p> <ul style="list-style-type: none"> • Concept of business plan 	2.0	2.0	4.0

		<ul style="list-style-type: none"> • Concept of market plan • Steps of market plan 			
19	Prepare production plan	<u>Business plan/Production plan:</u> <ul style="list-style-type: none"> • Concept of production plan • Steps of production plan 	1.25	1.5	2.75
20	Prepare business operation plan	<u>Business plan/Business operation plan:</u> <ul style="list-style-type: none"> • Concept of business operation plan • Steps of business operation plan • Cost price determination 	2.5	2.67	5.17
21	Prepare financial plan	<u>Business plan/Financial plan:</u> <ul style="list-style-type: none"> • 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	<u>Information collection and preparing business plan:</u> <ul style="list-style-type: none"> • Introduction • Market survey <ul style="list-style-type: none"> • 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	<u>Business plan appraisal:</u> <ul style="list-style-type: none"> • Return on investment • Breakeven analysis • Cash flow • Risk factors 	0.5	5.5	6.0
24	Maintain basic book keeping	<u>Basic book keeping:</u> <ul style="list-style-type: none"> • Concept and need of book keeping • Methods and types of book 	1.0	2.0	3.0

		keeping • Keeping and maintaining of day book and sales records			
	Total:		30	48	78
	All total		78		

Text book:

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

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

Reference book:

- Entrepreneur's Handbook, Technonet Asia, 1981.

Estimating, Costing and Supervision

Total: 156 hrs
Theory: 46 hrs
Tutorial: 110 hrs

Course Description:

This course is designed into two parts. They are Estimating and costing and Supervision. The first part intends to provide knowledge and skills in calculating quantities and costs of simple engineering structures. The second part, deals with supervisory technique necessary to construction site and construction activities as well.

Objectives:

After completion of this course, the students will be able:

1. To be familiar with unit of various items and measurement of civil construction works,
2. To calculate quantities and cost of estimate for simple engineering structures,
3. To be familiar with current government accounting format and procedures for construction sites, and
4. To apply supervisory techniques for managing construction sites.

Module1: Estimating items of construction works

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
1.	Procedure of estimating and type of estimate	<ul style="list-style-type: none"> • Introduction • Types of estimate • Unit of measurement for different items • Purpose of estimating • System of measurements • Data required for estimating • Conversion of systems of units 	2	1	3
2.	Calculate area/volume of regular/irregular shapes	<ul style="list-style-type: none"> • Sectional area of regular, shaped and irregular shaped trenches • Volume measurement for prism surface (cylindrical, trapezoidal, box etc.) • Rectangular and circular trenches 	1	1	2
3.	Estimate earthwork	<ul style="list-style-type: none"> • Format for detailed estimate, taking out dimensions, and quantity 	1	4	5

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<ul style="list-style-type: none"> • Specification / drawing of work • Estimating methods (long wall, short wall & centre line) 			
4.	Estimate quantity of masonry footings	<ul style="list-style-type: none"> • Drawing 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 & centre line) 	2	5	7
5.	Estimate simple superstructure wall of a building	<ul style="list-style-type: none"> • Drawing and specification of wall • Deduction (door and window opening) items • Estimating methods (long wall, short wall & centre line) 	1	2	3
6.	Estimate simple concrete flooring works	<ul style="list-style-type: none"> • Drawing and specification of the flooring works 	0.5	2	2.5
7.	Estimate simple RCC works	<ul style="list-style-type: none"> • Density of steel and concrete. • Reinforcement details of Beam / Lintel / Column / Slab • Reinforcement spacing, lapping, Hook, and bends • Development length • Procedure 	1	1	2
8.	Estimate plastering / punning/ pointing/pointing works	<ul style="list-style-type: none"> • Drawing and specification • Procedure 	0.5	3	3.5
9.	Estimate CGI sheet roofing works	<ul style="list-style-type: none"> • Drawing and specification of roof works • Size of gauze of CGI sheet available in the market • Procedure 	1	3	4
10.	Estimate a single room/ two roomed building/ multi roomed building	<ul style="list-style-type: none"> • Drawing and specification • Position of DPC, doors and windows, beams • Long wall and short wall method • Center line method 	1	2	3
11.	Estimate water intake works	<ul style="list-style-type: none"> • Drawing and specification of water intake works 	0.5	10	10.5
12.	Estimate reservoir	<ul style="list-style-type: none"> • Drawing and specification of reservoir 	0.5	5	5.5
13.	Estimate break pressure tank	<ul style="list-style-type: none"> • Drawings and specification of break 	0.5	5	5.5

S.No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		pressure tank			
14.	Estimate tap stand	<ul style="list-style-type: none"> Plan and elevation of tap stand 	0.5	3	3.5
15.	Estimate / bitumen road pavement/ concrete road pavement/	<ul style="list-style-type: none"> Longitudinal and cross section of roads Cutting and filling 	1	6	7
16.	Estimate slab culvert/ arch culvert	<ul style="list-style-type: none"> Drawings and specification Abutments, wing wall and curtain wall Slab reinforcement with main and distribution bars Road way, Kerb and Parapet Span range considerations Procedure 	2	8	10
	Sub-total		16	61	77

Module 2: Rate analysis

S.No.	Task	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
17	Be familiar with rate analysis	<ul style="list-style-type: none"> Definition Current district rate Format for rate analysis Factor affecting rate analysis Rate of material Transportation rate related to capacity of vehicle Procedure of rate analysis 	2	2	4
18.	Analyze rate for earthwork in excavation	<ul style="list-style-type: none"> Types of earth works Water charge, tools & plants, overhead, contingency and VAT 	1	2	3
19.	Analyze rate of PCC Concrete works (1:2:4)	<ul style="list-style-type: none"> 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

S.No.	Task	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
20.	Analyze rate for steel reinforcement works	<ul style="list-style-type: none"> • Drawing and specification • Procedure of Cutting, Bending, Binding and positioning the steel reinforcement works • Water charge, tools & plants, overhead, contingency and VAT • District rate of material 	1	3.5	4.5
21.	Analyze rate for centering/shuttering for slab	<ul style="list-style-type: none"> • Providing, fixing and dismantling centering and shuttering • Explanation of water charge, tools & plants, overhead, contingency and VAT 	1	2.5	3.5
22.	Analyze rate for rubble stone masonry in 1:4 cement sand mortar	<ul style="list-style-type: none"> • Drawing and specification • Water charge, tools & plants, overhead, contingency and VAT 	1	2	3
23.	Analyze rate of brick soling	<ul style="list-style-type: none"> • Norms and current district rates • Unit of measurement • Water charge, tools & plants, overhead, contingency and VAT 	1	2	3
24.	Analyze rate for brick work	<ul style="list-style-type: none"> • Number of bricks in per m³ • Ratio of volume of bricks and mortar • Norms and current district rates • Water charge, tools & plants, overhead, contingency and VAT 	2	2	4
	Sub-total		12	21	33

Module 3: Supervision

S.N	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
1.	Explain role of supervisor	<ul style="list-style-type: none"> • Supervisor as a builder's/employee's agent • Duties of supervisor • Relationships between client, consultant and contractor 	1		
2.	Be familiar with local area condition	<ul style="list-style-type: none"> • Definition of community, groups, user's group, caste etc. • Communication skill with local people 	1		1
3.	Manage construction site	<ul style="list-style-type: none"> • Major component of construction site (site office, site store, fabrication yard, perishable item stock yard, workers' & technicians' accommodation etc.) • List of site logistics • Arrangement of utilities (water supply, electricity, telephone etc.) • Surface water control • Maintaining good sanitary condition/Effect of unsanitary condition • Arrangement of equipment • Necessity of safety construction • Safety rules 	1	2	3
4.	Set up site office	<ul style="list-style-type: none"> • Arrangement of office logistics • Arrangement of staff • Arrangement for utilities • Planning working place (site in charge office, drafting room, account room etc.) • Storing and indexing working drawing 	1	3	4
5.	Set up site store	<ul style="list-style-type: none"> • Introduction to store and stock • Filing system 	0.5	3	3.5

S.N .	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<ul style="list-style-type: none"> • Inventory control • Maintaining register for entry and exit of materials • Methods to store materials 			
6.	Prepare progress report, keep builder's diary	<ul style="list-style-type: none"> • Daily work progress report • Monthly progress report • Definition of builder's diary • Supervisor's daily diary • Methods to entry diary 	1	1	2
7.	Prepare log book	<ul style="list-style-type: none"> • Log book and its uses • Format of log book • Maintaining site order book 	1	1	2
8.	Prepare muster roll	<ul style="list-style-type: none"> • Muster roll • Entry methods • Types of workers (daily, seasonal and permanent) • Payment process of muster roll 	1	2	3
9.	Measure work done	<ul style="list-style-type: none"> • Unit of different items • Measurement procedures 	0.5	3	3.5
10.	Fill measurement book (M.B.)	<ul style="list-style-type: none"> • Definition of measurement book. • Importance of MB • Size of MB • Precautions in data entry in MB • Precautions in handling of MB • Endorsement procedure of MB 	1	2	2
11.	Prepare running bill	<ul style="list-style-type: none"> • Definition of bill • Types of bill • Definition of bill of quantities • Definition of abstract of cost • Retention money • Procedure of running bill payment 	1	3	4
12.	Follow tendering/contract award procedures	<ul style="list-style-type: none"> • Definition of contract and agreement 	1	3	4

S.N .	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<ul style="list-style-type: none"> • Definition of tender/tender notice and tender document • Difference between bid bond and performance bond • Procedure of bidder's evaluation • Contract approval procedure • Contract award • Contract clauses 			
13.	Prepare final bill	<ul style="list-style-type: none"> • Definition of final bill • Condition of final bill • Comparative chart (contract quantity and final bill quantity) • Payment procedure of government 	1	2	3
14.	Explain completion certificate	<ul style="list-style-type: none"> • Virtual completion certificate • Midterm completion certificate • Final completion certificate 	0.5		1
15.	Explain post construction activities	<ul style="list-style-type: none"> • 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
	Sub-total		3	24	46

Module 4: Property Valuation

S.N	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
1.	Be familiar with valuation	<ul style="list-style-type: none"> • Definition • Purpose of valuation • Principle of valuation • Factor affecting the valuation 	1	4	5
2.	Prepare the valuation Report of property (land and Building)	<ul style="list-style-type: none"> • Methods of Valuation • Gross income, Net income, Outgoing, Scrap value, salvage value etc. • Sinking Fund , Depreciation etc. 	4	4	8
	Sub-Total		5	8	13
	Total (modules 1, 2, 3 & 4)		46	110	156

Suggested texts and references:

1. Punmia B.C. Dr. Estimating and Costing,
2. Chakravorty Estimating and Costing,
3. Dutta B.N. Estimating and Costing in Civil Engineering,
4. गलामी टक बहादूर, लागतअनुमान, मुल्यनिर्धारण तथा सूपरिवेक्षण, प्रा.शि.व्या.ता.प.।
5. Saxena S.C. Construction Planning Equipment
6. Davis, H.E. The Testing and Inspection of Engineering Materials
7. Raina, V.K. Construction Management Practice
8. Purifoy, Construction Equipment/Tools and Management
9. Modi, CPM & PERT
10. Austin, A.D., Neale R.H. Managing Construction Projects
11. Nepal Building Code, DUDBC
12. Testing and Inspection of Engineering Materials
13. Adhikari Rajendra Construction Management
14. Bhattari Dipak, Construction Management
15. Various Contract Documents and Tender Documents

Road and Trail Bridge

Total: 156 hrs
Theory: 48 hrs
Practical: 108 hrs

Course Description:

This course is designed to provide knowledge and skills of road and trail bridge construction in general. The course has been designed in systematic way beginning from the simple subject to the specific work items. It imparts concept, common terminology and construction materials used in the construction of roads and trail bridges. The first part intends to provide knowledge and skills on different types of road construction being adopted in rural as well as in urban areas including strategic road network and feeder roads; alignments and highway geometrics, different types of roads and road related structures construction; and road maintenance works. Similarly the second part provides knowledge and skills on short span trail bridge construction along with bridge site selection, standard drawings; bridge site surveying and construction approaches. The students will gain skill in construction supervision works. The course has been designed in systematic way beginning from the simple subject to the specific work items.

Course Objectives:

After completion of this course, the students will be able:

1. To describe historical development of road network in Nepal;
2. To illustrate road alignment and highway geometric;
3. To identify various road construction materials, equipment and plant;
4. To perform different types of road constructions works;
5. To construct different road related structures;
6. To perform routine, recurrent, periodic maintenance;
7. To select materials and construct short span trail bridge through community participation approach.

PART I: ROAD

Module: Introduction of Road

S. No.	Task Statements	Related Technical Knowledge	Time	
			T	P
1.	Describe background of road	<ul style="list-style-type: none">• Definition of road• Classification of roads• Development of road network in Nepal• Road planning concept in Nepal	1	

S. No.	Task Statements	Related Technical Knowledge	Time	
			T	P
2.	Assess cross Section of Road	<ul style="list-style-type: none"> • Cross section of road in cutting and embankments. • Ideal road alignment • Road profile L-section • Plan of road • Typical Cross section of road 	1	3
3.	Assess Hill Road	<ul style="list-style-type: none"> • Definition, Importance, Construction Problems and challenges • Requirement of hill road alignment • Typical cross sections of hill roads • Retaining walls, toe wall, slope protection works 	1	2
4.	Identify/enumerate road Materials	<ul style="list-style-type: none"> • Road materials (Common soil, Stone and brick aggregates, Cement and lime, Reinforcement steel, gabion wires, Timber, Stone and bricks and Bitumen) 	1	4.0
5.	Classify road pavements	<ul style="list-style-type: none"> • Elements of road pavements • Types of road pavements 	0.5	2.5
6.	Identify Pavement Structures	<ul style="list-style-type: none"> • Sub Grade, Sub Base, base and Wearing Course • Functions of the courses. 	0.5	2.5
	Sub-total		5	15

Module: 2 Roads construction and maintenance

S. No.	Task Statements	Related Technical Knowledge	Time	
			T	P
7.	Identify road construction equipment and machinery	Road construction equipment and plants 1 Compacting equipment <ul style="list-style-type: none"> • Hand rammer • Plate compactor • Hand roller • Steel roller • Vibratory roller 	1	2

S. No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> • Pneumatic roller • Sheep foot roller <p>2 Earth moving equipment</p> <ul style="list-style-type: none"> • Tipper truck • Loader • Back hoe • Excavator • Dozer • Belt conveyor <p>3 Miscellaneous equipment</p> <ul style="list-style-type: none"> • Concrete mixer • Drag line • Clam shell • Dredger • Pile driving equipment • Crane • Water pump • Air compressor 		
8	Assess Earthen Road in Cutting	<ul style="list-style-type: none"> • Cross section and L- section • Different hand tools • Setting out drawing on the ground • Field density • Compaction equipment 	1	3
9	Assess Earthen Road in Embankment	<ul style="list-style-type: none"> • Cross section • Soil stabilization 	0.5	3
10	Construct gravel road	<ul style="list-style-type: none"> • Materials required • Equipment required, • Construction procedure • Graduation requirements 	0.5	3
11	Construct soil stabilized roads	<ul style="list-style-type: none"> • Soil Stabilization: definition and Types • Mechanical Stabilization: Materials, Equipments, Construction Procedure 	1	3

S. No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> • Lime Stabilization: Materials, Equipments, Construction Procedure • Cement Stabilization: Materials, Equipments, Construction Procedure 		
12	Be familiar with sub base course construction	<ul style="list-style-type: none"> • Material selection/grading • Procedure 	0.5	3
13	Be familiar with base course construction	<ul style="list-style-type: none"> • Material selection/grading • Procedure 	0.5	2
14	Be familiar observe dry bound macadam construction	<ul style="list-style-type: none"> • Material selection/grading • Procedure 	0.5	2
15	Be familiar with wet bound macadam construction	<ul style="list-style-type: none"> • Material selection/grading • Procedure 	0.5	2
16	Be familiar with bituminous Road construction	<ul style="list-style-type: none"> • Bitumen binder and its chemical properties • Bitumen distributor and its function • Prime coat • Tack coat • Seal coat • Single bituminous surface treatment • Double bituminous surface treatment • Penetration macadam (Semi grouting) • Asphalt concrete • Cement concrete 	1.5	2
17	Assess road crossing structures	<p>Road crossing structures</p> <ul style="list-style-type: none"> • Scupper • Pipe Culverts • Slab Culverts • Arch Culverts • Box Culverts 	1	3

S. No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> Minor Bridges 		
18	Perform road protection works	<p>Gravity walls Retaining wall</p> <ul style="list-style-type: none"> Gabion retaining wall Dry stone retaining wall RCC retaining wall Stone masonry retaining wall <p>Breast wall</p> <ul style="list-style-type: none"> Gabion breast wall Dry stone breast wall Stone masonry breast wall <p>Miscellaneous walls</p> <ul style="list-style-type: none"> Toe wall Check dam Chute Cascade 	1.5	3
19	Manage/observe road drainage system	<ul style="list-style-type: none"> Seepage of water in road, Effects of moisture in pavement Importance of water management in road Longitudinal drainage (side drain) Cross drainage (culverts) 	1	2
20.	Observe bioengineering technique for slope protection	<ul style="list-style-type: none"> Concept of bioengineering Causes of slope failure Different vegetation structures Function of vegetation structures Procedure 	1	3
21	Identify defects in pavement	<ul style="list-style-type: none"> Alligator cracks, Longitudinal Ruts, Cross ruts, Pot holes, etc. Mud pumping, Edge cracking 	1	2
22	Assess road maintenance work	<p>1. Introduction of road maintenance</p> <p>a. Types of road maintenance</p> <ul style="list-style-type: none"> Routine maintenance Recurrent maintenance Periodic maintenance 	1	2

S. No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ Emergency maintenance b. Water management 2. Vehicle operation cost		
23	Repair Potholes		0	4
	Sub-total		14	44
	Total		22	56
	Grand total		78	

PART 2: TRAIL BRIDGE

Module: 1 Introduction of Trail Bridge

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
1.	Explain Trail Bridges	<ul style="list-style-type: none"> • Trail Network • Types of Rivers • Definition of Trail Bridges • Historical Background on Trail Bridges Development • Present Scenario on Trail Bridges and Future Demand • 	1		1
2.	Recognize Crossing/ Bridges Types	<ul style="list-style-type: none"> • Bridges Types and its application • Classification of Trail Bridge Standard • Demarcation Policy (<i>Only Short Span Trail Bridge</i>) 	0.5	1	1.5
3	Identify Components of Trail Bridge	<ul style="list-style-type: none"> • Major Components and structures of Trail Bridges • Function of Major Component and structures of Trail Bridges • Steel Parts Used in Trail Bridges • Cable and its configuration 	0.5	1	1.5
	Sub-total		2	2	4

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
Module: 2 Social and Technical Survey					
4	Plan for Site Survey	<ul style="list-style-type: none"> • Pre-feasibility study and bridge request form • Field Trip Designing Procedure • Check list of survey equipment 	0.5	1	1.5
5	Conduct Reconnaissance Survey	<ul style="list-style-type: none"> • Existing Crossing Point and proposed site • Selection of bridge site • Detour Range • River bank condition • Span and Freeboard situation 	0.5	1	1.5
6	Conduct Social Assessment	<ul style="list-style-type: none"> • Community Meeting (Facilitation) • Reassess/Reconfirm bridge need (PRA) • Self-help community approach of the project • Local capacity and their commitment (Focus Group Discussion) • Action Plan 	1	3	4
7	Conduct Bridge Axis Survey	<ul style="list-style-type: none"> • Axis Fixation and Span calculation 	0.5	4	4.5
8	Prepare Survey Report	<ul style="list-style-type: none"> • Data Plotting Procedures 	0.5	2	2.5
	Sub-total		3	11	14
Module:3 Bridge Standard Designs					
9	Position Bridge Foundation on Profile	<ul style="list-style-type: none"> • Soil and rock type • Selection of Bridge Foundation • Level difference between walkway cable saddles of two banks and its limits • Tower height limits • Free board 	0.5	1	1.5
10	Select Cable Combination	<ul style="list-style-type: none"> • Survey Data & Calculation of 	0.5	1	1.5

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		Freeboard • Loads on Trail Bridge • Selection of Cable size and number • Calculation of Cable Length			
11	Select Bridge Foundation Structures	• Typical Designs of Anchor Block & its selection	0.5	1	1.5
12	Assist in designing Adjacent Structures	• Retaining Structure • Slope Protection works • River Bank Protection • Drainage works	0.5	1	1.5
13	Compile Bridge Construction Standard Drawing	• Standard Steel Drawing Standard Construction Drawing • Relation Between Construction and Steel Drawing	0.5	1	1.5
14	Prepare General Arrangement Drawing	• Plan and Profile of Bridge • Span and Dead load Sag • Bridge Axis and center of Tower • Elevation of bridge elements • Bridge Structures Dimension • Curve Drawing (3 point method) • Calculation of f_{min} and "e" distance	1	1	2
15	Prepare Cost Estimate for both community/ contracting Approaches	• Cost estimate for community approach of implementation • Cost approach for contracting approach of implementation • Quantity estimation • Rate Analysis • Abstract of cost	0.5	0	0.5
	Sub-total	•	4	6	10

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
Module 4 : Supervision and Supporting of Trail Bridge Construction					
16	Layout Trail Bridge	<ul style="list-style-type: none"> • Survey Tools and Equipment handling procedures • Distance and angle measurement • Offset setting • Axis pegs • Bench Mark • General Arrangement Drawing • Safety Measures 	0.5	2	2.5
17.	Construct Trail bridge	<ul style="list-style-type: none"> • Setting out of Bridge • Transportation, handling and hoisting of cable • Fabrication / erection / construction of bridge 	0.5	2	2.5
18.	Supervise Collection of Local Materials	<ul style="list-style-type: none"> • Stone Quarry • Sources of Local Materials • Quality requirement of Sand, Aggregate, and Stones • Environmental Awareness • Storage of Local materials • Measurement of the works accomplished 	0.5	1	1.5
19.	Supervise Stone Dressing Works	<ul style="list-style-type: none"> • Characteristics of good stones and use of chisel and hammer dressed & broken stone • Different types/ shapes of Stones (Corner/Face/Bond & Fill Stones) • Handling procedures of tools and Equipment for stone dressing works 	0.5	1	1.5
20	Supervise Civil Construction Works	<ul style="list-style-type: none"> • Stability of cutting slopes for 	1	1	2

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<p>different types of soil/rock</p> <ul style="list-style-type: none"> • Excavation Procedure (No Blasting Materials) • Concreting works • Function & Construction of Tower, Deadman/ Drum • Saddle and its accessories, fixation • Positioning and details of hole drilling works • Cable crossing on both banks 			
21	Supervise non-local material Transportation/Storage	<ul style="list-style-type: none"> • Material Handling Over • Cable, Cement, Steel parts and Tools Transportation • Material Inventory Lists • Storage of materials at construction site • Security/Safety of stored Materials 	1	1	2
22	Hoist Cables Mechanically	<ul style="list-style-type: none"> • Types and uses of Cable Pulling Machines • Hoisting Sag Calculation and sag setting • Bulldog Grips and their application • Gravity Load • Fixation Cable 	0.5	1	1.5
23	Illustrate/Supervise Walkway Parts Fitting	<ul style="list-style-type: none"> • Fixing procedures of crossbeam suspender and steel deck • GI Wire mesh knitting procedure • Fixation Cable 	0.5	1	1.5
24	Conduct Final Assessment	<ul style="list-style-type: none"> • Technical evaluation 	0.5	1	1.5

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		procedures of bridge components			
	Sub-total		5.5	11	16.5
Module 5 : Construction of Model Trail Bridge					
25	Layout Model Trail Bridge	<ul style="list-style-type: none"> • Survey Tools and Equipment handling procedures • Distance and angle measurement • Offset setting • Axis pegs • Bench Mark • General Arrangement Drawing • Safety Measures 	1	2.5	35
26	Dress Stones for Masonry	<ul style="list-style-type: none"> • Characteristics of good stones • Different types/shapes of Stone used in bridge construction • Handling procedures of tools and Equipment for stone dressing works 	1	3	4.5
27	Be familiar with Foundation Structures	<ul style="list-style-type: none"> • Stability of cutting slopes for different types of soil/rock • Excavation Procedure (No Blasting Materials) • Function & Construction of Tower, Deadman/ Drum • Saddle and its accessories, fixation • Positioning and details of hole drilling works • Cable crossing on both banks 	0.5	1	1.5
28	Hoist Cables Manually	<ul style="list-style-type: none"> • Types and uses of Cable Pulling Machines 	0.5	1	1.5

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<ul style="list-style-type: none"> • Hoisting Sag Calculation and sag setting • Bulldog Grips and their application • Gravity Load 			
29	Perform Walkways Fixation	<ul style="list-style-type: none"> • Fixing procedures of crossbeam suspender and steel deck • GI Wiremesh knitting procedure 	0.5	1	1.5
	Sub-total		3.5	8.5	12
Module: 6 Social Organizational Support at Community Level					
30	Facilitate Users Committee (UC) Formation	<ul style="list-style-type: none"> • Facilitating Community Meeting • Information Dissemination • Explaining roles and responsibility of Users Committee • Seeking Consensus forming representative UC. 	0.5	1	1.5
31	Educate Users Committee	<ul style="list-style-type: none"> • Facilitating users Committee Meeting • Roles and Responsibility Assignment of UC members • Project Book • Participatory Decision making Process • Establishing Further Action Plan • Minute Keeping • Conflict Resolution 	0.5	1	1.5
32	Facilitate mobilizing local resources	<ul style="list-style-type: none"> • Facilitating users Committee Meeting • Local Resource Mobilization 	0.5	1	1.5

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		Techniques <ul style="list-style-type: none"> • Participatory Decision making Process • Establishing Further Action Plan • Record Keeping 			
33	Establish Community Agreement	<ul style="list-style-type: none"> • Facilitating users Committee Meeting • Local Resource Mobilization Techniques • Participatory Decision making Process • Agreement of Collaboration • Establishing Further Action Plan • Record Keeping 	0.5	1	1.5
34	Assist in conducting Public Audit	<ul style="list-style-type: none"> • Community Meeting conducting Procedures • Account Keeping procedures 	0.5	1	1.5
35	Facilitate Formation of Bridge Maintenance Committee (BMC)	<ul style="list-style-type: none"> • Maintenance Types • Bridge Inspector • Routine bridge maintenance schedule • Routine maintenance tools and equipment handling procedure • Bridge Maintenance Report/ records 	0.5	1	1.5
36	Orient BMC/ Bridge Warden (BW) on Maintenance	<ul style="list-style-type: none"> • Duty/responsibility of Bridge warden/ Bridge Inspector/BMC • Maintenance types /schedule • Maintenance tools handling Procedure • Record Keeping 	0.5	1	1.5

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
	Sub-total	•	3.5	7	10.5
Module: 7 Self-orientation on Social Organizational Support at District Level					
37	Obtain Information on Partnership of Collaboration	<ul style="list-style-type: none"> • Self-help/community nature of the project • Flow-diagram of step- wise procedures for new construction • Record Keeping/ Note Taking 	0.5	1	1.5
38	Obtain Information on yearly planning	<ul style="list-style-type: none"> • Trail Bridge Yearly Plan • Planning and coordination procedure of trail bridge • Organizational Structure of DDC 	0.5	1	1.5
39	Report Bridge Progress	<ul style="list-style-type: none"> • Progress Format • Measurements • Photographs 	0.5	1	1.5
40	Assist in maintaining district bridge records	<ul style="list-style-type: none"> • Local Bridge Register • District map 	0.5	1	1.5
	Sub-total		2	4	6
Module: 8 Trail Bridge Maintenance					
41	Explain maintenance concepts	<ul style="list-style-type: none"> • Definition of maintenance • Maintenance need 	0.5	0	0.5
42	Classify Maintenance Types	<ul style="list-style-type: none"> • Classification of Maintenance 	0.5	0	0.5
43	Demonstrate/Monitor/ Assist in Performing Routine Maintenance	<ul style="list-style-type: none"> • Importance of Bridge Parts maintenance • Maintenance schedule • Maintenance tools • Maintenance Manual 	0.5	1	1.5
44	Observe Bridge Condition Investigation (BCI)	<ul style="list-style-type: none"> • Bridge Condition Investigation survey conducting procedures • Bridge Structures condition/ Assessing Procedure 	0.5	1	1.5
45	Be familiar with in Conducting Major Maintenance	<ul style="list-style-type: none"> • Bridge Condition Investigation report Analyzing Procedure • Preparing major maintenance report 	1	0	1

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		<ul style="list-style-type: none"> • Possible Major Maintenance Activities • Responsible Organization for Major Maintenance 			
	Sub-total		3	2	5
	All total		26.5	51.5	78
	All (Part A + B)		156		

Water Supply, Sanitary and Irrigation Engineering

Total	156 hrs
Theory	39 hrs
Practical	117 hrs

Course Description:

This course is designed to impart knowledge and skills on water supply, Sanitary and Irrigation Engineering in general. The course has been designed in systematic way beginning from the simple subject to the specific work items. First part intends to provide skills focusing on water supply works along with water demand calculation, sources selection, structures identification and construction; simple sanitary works. Similarly, second part provides skills focusing on irrigation works along with irrigation system, identification of irrigation structures of basic calculations, canal lining, canal repairing works; river edge and slope protection works.

Course Objectives:

After completion of this course, the students will be able:

1. To calculate water demand for various purposes;
2. To describe different water sources and source selection criteria;
3. To illustrate and construct components of gravity water supply system;
4. To install and repair simple plumbing fittings;
5. To install and repair minor sanitary fittings and fixtures;
6. To be familiar with irrigation system;
7. To identify the structures and components of system; and
8. To carry out various river edge protection works.

Part: 1 Water Supply Engineering

S.No.	Task Statement	Related Technical Knowledge	Time	
			T	P
1.	Calculate water demand	<ul style="list-style-type: none"> • Concept of water demand • Population survey • Design period • Concept of population forecasting • Different method of 	2	2

S.No.	Task Statement	Related Technical Knowledge	Time	
			T	P
		<p>population forecasting and their suitability</p> <ul style="list-style-type: none"> Water demand (house hold, school, public use, industries, firefighting and losses and wastes) 		
2.	Select sources of water	<p>Introduction</p> <p>1. Types of sources</p> <ul style="list-style-type: none"> Surface water (river stream and Lake) sources Ground water (Surface spring, Gravity spring Artesion spring, Shallow well, Deep well and Artesion well) <p>2. Sources / selection investigation criteria (Location, quantity, quality and cost.)</p> <p>3. Current water sources</p> <p>4. Water rights</p>	2	4
3.	Measure discharge	<p>Concept</p> <p>1. Discharge measuring techniques</p> <ul style="list-style-type: none"> Bucket and stopwatch V-notch weir Velocity area method <p>2. Safe yield and design yield</p>	1	3
4.	Design/select pipeline/intake/sedimentation tank/break pressure tank/reservoir tank/tapstand/special crossing section or component	<p>Concept</p> <p>1. Design/selection of</p> <ul style="list-style-type: none"> Pipeline section (mainline, branch line and tap line) with hydraulic grade line Intake section (intake and collection tank) Types of intake Sedimentation tank section (design flow, detention time 	2	4

S.No.	Task Statement	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> and capacity calculation) • Design parameters • Break-pressure tank section (masonry, HDP and float valve) • Importance of BPT • Reservoir tank section (capacity) • Tapstand section & its types • Special component section (suspended crossing, gully crossing, pipeline valve boxes and frictional diffuser) 		
5.	Perform intake/sedimentation tank/break pressure tank / reservoir tank (Ferrocement)/ tap stand/special crossing section construction	<ul style="list-style-type: none"> • Location map and Drawings of intake, sedimentation tank, break pressure tank, reservoir tank (Ferrocement), tap stand and special crossing section 	0.5	4
6.	Perform pipeline construction work	<ul style="list-style-type: none"> • Location map and drawing of pipeline • Breadth and depth of trench line • Pipe laying procedure • Types of pipes • HDP pipe joining • Backfilling • Marking the pipeline • Rejoining the buried pipe 	1	4
7.	Observe the installing of hand pump	<ul style="list-style-type: none"> • Concept • Types of pump • Permeability & capillary action. 	0.5	3

S.No.	Task Statement	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> • Soil strata • Water table • Use of drawings • Use of cow dung • Scaffolding needed. 		
8.	Identify causes of water pollution.	<ul style="list-style-type: none"> • Pure and Impure water • Properties and hardness of water • Wholesome and Potable water • Contaminated and polluted water • Definition of water pollution • Causes of water pollution • Water pollution at different sources/stages (Intake, reservoir, collection chamber • Main/distribution pipe lines). • Prevention of water pollution 	1.5	2
9.	Identify components of water treatment units	<p>Concept</p> <p>1. Treatment units</p> <ul style="list-style-type: none"> • Screening • Sedimentation • Coagulation • Aeration • Filtration • Chlorination/disinfection 	1	3
10.	Identify supply system	<p>Introduction of supply system</p> <p>1. Category of system</p> <ul style="list-style-type: none"> • Open system • Closed system <p>2. Type of systems</p> <ul style="list-style-type: none"> • Open system without faucets • Open system with faucets • Closed system with reservoir 	1.5	3

S.No.	Task Statement	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> • Closed systems with intermittent services • Closed system with float – valves 		
11.	Identify distribution system	Purpose of Distribution systems <ul style="list-style-type: none"> • Types • Gravity system • Pumping system • Dual systems 	0.5	2
12.	Maintain/repair pipeline/reservoir tank/tap stand	<ul style="list-style-type: none"> • Minor maintenance • Major maintenance 	0.5	2
	Sub-total		14	36

Part: 2 Sanitary Engineering

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
20.	Define sanitation	<ul style="list-style-type: none"> • Definition and role of sanitation • System of sanitation and sewerage • Type of sewers • Laying of sewer 	1	1
21.	Dispose sewage	<ul style="list-style-type: none"> • Importance of disposal of sewage • Land treatment • Dilution Method • Self-purification of River 	0.5	2
22.	Dispose of Excreta in un-sewer area	<ul style="list-style-type: none"> • Pit privy • VIP latrine • Pour flush latrine • Septic tank 	0.5	2
	Construct ventilated improved pit latrine (VIP)	<ul style="list-style-type: none"> • Design guidelines for VIP latrine. • Pipe size & type. • Quantity of waste. 	1	3

		<ul style="list-style-type: none"> • Material for superstructure • Brick/stone/mud. • Lining of trenches. 		
	Identify a house-hold septic-tank with soak pit	<ul style="list-style-type: none"> • Definition • Working principle of septic tank & soak pit. • Design parameter • Capacity calculation/determination of septic tank & soak pit. • Detention time • Effluent disposal • Construction procedure • Operation & maintenance 	1	4
23.	Manage/dispose solid waste	<ul style="list-style-type: none"> • Definition • Types of wastes • Impact of waste • Disposal techniques • Onsite Management • Waste segregation • Collection of solid waste • 4R Principle • Composting • Disposal 	1	2
			5	14

Part: 3 Irrigation Engineering
Module: 1 Irrigation system and structures

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
24.	Describe irrigation systems	<ul style="list-style-type: none"> • Definition • Need of irrigation • Types of Irrigation • Methods of irrigation • Irrigation in Nepal • Ground water irrigation 	1	
25.	Identify the various irrigation structures	<ul style="list-style-type: none"> • Intake structure • Head works • Canal type • Cross regulator • Escapes and Canal falls. 	2	4

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> • Distribution boxes. • Cross-Drainage works • (Aqueducts, Siphon aqueducts, Super passage, Siphon, Level crossing, Inlet or Inlet and Outlet 		
26.	Define various irrigation terminologies	<ul style="list-style-type: none"> • GCA, CCA, NCA, Duty and delta. • Canal systems (Main / branch canal Minor, Tertiary, Water-course & Field channel) 	1	
27.	Sketch a free hand index map of a typical irrigation system	<ul style="list-style-type: none"> • Purpose • Sketching procedure 	0	3
28.	Determine GCA/CCA in ha/ % of GCA.	<ul style="list-style-type: none"> • Cropping intensity • Cropping calendar • Rabbi-crop • Khariff- crop • Spring crop 	1	2
29.	Draw a free-hand cross section of a Hill/Terai canal.	<ul style="list-style-type: none"> • Side slopes • Berm width • Free board • Bank width, Radius of road way, Spoil banks, Bed bars, Right of way, Side drains 	1	4
30.	Identify seepage loss in canal.	<ul style="list-style-type: none"> • Evaporation losses, • Conveyance losses, • Surface run-off & • Deep percolation. • Units of losses • Measurement of losses • Canal efficiencies. • Thumb rule for canal losses. 	1	3
31.	Calculate peak water requirement.	<ul style="list-style-type: none"> • Fundamental concept on • Crop (major crop)water 	1.5	4

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		requirement, <ul style="list-style-type: none"> • Effect of temperature, humidity, wind, soil type & effective rain-fall on crop water requirement. • Units of water consumption. • Duty at different stages/ sections of a canal system 		
32.	Find out the permissible velocity in canal.	<ul style="list-style-type: none"> • Concept of non-silting & non-scouring velocity (critical velocity). • Permissible velocities for different types of soil type. • Fixation of longitudinal slope • Review of tables on permissible velocities. • Review of tables on velocities of existing canals. • Velocity in lined canals. • Methods of velocity measurement (float and current meter methods) 	1.5	4
33.	Calculate discharge of a channel/stream.	<ul style="list-style-type: none"> • Methods of velocity measurement • Methods of area measurement. • Depth, Width and area of flow • Value of Manning's rugosity coefficient (n) for different types of soils. • Area, $A=BD+ZD^2$ • Perimeter, $P=B+2D(1+Z^2)^{1/2}$ 	2	4

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> Hydraulic mean depth, $R=A/P$ Velocity, $V=(1/n)R^{2/3}S^{1/2}$ Discharge, $Q=A*V$ 		
34.	Identify the components of lift/pump irrigation system	<ul style="list-style-type: none"> Different components of lift/pump irrigation. Shallow/Deep tube wells Methods / steps involved in shallow tube well installation. Selection of tube well 	0.5	3
35.	Carryout the repair works of simple canal section.	<ul style="list-style-type: none"> Types of maintenance Canal operation & maintenance. Siltation of canal & weed growth. Breaches in canals & its repairs. 	1	4
36.	Carryout the lining works of simple canal section.	<ul style="list-style-type: none"> Definition Importance and need Different types of canal lining (Concrete lining, Brick lining) Brick/stone pitching. 	0.5	3
37.	Enlist Irrigation Policies.	<ul style="list-style-type: none"> Relevance of policies Irrigation Policy (2049,1st amendment 2053, 2060) & Irrigation Regulation (2056). Irrigation policies/regulation in the context of operation & management. 	1	1
Sub-total			15	39

Module 2: River training and protection works

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
38.	Perform protection work for narrow gully using poles and branches	<ul style="list-style-type: none"> • Definition of protection works • Introduction • Definitions of the terms used. • Construction materials (Suitability, Merits / demerits) • Design criteria. 	0.5	3
39.	Perform brush /hedge layer.	<ul style="list-style-type: none"> • Brush/Hedge layer. • Construction materials (Suitability, Merits / demerits). 	0.5	2
40.	Perform vegetation stone wall (bio wall)	<ul style="list-style-type: none"> • Vegetation-stone wall. • Construction method. • Suitability. • Merits/demerits 	0.5	4
41.	Perform vegetation gabion.	<ul style="list-style-type: none"> • Vegetation gabions, turfing. • Construction method • Suitability • Construction material • Merits/demerits • Design criteria. 	0.5	4
42.	Measure river stages	<ul style="list-style-type: none"> • Bed level • High Flood Level • Normal Flow Level • Measuring method • Plotting method. 	0.5	2
43.	Weave Gabion mattress (steel-wire mesh)	<ul style="list-style-type: none"> • Introduction to gabion-mattress • Materials used • Weaving method • Recommended sizes of boxes & their mesh. • Types of joints used 	0.5	4

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
44.	Construct gabion wall.	<ul style="list-style-type: none"> • Guiding rules of construction • Construction method • Construction material • Suitability • Advantages/disadvantages 	0.5	5
45.	Identify Solid/Permeable Spur /Groynes	<ul style="list-style-type: none"> • Introduction to river training • Definition of spur/ groynes. • Types of spur/ groynes • Location of spur/ groynes • Length/spacing of spur/ groynes • Construction method & guidelines. 	1	2
46.	Identify launching Apron	<ul style="list-style-type: none"> • Definition& functions of launching apron. • Guiding rules for construction. • Bank pitching • Construction materials • Design parameters for launching apron 	0.5	2
	Sub-total		5	28
	Total		39	117
	All total		156	

Suggested texts and references:

1. Parajuli, A.P., Water supply engineering
2. Parajuli, A.P., Sanitary engineering
3. Adhikary, sujan, irrigation engineering
4. Drinking Water Installation and Drainage Department in Nepal, SKAT
5. Gravity Flow Water System, UNICEF
6. Gravity Water Supply System In Nepal, UNICEF
7. Birdie G.S., Birdie J.S. Water Supply and Sanitary Engineering,
8. Leternon, Josse Water Supply and Sanitation Manual, Remote Area Development Committee
9. Water Supply Manual, Department of Water supply and Sewerage

10. पौडेल, बोध प्रसाद, खानेपानी प्रणाली, प्रा.शि.व्या.ता.प. ।
11. श्रेष्ठ शशिराज, खानेपानी तथा ढल निकास (भाग १)
12. Hill irrigation Manual, Department of Irrigation
13. Punmia B.C. Dr. Introductory Irrigation Engineering
14. Sharma S.K. Irrigation Engineering
15. Garg S.K. Irrigation Engineering & Hydraulic Structures
16. Modi, Irrigation, Water Resources and Water Power Engineering
17. Varshney& Gupta, Theory and Design of Irrigation Engineering Structures
18. शर्मा, हरिप्रसाद ग्रामीण खानेपानी प्रणालीनिर्माण तथा व्यवस्थापन, २०६४ ।

Workshop Practice

Total	234 hrs
Theory	22 hrs
Practical	212 hrs

Course Description:

This course contains three different subjects in separate identity. First part focuses on imparting knowledge and skills of basic Carpentry. Similarly, Second part focuses on providing knowledge and skills of plumbing. Moreover, third part deals about building electrification work.

According to the nature and volume of the practical tasks, the students can work individually or in groups.

PART I: BASIC CARPENTRY

Module: 1: Introduction to carpentry

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
1.	Give an overview of Carpentry	<ul style="list-style-type: none"> ▪ Define carpentry. ▪ Use of wood/timber. ▪ Describe the characteristics of hard wood and softwood. ▪ Define ply wood, lamina board, block board, fibre board, batten board and hard board. ▪ Explain seasoning and its types. ▪ State the procedure to detect timber defect/decaying ▪ Explain the methods (charring, tarring and painting) for preserving timber. ▪ Identify different hand tools ▪ Layout tools, cutting tools, curve line cutting/shaving tools, drilling/boring, striking, driving & holding/clamping tools. ▪ Explain the function of different 	2.00	

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		hand and power tools		
2.	Apply safety rules while performing carpentry works	<ul style="list-style-type: none"> ▪ Explain different sign and symbols of safety ▪ List common safety rules used in carpentry work ▪ Enlist the requirements of First aid box. ▪ Explain procedure of applying basic first aid. 	0.50	1.00
	Sub total		2.50	1.00

Module: 2: Basic wood works

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
3.	Oil hand tools/equipment.	<ul style="list-style-type: none"> ▪ Describe tools maintenance equipment and materials (Grinding machine, oilstones, Oil & Files) ▪ State the purpose of oiling ▪ Use of Lubricants. ▪ State the procedure for applying oil ▪ State safety precautions required during oiling. 	0.5	1.00
4.	Sharpen shaping/saving tools.	<ul style="list-style-type: none"> ▪ Purpose of tools sharpening shaping and saving tools ▪ Equipment and materials required for sharpening ▪ Sharpening procedure ▪ Safety precautions 	0.5	2.00
5.	Sharpen saw.	<ul style="list-style-type: none"> ▪ Concept of topping, shaping, setting & sharpening saw ▪ Shape and size of teeth 	0.5	2.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		<ul style="list-style-type: none"> ▪ Equipment and materials required ▪ Filing technique ▪ Procedure ▪ Safety precautions 		
6.	Saw a log.	<ul style="list-style-type: none"> ▪ Define log. ▪ State the formula to calculate the volume of log. ▪ Differentiate among Quarter, Rift and Tangential 	0.5	2.00
7.	Perform sawing / slicing work.	<ul style="list-style-type: none"> ▪ Definition ▪ Use of Sawing tools; Rip Saw, Back Saw, Cross-Cutting Saw and Key Saw ▪ Parts of tools ▪ Procedure of sawing ▪ Safety precautions 	0.5	2.00
8.	Perform shaping work.	<ul style="list-style-type: none"> ▪ Definition ▪ Shaping tools; Farmer chisel, Pocket chisel, Pocket chisel ▪ Parts of tools ▪ Procedure of shaping ▪ Safety precautions 	0.5	2.00
9.	Perform hand drilling/boring work.	<ul style="list-style-type: none"> ▪ Definition ▪ Drilling tools; Hand drill, Ratchet Brace, Bits ▪ Parts of drilling and boring tools ▪ Procedure of drilling ▪ Procedure of boring 	0.5	2.00
10.	Perform striking/driving works.	<ul style="list-style-type: none"> ▪ Definition ▪ Striking and driving tools; Mallet, Hammer and Claw hammer 	0.5	2.00
11.	Perform shaving (planning or smoothing) work.	<ul style="list-style-type: none"> ▪ Definition ▪ Planning and smoothing tools; 	0.5	2.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		Jack Plane, Smoothing Plane, Block Plane <ul style="list-style-type: none"> ▪ Parts of tools ▪ Procedure of planning 		
12.	Perform (<i>Khanch</i>) groove cutting.	<ul style="list-style-type: none"> ▪ Function of groove ▪ Size of groove (<i>khanch</i>) ▪ Groove cutting procedure 	0.5	2.00
	Sub total		5.00	19.00

Module 3: Wood joints

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
13.	General information about joint	<ul style="list-style-type: none"> ▪ Definition of joint. ▪ Explain the category of joints (Lengthening, Widening and Framing) ▪ Drawing free hand sketch of different joints (butt, lap, dowelled, mitred, rebated, dado & groove, tenon & mortise and dovetailed) ▪ Purposes of different joints. ▪ Identification of tools, equipment and material required to make different types of joints. 	0.5	2.00
14.	Make lap joint.	<ul style="list-style-type: none"> ▪ Joint making procedure 		2.00
15.	Make dowelled joint.	<ul style="list-style-type: none"> ▪ Joint making procedure 		2.00
16.	Make mitred joint.	<ul style="list-style-type: none"> ▪ Joint making procedure 		2.00
17.	Make rebated joint.	<ul style="list-style-type: none"> ▪ Joint making procedure 		2.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
18.	Make dado & groove joints.	<ul style="list-style-type: none"> Joint making procedure 		2.00
19.	Make tenon and mortise joint.	<ul style="list-style-type: none"> Joint making procedure 		2.00
20.	Make dovetailed joint.	<ul style="list-style-type: none"> Joint making procedure 		2.00
21.	Apply metal fasteners.	<ul style="list-style-type: none"> Application procedure 	0.50	2.00
	Sub total		1.00	18.00

Module: 4: Finishing works

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
22.	Apply sand/emery paper (abrasives).	<ul style="list-style-type: none"> Application procedure 		2.00
23.	Apply putty over holes.	<ul style="list-style-type: none"> Application procedure 		2.00
24.	Apply adhesive (Fevicol, Mobicol)	<ul style="list-style-type: none"> Application procedure 		2.00
25.	Apply primer.	<ul style="list-style-type: none"> Application procedure 		2.00
26.	Apply enamel paint.	<ul style="list-style-type: none"> Application procedure 		2.00
27.	Apply varnish.	<ul style="list-style-type: none"> Application procedure 		2.00
28.	Apply Shellac / French polish.	<ul style="list-style-type: none"> Application procedure 		2.00
	Sub total			15.00

Project works

S.N.	Project works (all tasks)	Time (hrs)	
		T	P

S.N.	Project works (all tasks)	Time (hrs)	
		T	P
29.	Make small stool Make door/window frame Construct simple Book rack/shoes rack. Construct simple roof truss. Calculate the cost of products. Student will be able to calculate final cost including the labour cost, material cost, and contingencies cost VAT etc.		57.50
	Sub total	0.00	57.50
	Total	8.50	110.50
	Grand total	119.00	

PART II: BASIC PLUMBING

Module: 5: Basic Plumbing

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
30.	General information an out plumbing and tools.	<ul style="list-style-type: none"> ▪ Interpret plumbing drawing and fitting symbols. ▪ Identify plumbing tools/equipment such as drilling machine, die set, bench vice, pipe vice, chain vice, pipe wrench, slide wrench, combination pliers, screw driver, heating plate, blow lamp, Hack saw, File, Brush, Oil can, Tape etc. ▪ Identify Fittings such as Union, Elbow, Bend, Socket, Plug, Tee, Cross, Nipple, Gate valve, Float valve, Non-return valve and Tap ▪ Identify materials such as GI Pipe, HDP Pipe, PPR Pipe, CPVC Pipe, Jute, Pipe tape, Thermo-chrome Chalk, Teflon 	1.00	2.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		<p>cloth and Putting.</p> <ul style="list-style-type: none"> ▪ Explain the function of above mentioned tools, equipment, fittings & materials. ▪ Define cutting template and thermo chrome chalk. 		
31.	Make HDP butt joint	<ul style="list-style-type: none"> ▪ Define Heating plate, Teflon-cloth and “Z” dimension. ▪ State how to maintain temperature, HDP pipe cutting procedure 	0.50	2.00
32.	Make HDP Tee/Elbow/ Bend with different angle/Y/reducer/cross	<ul style="list-style-type: none"> ▪ Diagram Tee, Elbow, Bend with different angle, Y, Reducer and Cross with components. ▪ Explain the application of Tee, Elbow, Bend, Y, Reducer and Cross. 	0.50	12.00
33.	Cut Galvanized Iron (GI) pipe using hack saw	<ul style="list-style-type: none"> ▪ Explain the use of different grades of hacksaw blade for pipe cutting. ▪ Discuss the necessity of coolant while cutting. ▪ Explain different grade of GI pipes. ▪ Cutting procedure of G.I. 	0.50	3.00
34.	File GI pipe	<ul style="list-style-type: none"> ▪ Explain types of file used for different pipes. ▪ Explain the necessity of filing on different pipes. 	0.50	1.00
35.	Cut thread on GI pipe using pipe die	<ul style="list-style-type: none"> ▪ Identify standard length of thread according to pipe size. ▪ Explain the reason of using right size of die for thread cutting. ▪ State the purpose of using 	1.00	4.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		lubricant during thread cutting. ▪ Explain the types of thread(inner and outside)		
36.	Connect pipes with GI fittings	▪ List the name of GI fittings used in plumbing work. ▪ Explain the uses of GI fitting used in plumbing work. ▪ List different types of hemp and their purposes.	1.00	3.00
37.	Cut Polypropylene Random (PPR) pipe using pipe cutter	▪ Explain the uses of PPR pipe ▪ Explain the uses of cutting wheel. ▪ Explain the reason of adjusting cutting depth slowly.	0.5	2.00
38.	Install PPR pipe lines with fittings	▪ Explain the use of different fittings on PPR pipe. ▪ Describe the importance of using PPR heat melting machine and heat gate valve. ▪ State the importance of maintaining melting temperature of PPR pipe	1.00	3.00
39.	Cut Chlorinated polyvinyl chloride (CPVC) pipe using hacksaw	▪ Cutting procedure		0.50
40.	Install CPVC pipe lines with fittings	▪ Installing procedure		2.00
41.	Perform drilling using drill machine.	▪ State different types of drill machine. ▪ Identify type of drill bits according to the type of surface (wood, concrete, metal). ▪ Identify size/number of drill bits according to the size of hole required. ▪ State the precaution to be taken	0.50	2.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		while drilling using drill machine.		
	Sub total		6.5	33.50

Project works

S.N.	Project works	Time (hrs)	
		T	P
42.	Students have to accomplish the following project work/s either individually or in a group. <ul style="list-style-type: none"> Make and assemble GI Pipes (or PPR) in a rectangular loop with the help of different fittings such as Elbow, Union and Tee according to the given dimension and drawing. 		11.00
	Sub total	0.00	11.00
	Total	7.00	45.00
	Grand total	52.00	

PART III: BASIC ELECTRICITY

Module: 6: Electrical Installation

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
43.	Apply safety rules while performing electrical works	<ul style="list-style-type: none"> Explain different sign and symbols of electrical safety List common safety rules used in electrical work Describe electrical hazards State the preventive measures from electrical hazards. Explain First aid procedure on dealing with electrical shock. 	1.00	1.00
44.	Measure Voltage using Voltmeter/ Multi-meter	<ul style="list-style-type: none"> List basic terms used in electrical work Explain the relation between current, voltage and power 	1.00	1.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		<ul style="list-style-type: none"> ▪ Define Voltmeter, Ammeter and Multi-meter. ▪ Explain different electrical symbols ▪ Describe the types of electrical circuit (closed and open circuit) 		
45.	Measure Current using Ammeter	<ul style="list-style-type: none"> ▪ Introduction of Ammeter and current measurement. 		1.00
46.	Prepare layout drawing for domestic electrical installation/wiring	<ul style="list-style-type: none"> ▪ State Nepal Electricity Authority (NEA) rules for simple house wiring. ▪ Explain the concept of layout diagram, wiring diagram and schematic diagram. ▪ Identify different types of electrical symbols. ▪ Identify different types of wiring symbols. ▪ Interpret layout, wiring and schematic diagram. 	1.00	3.50
47.	Perform exposed (surface) wiring on board/wall	<ul style="list-style-type: none"> ▪ Describe the types of wiring. (Exposed and concealed wiring) ▪ Explain the types of surface wiring. ▪ State the procedure for surface wiring. ▪ State the precaution to be taken while performing surface wiring. 	0.5	6.00
48.	Install one way switch	<ul style="list-style-type: none"> ▪ Explain the procedure of identifying the phase using line tester ▪ Identify phase terminal in one way switch ▪ Explain the function of one way 	0.5	1.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		switch		
49.	Install two-way switch	<ul style="list-style-type: none"> ▪ Explain the situation of using two way ▪ Identify and use terminal of three points (up and down position) 	0.1	1.00
50.	Install tube light/bulb/Buzzer	<ul style="list-style-type: none"> ▪ Identify different parts of tube light ▪ Identify different types of tube light (normal and electronic choke) 	0.1	2.00
51.	Install power socket	<ul style="list-style-type: none"> ▪ Interpret the connection diagram of power socket 	0.1	1.00
52.	Install gang switch	<ul style="list-style-type: none"> ▪ Identify type of gang switch required as per the requirement ▪ Explain procedure of identifying the phase using line tester ▪ Identify phase terminal in gang switch 	0.4	1.00
53.	Install MCB	<ul style="list-style-type: none"> ▪ List standard size of MCB ▪ Differentiate between MCB and kit-kat fuse 		1.00
54.	Install DP main switch	<ul style="list-style-type: none"> ▪ Explain DP main switch ▪ List standard size of main switch ▪ Identify connection diagram of DP main switch 	0.15	1.00
55.	Install energy meter	<ul style="list-style-type: none"> ▪ Define energy meter ▪ State the precaution to be taken while installing energy meter. 	0.15	1.00
56.	Perform grooving of concealed wiring on walls	<ul style="list-style-type: none"> ▪ Procedure 		3.00
57.	Lay in PVC pipes for concealed wiring in ceiling (Concrete)	<ul style="list-style-type: none"> ▪ Procedure 		3.00
58.	Perform earthing	<ul style="list-style-type: none"> ▪ Describe the importance of earthing. 	0.50	1.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		<ul style="list-style-type: none"> ▪ State the procedure for earthing. 		
	Sub total		6.50	28.50

Project works

S.N.	Project works	Time (hrs)	
		T	P
59.	Student has to accomplish the following project work/s either individually or in a group. <ul style="list-style-type: none"> • Connect Lighting & Signal Circuits on Board according to the given dimension and drawing. 		28.00
	Sub total	0.00	26.00
	Total	6.50	56.50
	Grand total	63.00	
	All total	234	

Suggested texts and references:

1. शिलाकार, दोब्वरलाल, *काष्ठकार्यको परिचय (An Introduction of Wood Work)*, प्रथम संस्करण २०५४ ।
2. चिनिकाजी स्थापित र केशव दास वैद्य *सिकर्मी व्यवसाय*
3. शाक्य रत्नमान, मर्सानी अमृतप्रसाद औद्योगिक शिक्षा, कक्षा ९ र १०, पाठ्यक्रम विकास केन्द्र २०५६ ।
4. Singh Surendra, *Engineering Materials (Latest Edition)*, Vikas Publishing House Pvt.Ltd.
5. Jain, *Design of Timber Structure (Latest Edition)*.
6. Byanjankar, Mohan Man, *The Essential Views in Carpentry and Masonry*, Nepal Engineering College, 1996.
7. Deolakar S.G., *Plumbing Design and Practice*, Tata McGraw-Hill Publishing Co. Ltd., 1994.
8. McConnell, Charles, *Plumbers and pipe Fitters Library, volume I, II, and III*, Macmillan Publishing Company, 1986.
9. C.R.Dargan, *Electrical Drawing and Estimating*
10. Code of Practice for Electrical Wiring Installation, CTEVT
11. Malla, N.B., *Introduction of Electricity* Vol. I
12. S. K. Malice, *Electric Trade Theory and Practical*

On-the- Job Training (OJT)

Duration: 3 months (480 hours)

Course description:

The On-the-Job Training (OJT) is provisioned to make the students capable of tackling problems in a real work situation related to *Civil Engineering*. The student applies knowledge and skills gained during the whole course.

The choice of project will depend upon the interest of the student and the nature of the job/project available in the workplace. However, the entire project covers basic surveying, designing, drawing and estimating and costing.

Course objectives:

After the completion of this course students will be able to:

1. Be familiar with the world of the work
2. Enhance hands on practice skills through integrated project works

Activities and deliverable:

In addition to the day-to-day activities in the workplace including comprehensive report, each student is required to carry out an individual project work alone or under the supervision of the concerned institute, industry/organization where the student works.

Each student has to submit a draft report prior to the final report so that the assigned instructor/guide can correct gross mistake. The final report should be submitted to the authority.

Integrated project works

Students can select any **ONE** of the following projects or the project available in the workplace.

1. Project work on design, drawing and cost estimate of 3 roomed residential/small office building.
 - Basic surveying: measure and plot a piece of land for building layout.
 - Collect materials and labour rate for rates analysis.
 - Carryout architectural design and drawing of a 3 roomed residential/office building (site plan, floor plans, elevations and sections).
 - Prepare internal plumbing and electrical layout drawings.
 - Prepare bill of quantities and cost estimate.
 - Compile, submit and present report
2. Project work on design, drawing and cost estimate of small rural water supply(gravity flow) or rural sanitary scheme.
 - Perform basic surveying
 - Collect materials and labour rate for rates analysis.
 - Prepare design and drawings of a rural water supply (gravity flow) or rural sanitary scheme.
 - Prepare bill of quantities and cost estimate.
 - Compile, submit and present report

3. Prepare drawings and cost estimate of small road project.
 - Perform road surveying or study contour map
 - Collect materials and labour rates for rate analysis.
 - Perform layout of road alignment, profile and cross-section.
 - Design horizontal and vertical curve
 - Provide typical retraining structures, drains and culverts.
 - Prepare bill of quantities and cost estimate.
 - Compile, submit and present report
4. Prepare drawings and cost estimate of small irrigation project.
 - Perform basic surveying or study contour map
 - Collect materials and labour rates for rate analysis.
 - Draw layout, profile and cross-section of small hill irrigation project with the help of given data/topographic map.
 - Draw typical head works structure (weir, trash-rack), aqueduct, fall, Siphon, lined canal sections etc.
 - Prepare bill of quantities and cost estimate.
 - Compile, submit and present report

Evaluation Scheme:

The evaluation of the performance of the student is to be carried out by three agencies; the concerned institute, industry/organization where the student work, and the CTEVT unless otherwise directed by office of the controller of examinations /Technical Division of the CTEVT. The OJT carries 500 marks. The student has to score 60% or above for successful completion of the course. The breakdown of the total marks is as follow.

Distribution of marks for evaluation

Section	Evaluator/Paper	Distribution of marks			Total Marks
		Internal	Final	Time	
1	Related government/non government organizations/construction industries'/users agency's supervisor where trainees are placed (continuous evaluation)	100			100
2	Related institution supervisor/teacher <ul style="list-style-type: none"> • Daily diary • Report 	100			100
3	CTEVT appointed examiner (at the end of the field practice) <ul style="list-style-type: none"> • Report presentation 		100		100
				Total	300

References:

1. Course notes provided by the teachers/department.
2. Sample drawings of different municipality office, Nepal Government Projects.
3. Building bye-laws.
4. Building Construction Hand Book by Roy Chudley and Roger Greeno.
5. Nepal National Building Codes.
6. Village water systems- A technical journal (Nepal and Bhutan)
7. Estimating and Costing by B. N. Dutta.
8. Text books of related courses.
9. Government norms of rate analysis

Experts Involved in Curriculum Revision, 2008

CTEVT would like to extend its heartfelt thanks to the following experts who contributed in the process of revising the curriculum in TSLC in Civil Engineering.

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