

CURRICULUM

TSLC

Civil Engineering

(Pre-SLC Intake)



Council for Technical Education and Vocational Training
Curriculum Development Division

Sanothimi, Bhaktapur

(First Revision 1989, Second Revision 1995, Third Revision 2008)

Fourth 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 pre SLC intake Civil Sub-Overseer programme since 2046 V.S. (1989 AD). Till 2059, there are three different specialisation in 2nd year, namely Building Construction, Water Supply and Irrigation and Roads and Bridges after completing the first year of this course. With the past experiences, it has been found that these graduates need to have minimum

skills and knowledge in all three specialised fields mentioned above. This was the prime objective of the second revision. The prime objective of this revision is to incorporate Computer Aided Design.

This course is designed to prepare competent general civil sub-overseers especially, in the field of building construction, water supply, road and bridges and irrigation 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. They are offered about 8% of academic courses such as Applied English, Applied Mathematics, Applied Nepali and Applied Science; and remaining 92% civil engineering courses. The duration of course is 2 years plus five months on-the-job work assignments after completing the final examination.

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 29 months (24 months on institution + 5 months on OJT). The total duration will be 104 weeks/3120hrs on institution and 20 weeks/800 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 minimum academic qualification of grade 10 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:

- Grade 10 pass
- Students should pass entrance examination administered by CTEVT
- They should submit the following documents at the time of application
 - Grade 10 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 of 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 500 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

First year

S. No.	Subjects	Nature	Class/ Week	Total Class/Year	Full Marks		
					T	P	Total
1.	Applied English	T	2	78	50	0	50
2.	Applied Math	T	4	156	100	0	100
3.	Applied Nepali	T	2	78	50	0	50
4.	Applied Science	T	2	78	50	0	50
5.	Computer Application	P	2	78	0	50	50
6.	Construction Materials	T	2	78	50	0	50
7.	Construction Technology I	T+P	8	312	40	160	200
8.	Engineering Drawing I	P	6	234	0	150	150
9.	Engineering Surveying I	T+P	6	234	30	120	150
10.	Workshop Practice	P	6	234	0	150	150
Total			40	1560	370	630	1000

Second year

S. No.	Subjects	Nature	Class/Week	Total Class/Year	Full Marks		
				0	T	P	Total
1.	Construction Technology II	T+P	6	234	30	120	150
2.	Computer Aided Drafting	P	2	78	0	50	50
3.	Engineering Drawing II	P	6	234	0	150	150
4.	Engineering Surveying II	T+P	6	234	30	120	150
5.	Entrepreneurship Development	T+P	2	78	20	30	50
6.	Estimating, Costing & Supervision	T+P	6	234	30	120	150
7.	Road & Trail Bridge	T+P	6	234	30	120	150
8.	Water Supply, Sanitary and Irrigation Engineering	T+P	6	234	30	120	150
Sub Total			40	1560	170	830	1000

On-The-Job Assignment

S.No.	Subjects	Nature	Hours/Week	Total Hours	Full Marks
1	On-the-job training	P	20	800	500
Grand Total (1st year+ 2nd year+OJT)				3920	2500

First Year

1. Applied English
2. Applied Math
3. Applied Nepali
4. Applied Science
5. Computer Application
6. Construction Materials
7. Construction Technology I
8. Engineering Drawing I
9. Engineering Surveying I
10. Workshop Practice

Applied English

Total: 78 hrs

Theory: 78 hrs

Course descriptions:

This course is designed for the development of English language skills in reading, writing and speaking for the Technical students of Nepal, especially for the Technical School Leaving Certificate Level.

Course Contents:

S.No.	Descriptions	Time (hours)
1.	Introduction <ul style="list-style-type: none">◆ Noun◆ Verb◆ Adjective◆ Adverb	4
2.	Auxiliary and main verbs and their uses	
3.	Subject verb agreement- construction of open sentences plus guided compositional writing	2
4.	Tense and sentence structure- present, past and future along with their relevant practical exercises. More practices on the following tense structures: <ul style="list-style-type: none">◆ Simple present/present continuous◆ Simple past/past continuous (when)◆ Present perfect/simple past◆ Past perfect/simple past◆ Present perfect/continuous◆ Future perfect/continuous◆ "Going to" future/uses	10
5.	Punctuation	2
6.	Affirmative/Negative sentences	2
7.	Yes/No question	2
8.	Wh- question	3
9.	Tag question	2
10.	Letter writing <ul style="list-style-type: none">◆ Social letter	4

♦ Application	
♦ Complain letter.	
♦ Business letter	
11. Memorandum writing	3
12. What is a report? How a particular type of report is written?	3
13. Read, understand and use the technical terms in their sentences (with emphasis on trade related terminology).	2
14. Practical job reports on the basis of their workshop activities such as in filling work, drilling, sawing, G.I. pipe cutting etc.	3
15. Read short technical publication	2
16. Read and follow English language instruction.	3
17. Understand and use basic vowel sounds, consonant sounds and diphthong sounds.	2
18. Word stress	2
19. Prepare a 5 minutes speech on a particular topic such as on "Air Pollution", "Draught", "Landslides", "Flooding", "Earthquake", etc.	2
20. Voice- active and passive	4
21. Reported speech	3
22. Rearrangement of words into sensible sentences	2
23. Conditional sentences	2
24. Relative clauses	2
25. Joining sentences	2
26. Articles	2
27. Preposition- place and time	2
28. Intonation	2
29. Situational understanding plus appropriate response. Example is given below:	2
Situation	Response
You're in a restaurant. A waiter comes and takes your order. A few minutes later another waiter comes and asks you what	No thanks. I've already placed the order
30. Comprehension practice	2

Suggested texts and references:

1. Applied English for Construction CTEVT, 2049 (1992).

Applied Math

Total: 156 hrs
Theory: 156 hrs

Course descriptions:

This course is design to provide the required mathematical basis necessary in comprehending the technical courses. Existing knowledge of previous education will be deepened and consolidated by applying it to problems in the areas of practical and theoretical training.

Task statements:

At the end of this course trainees will be able to:

1. Explain the S.I. concept.
2. Convert quantities from imperial to metric system and vice versa.
3. Add, subtract, multiply and divide quantities, weights, distances, time and costs of materials, building parts and processes related to construction operations.
4. Calculate perimeters and areas of rectangular, triangular and circular flat surfaces.
5. Calculate dimensions, quantities and weights of materials, areas and costs.
6. Calculate using the "unitary method".
7. Apply simple equations.
8. Calculate on uses of scales.
9. Calculate applying the theorem of Pythagoras.
10. Calculate using simple trigonometrical functions.
11. Calculate mass and density.
12. Calculate gradient by using the method proportions and percentages.
13. Calculate proportional and percentage changes in quantities and weights of materials, dimensions, areas, volumes, costs and times.
14. Calculate perimeters, surface areas, volumes and weights of materials in shape of a cone, pyramid and prisms including the cylinder.
15. Calculate the area of pitched surfaces.
16. Use a pocket calculator to make calculations.
17. Express and interpret information in graphical form.
18. Calculate simple mean, median and mode.

Suggested texts and references:

Applied Math for Technical Schools Construction, CTEVT 2049 (1992)

प्रयोगात्मक नेपाली

जम्मा : ७८ घण्टा
सैद्धान्तिक : ७८ घण्टा

कोर्ष वर्णन:

प्राविधिक शिक्षालयहरूमा दुई वर्षे प्राविधिक एस.एल.सी. मा तालीम लिने प्रशिक्षार्थीहरूका लागि नेपालीका व्यावहारिक पक्षमा आवश्यक पर्ने भाषिक सीपको विकासका लागि देहाय बमोजिमको व्यावहारिक नेपाली अध्यापनका लागि तयार गरिएको छ । यसमा व्यावहारिक नेपाली व्याकरण र सामान्य रचना तथा सब-ओभरसियरको कामको सिलसिलामा आवश्यक पर्ने व्यावहारिक कार्यसंग सम्बन्धित विषयहरू समावेश गरिएका छन् ।

विषय	पाठघण्टा
१ व्याकरण	
● पदविचार सम्बन्धी ज्ञान (नाम, सर्वनाम, क्रिया, विशेषण र अव्यय)	४
● शब्द निर्माण प्रक्रिया (उपसर्ग, प्रत्यय र समास)	३
● वाक्य निर्माण सम्बन्धी ज्ञान	२
● वाक्यका किसिम (सामान्य, मिश्र र संयुक्त)	३
● वाक्य परिवर्तन सम्बन्धी ज्ञान (आज्ञार्थक, इच्छार्थक, प्रश्नार्थक, सम्भावनार्थक आदि)	३
● वाच्य परिवर्तन सम्बन्धी ज्ञान र प्रयोग	४
● निर्माण सम्बन्धी पारिभाषिक शब्दको ज्ञान र तिनको प्रयोग	४
● नेपाली समाजमा विपरीतार्थक, पर्यायवाची, श्रुतिसम भिन्नार्थक शब्दको ज्ञान र प्रयोग	४
● नेपाली समाजमा प्रचलित निर्माण विषय संग सम्बन्धित शब्द र वाक्पद्धतिको ज्ञान र प्रयोग	८
२ भाषा र अभिव्यक्ति	
● अनुच्छेद लेखन प्रक्रियाको ज्ञान र प्रयोग ।	५

- निबन्ध लेखन प्रक्रियाको ज्ञान र प्रयोग । ५
 - पत्र लेखन (घरायसी पत्र, कार्यालयीय पत्र, व्यापारिक पत्र, व्यावसायिक पत्र, संस्मरण पत्र (Memo)) को ज्ञान र प्रयोग । ५
 - निर्माण सम्बन्धी जनचेतना शिक्षा (यसमा निर्माण सम्बन्धी कमी कमजोरीबाट हुने भूकम्प चुहावट, गारो वा बनोट चर्कने, आगजनी, ओस आदि विषयमा १ पेजको लेख लेखाई त्यसबारे आफ्नो कक्षामा बोल्न लगाउने जस्ता सीप दिने र त्यसमा अभ्यास गराउने) । ४
 - निर्माणका कार्य गर्दा हुने वातावरण प्रदुषण र ती प्रदुषणबाट हुने खराबी र त्यसका लागि निर्माण गर्दा ध्यान दिनु पर्ने विषयमा जनचेतना शिक्षा । १
 - बूँदा र सारांश लेखनको ज्ञान र प्रयोग ३
 - प्रश्नको आधारमा उत्तर लेखन प्रक्रियाको ज्ञान र अभ्यास २
- ३ प्रतिवेदन लेखन**
- सामान्य प्रश्नावली तयारी सम्बन्धी ज्ञान र प्रयोग ३
 - कार्य प्रतिवेदन सम्बन्धी ज्ञान र प्रयोग ३
 - कार्यालय व्यवस्थापन सम्बन्धी ज्ञान (व्यावसायिक कार्यशालाको स्थापनाका लागि आवश्यक योजना तयारी गर्ने, निर्माण सम्बन्धी कामका लागि कार्य योजनाको तयारी गर्ने, योजना गरिएको कार्यक्रमका लागि बजेटिङ्ग गर्ने) विषयको ज्ञान र प्रयोग ५
 - मासिक तथा वार्षिक प्रगति प्रतिवेदन सम्बन्धी ज्ञान र प्रयोग । २
- ४ उद्योगबाट उत्पादित सामग्रीको जानकारी सम्बन्धी ज्ञान**
- उद्योगबाट उत्पादित वस्तुको प्रयोग अघि त्यसको गुणस्तर बनोट, प्रयोग विधि आदिको विषयमा जानकारी गर्न सामग्री प्रयोग पन्जिका (Catalogue) अध्ययन र प्रयोग गर्ने ज्ञान र अभ्यास । ४
 - टेण्डर तथा बोलपत्र सम्बन्धी ज्ञान २

Applied Science

Total: 78 hrs
Theory: 78 hrs

Course descriptions:

This course is designed to provide required scientific basis necessary in comprehending the technical courses. Using practical examples in teaching the various topics, this course demonstrates the importance of knowledge in physics and chemistry to ensure the security, durability and utility value in construction work.

Tasks statement:

At the end of this course trainees will be able to:

1. Explain the concept of substance mixture (quantity) as a result of a physical process.
2. Explain the concept of reaction as a result of a chemical process.
3. List the characteristics of acids, bases and salts relevant to construction facts.
4. Describe main physical and chemical characteristics of water.
5. Explain causes and methods of prevention to the phenomenon of efflorescence and dampness.
6. Apply the concept of adhesion and cohesion to constructional processes.
7. Apply the concept of capillary to constructional processes.
8. Explain the impact of frost to constructions.
9. Define the concept of mass, density and force of gravity.
10. Name characteristics of ferrous and usual non-ferrous metals.
11. Name the major characteristics of plastics.
12. Explain causes, effect and prevention of corrosion.
13. Explain the concept of temperature, its units and conversion.
14. Differentiate the types of heat transmission.
15. Explain the influence of heat on construction materials and building parts.
16. Describe the causes, effect and prevention of condensation
17. Differentiate the types of sound transmission.
18. Name measures of protection against sound and heat transmission.
19. Explain the concept of compressive, tensile and shear forces.
20. Explain the Ohm's law.

21. Explain the concept of Ampere, Ohm, Volt, Watt, Joule, Kilowatt-hour and magnetism.
22. List the requirements of simple electrical circuit (Series and Parallel).

Computer Application

Total	78 hrs
Theory	10 hrs
Practical	68 hrs

Course Description:

This course intends to impart the knowledge and skills on preparing documents, spreadsheets, presentations slides and database management sheets by using different computer application packages.

Module: 1 Computer System

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
1.	Categorize computer peripheral	<ul style="list-style-type: none"> ▪ Identify input devices (keyboard, mouse, joystick, and scanner), output devices (monitor, printer/plotter, sound card, and speaker), central processing unit, memory unit, and auxiliary storage devices (hard disk, CD/DVD/Blue Ray, Pen drive, memory card). ▪ Explain different types of ports (Parallel, Serial, USB, IEEE 1394 and Slots) 	0.50	1.00
2.	Install Operating System	<ul style="list-style-type: none"> ▪ Explain operating system including its role. ▪ Describe different types of operating systems (MS-DOS, Windows, Unix, Linux) ▪ Enlist the function of DOS Commands (COPY, REN, DIR, TYPE, CD, MD and BACKUP). ▪ Explain precautions to be taken while installing operating system. ▪ Make a list of tasks to be 	0.50	4.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		performed before, during and after installation of MS Window operating system.		
3.	Install Application/Driver Software	<ul style="list-style-type: none"> ▪ Differentiate application software and driver software. ▪ Describe the uses of antivirus program. ▪ Explain the procedure for installing application/driver software ▪ Describe the features of Control Panel 	0.5	2.00
4.	Uninstall Software/Application			1.00
5.	Format External Mass Storage			0.50
	Sub total		1.50	8.5

Module: 2 Preparing Documents using Word Processing Package

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
6.	Perform document typing	<ul style="list-style-type: none"> ▪ Explain the interface of Word Processing including different tools/menu. ▪ Describe how to open, save document and exit. ▪ Explain the procedure to type document in word processing software ▪ Demonstrate systematic way of typing. 	0.50	2.00
7.	Setup Page in Word Processing.	<ul style="list-style-type: none"> ▪ Explain different features and attributes of “Page Setup” Box. ▪ Explain how to setup margins, 	0.25	1.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		<p>orientation, size and columns.</p> <ul style="list-style-type: none"> ▪ Define Breaks, Line numbers and Hyphenation. ▪ Explain the procedure to setup page. 		
8.	Insert Object/Picture/Photo	Explain Procedure of Inserting Object/Picture/Photo		1.00
9.	Insert Header/Footer	<ul style="list-style-type: none"> ▪ Differentiate Header and Footer. ▪ Explain the procedure to insert different header and footer in different pages. 	0.25	1.00
10.	Insert Table	<ul style="list-style-type: none"> ▪ Explain row and column. ▪ State the procedure to insert table ▪ Describe table formatting procedure (Border and Color). 	0.25	1.00
	Sub total		1.25	6.00

Module: 3 Preparing Spreadsheets using Spreadsheet Package

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
11.	Create workbook.	<ul style="list-style-type: none"> ▪ Explain the concept and uses of Spreadsheet. ▪ Interpret Spreadsheet's Interface. ▪ Differentiate among column, row, cell, workbook, worksheet, labels, values, dates and formulas. 	0.50	2.00
12.	Analyze data using basic formula/function	<ul style="list-style-type: none"> ▪ Interpret "Insert Function" Box. ▪ Differentiate Relative and Absolute Cell Reference ▪ Explain the procedure to insert formula/function 	0.50	1.00
13.	Create Chart/Graph	<ul style="list-style-type: none"> ▪ Explain differentiate types of charts/Graph. 	0.25	1.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		<ul style="list-style-type: none"> State the procedure to create chart/graph. 		
14.	Filter Data	<ul style="list-style-type: none"> Differentiate between filtering and sorting. Explain the purpose of filtering. Interpret filtered data. 	0.25	1.00
15.	Sort Data	<ul style="list-style-type: none"> Explain the purpose of sorting. Interpret sorted data. 	0.25	1.00
16.	Setup Page in Spreadsheet	<ul style="list-style-type: none"> Explain different features and attributes of “Page Setup” Box. Explain how to setup margins, orientation, size and columns. Explain the procedure to setup page. 	0.25	1.00
	Sub total		2.00	7.00

Module: 4 Presentation creation using Presentation Package

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
17.	Prepare Master Slide	<ul style="list-style-type: none"> Interpret Presentation package interface including tools/menu. Differentiate among slides, master slide, outline, notes page, handout master, notes master and slide sorter. Explain the purpose of preparing master slide. Enlist the procedure to prepare master slide including formatting and editing. 	1.00	1.00
18.	Prepare Slides	<ul style="list-style-type: none"> Explain the procedures to insert Text, Pictures/Objects/ Sound and Charts/Graphs. 	0.50	2.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
19.	Animate the content of slide.	<ul style="list-style-type: none"> ▪ Define animation. ▪ Explain the procedure to apply animation to the content of slide. ▪ Differentiate between transition and animation. 	0.50	1.00
20.	Perform On-screen Presentation	<ul style="list-style-type: none"> ▪ Explain the procedure to perform on-screen presentation. ▪ State the precautions to be taken while connecting computer with Multimedia Projector for presentation. 	0.50	2.00
	Sub total		2.50	6.00

Module: 5 Maintaining Database Management System using Database Package.

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
21.	Create Database Table	<ul style="list-style-type: none"> ▪ Define Database. ▪ Explain the purpose of Database Management System ▪ Interpret the interface of Database Package including tools/menu. ▪ Differentiate Table, Query, Form and Report. ▪ Enlist the procedure to create database table. 	1.00	2.00
22.	Create Query	<ul style="list-style-type: none"> ▪ Explain the procedure to create query. 	0.25	1.00
23.	Generate report	<ul style="list-style-type: none"> ▪ State the procedure to generate report. ▪ Explain the procedure to print report. 	0.50	1.5

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
	Sub total		1.75	4.5

Module: 6 Managing e-mail/internets.

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
24.	Browse Information through Internet	<ul style="list-style-type: none"> ▪ Differentiate among web server, web browser, web site, domain name system (DNS), WWW, search engine and internet service provider. ▪ State the precaution to be taken while browsing through internet. ▪ List the steps for information browsing through internet. 	0.50	1.00
25.	Compose/Send mail through internet.	<ul style="list-style-type: none"> ▪ Explain the concept of e-mail. ▪ Differentiate Web based e-mail and POP e-mail. ▪ Explain the procedure to send mail through internet. 	0.50	1.00
	Sub total		1.00	2.00

Project works

26.	<p>Following projects are to be prepared and submitted (e-copy) using different packages.</p> <ul style="list-style-type: none"> • Create a Bio-Data in Word Processing giving Educational and Personal Details. • Create a Spreadsheet Worksheet entering marks of five subjects of 20 students. Perform sorting according to their rank and generate a suitable graph for the same data. • Design a presentation with not less than 10 slides on trade specific topic. 		34.00
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	<ul style="list-style-type: none"> • Create a Database in Database package with not less than 20 entries. Query and then generate the report. 		
	Sub total	0	34.00
	Total	10.00	68.00
	Grand total	78	

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 trainee will be introduced to the locally available construction materials according to the concept of low cost in construction especially suitable to our rural requirement.

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 ▪ Blocks ▪ Plastic ▪ Glass ▪ Asbestos sheet ▪ Fiber Glass/Sheet ▪ Bricks ▪ Steel ▪ Aluminum ▪ Timber ▪ Plywood ▪ Artificial wood ▪ Bamboo and cane ▪ Roofing materials (<i>Khar</i>, Straw, Slate, <i>Khapada</i>, Tiles, Corrugated Galvanized Iron CGI sheet) 	2	
2.	Explain Mud as construction material	<ul style="list-style-type: none"> ▪ Selection ▪ Consistency and Shrinkage 	4	

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		test <ul style="list-style-type: none"> ▪ Soil stabilization ▪ Ramming technique ▪ Adobe block 		
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 ▪ Abrasion Test (Conceptionly) ▪ 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/Morton preparation, Molding, Drying, Burning ▪ 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 	10	

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ 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	
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	<ul style="list-style-type: none"> ▪ Definition ▪ Classification: Thermoplastics 	2	

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
	construction material	<ul style="list-style-type: none"> and Thermosets ▪ Uses ▪ Types of joints 		
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 bar as a construction material	<ul style="list-style-type: none"> ▪ Classification ▪ CGI sheets ▪ Gauge of CGI sheets ▪ Reinforcing steel bars ▪ Test of bars (Concept only) 	4	
16.	Explain Bamboo/Cane	<ul style="list-style-type: none"> ▪ Uses and importance ▪ Types ▪ Characteristics ▪ Common types used in constructional purposes 	3	
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 अमृतप्रसाद औद्योगिक शिक्षा, कक्षा ९ र १०, पाठ्यक्रम विकास केन्द्र २०५६ ।
८. शाक्य रत्नमान, वाग्ले माधवप्रसाद र लम्साल जयप्रसाद, *बेत बांस शिल्प शिक्षा कक्षा ९*, पाठ्यक्रम विकास केन्द्र २०५६ ।
९. ब्यनजनकार मोहन मान, गाहो लगाउने प्रविधि २०४८ ।

Construction Technology I

Total: 312 hours

Theory: 78 hours

Practical: 234 hours

Course Description: This course is designed to provide basic knowledge and skill in civil construction works. This course intends to provide skill in choosing appropriate constructional material for various constructional purposes. The student will be acquainted with the masonry, finishing and flooring works. According to the nature and volume of the practical tasks, the student can work in groups.

Module: Masonry work

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
1.	Explain stone masonry works	<ul style="list-style-type: none"> ▪ Definition ▪ Types of stone masonry; Random Rubble, Rubble, Ashlar and Dry ▪ Requirements of good stone masonry works ▪ Terminology used in stone masonry works 	2	0
2.	Enlist the tools for stone masonry	<ul style="list-style-type: none"> ▪ Commonly used tools and equipment for stone masonry ▪ Use and care of tools and equipment ▪ Handling procedure including safety requirements 	2	2
3.	Dress the face/bond stone for Rubble masonry works	<ul style="list-style-type: none"> ▪ Types of dressing; Chisel and hammer dressing ▪ Tools for dressing ▪ Purpose of dressing works ▪ Dressing Procedure 	2	4

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ Requirement of face/bond stone for rubble masonry work ▪ Safety 		
4.	Dress the face/bond stone for Ashlar masonry works	<ul style="list-style-type: none"> ▪ Requirement of good face/bond stone for Ashlar masonry works ▪ Dressing procedure 	2	4
5.	Dress the corner stone for random rubble masonry works	<ul style="list-style-type: none"> ▪ Requirement of good corner stone for random rubble masonry works ▪ Dressing procedure 	1	4
6.	Dress the corner stone for Rubble masonry works	<ul style="list-style-type: none"> ▪ Requirement of good corner stone for Rubble masonry works ▪ Dressing procedure 	2	4
7.	Dress the corner stone for Ashlar masonry works	<ul style="list-style-type: none"> ▪ Requirement of good corner stone for Ashlar masonry works ▪ Dressing procedure 	2	4
8.	Identify different walls	<ul style="list-style-type: none"> ▪ Definition ▪ 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	6
9.	Build random rubble/rubble/Ashlar stone masonry wall in cement sand/mud mortar.	<ul style="list-style-type: none"> ▪ Terminologies ▪ Minimum width of stone masonry ▪ Procedure for building stone masonry wall ▪ Joints and thickness ▪ Filling stones ▪ Strength of mortar 	4	12

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
10.	Build a Rubble/Ashlar stonewall	<ul style="list-style-type: none"> ▪ Typical opening sizes for doors, windows and ventilators 	2	10
11.	Build one, one and half and two brick thick English Bond wall	<ul style="list-style-type: none"> ▪ Terminologies in brick masonry works ▪ Types of brick bonds; English, Flemish, Header and Stretcher bonds ▪ Procedure for making English bond ▪ Joint thickness ▪ Tools and equipment for brick masonry works 	2	10
12.	Build one, one and half and two brick thick Flemish Bond wall	<ul style="list-style-type: none"> ▪ Types of Flemish bond ▪ Procedure for making Flemish bond 	2	7
13.	Build header bond wall	<ul style="list-style-type: none"> ▪ Procedure for building header bond wall 	1	2
14.	Build stretcher bond wall	<ul style="list-style-type: none"> ▪ Procedure for building stretcher bond wall 	1	2
15.	Build one/one and half/ two brick thick return wall in Flemish/English Bond	<ul style="list-style-type: none"> ▪ Procedure for building retaining wall 	2	10
16.	Build one brick thick cross wall in Flemish/English Bond	<ul style="list-style-type: none"> ▪ Procedure for building cross wall 	2	10
17.	Assess dry brick footing	<ul style="list-style-type: none"> ▪ Types of foundations ▪ Procedure for building brick footing ▪ Offset ▪ Foundation excavation ▪ Timbering of trenches 	2	10
18.	Build hollow block wall	<ul style="list-style-type: none"> ▪ Sizes of the block ▪ Procedure for building hollow block wall 	2	6
19.	Apply protective measures in	<ul style="list-style-type: none"> ▪ Definition of dampness 	3	8

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
	building construction against dampness and termite	<ul style="list-style-type: none"> ▪ Causes of dampness ▪ Controlling methods of dampness (water proofing compounds and cavity wall) ▪ Effect of dampness ▪ Efflorescence ▪ Anti-termite treatment 		
20.	Assess brick chimney	<ul style="list-style-type: none"> ▪ Definition ▪ Importance and function ▪ Types and sizes ▪ Construction materials 	2	8
	Sub-total		40	123

Module: Concrete work

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
21.	Lay (Lime/Surkhi/Sand) Plain Cement Concrete (PCC) in foundation	<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	10
22.	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 ▪ Role of concrete and steel in RCC 	2	10

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ 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 		
23.	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	8
24.	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 	2	4
25.	Assess Pre-cast RCC slab	<ul style="list-style-type: none"> ▪ Definition of Pre-cast structures ▪ Uses 	2	4
	Sub-total		10	36

Module: Flooring works

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
26.	Enlist types of floor	<ul style="list-style-type: none"> ▪ Definition ▪ Types ▪ Functions of different layers of a floor 	2	1
27.	Build mud floor	<ul style="list-style-type: none"> ▪ Advantages and disadvantages 	2	2

		<ul style="list-style-type: none"> ▪ Flooring procedure 		
28.	Build timber floor	<ul style="list-style-type: none"> ▪ Advantages and disadvantages ▪ Flooring procedure 	2	6
29.	Build brick floor	<ul style="list-style-type: none"> ▪ Types of brick floor ▪ Advantages and disadvantages ▪ Flooring procedure 	2	6
30.	Build Flagstone floor	<ul style="list-style-type: none"> ▪ Advantages and disadvantages ▪ Flooring procedure 	2	6
31.	Prepare Cement Concrete for flooring	<ul style="list-style-type: none"> ▪ Advantages and disadvantages ▪ Flooring procedure 	2	6
32.	Lay Tile/Terrazzo/Mosaic /Marble floor	<ul style="list-style-type: none"> ▪ Advantages and disadvantages ▪ Flooring procedure 	2	8
	Sub-total		14	35

Module: Finishing works

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
33.	Perform plastering works	<ul style="list-style-type: none"> ▪ Definition ▪ Functions ▪ Material used in plastering ▪ Mix proportion ▪ Procedure for plastering ▪ Required tools 	2	6
34.	Perform pointing works	<ul style="list-style-type: none"> ▪ Definition ▪ Function ▪ Types ▪ Material used in pointing ▪ Mix proportion ▪ Procedure for pointing 	2	6
35.	Perform wall/ceiling coloring works	<ul style="list-style-type: none"> ▪ Purpose ▪ Materials ▪ Procedure for painting ▪ Required tools 	2	6
36.	Perform enamel painting works	<ul style="list-style-type: none"> ▪ Purpose ▪ Materials 	2	6

		<ul style="list-style-type: none"> ▪ Procedure for painting ▪ Required tools 		
37.	Evaluate Plaster-of-Paris works /wall Putty work	<ul style="list-style-type: none"> ▪ Purpose ▪ Materials ▪ Procedure for plaster of Paris ▪ Required tools 	2	6
38.	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 	2	8
39.	Identify common construction problems	<ul style="list-style-type: none"> ▪ Cracks ▪ Construction joints/Expansion joints/cold joint ▪ Floor Sinking ▪ Remedial measures (Grouting, Sealing materials) 	2	2
	Sub-total		14	40
	Total		78	234

Suggested texts and references:

1. Galami T.B., *A Text Book of Construction (Part -I)*, CTEVT.
2. अधिकारी राजेन्द्र प्रसाद र के.सी. अर्जुन भवन निर्माण, प्रा.शि. तथा व्या.ता परिषद् २०५४।
3. Punmia B.C. Dr., *Building Construction* (Latest Edition).
4. Kumar Sushil *Building Construction* (Latest Edition).
5. Sharma S.K. & Kaul B.K., *Building Construction* (Latest Edition).
6. Singh Gurucharan, *Building Planning & Design* (Latest Edition)
7. Department of Urban Development, *Nepal Building Code*
8. Arya A.S., *Masonry and Timber Structure including Earth* (Latest Edition)
9. Jain, *Plain Cement Concrete, Vol I & II* (Latest Edition)
10. Kumar Sushil, *Reinforced Concrete Structure* (Latest Edition)
11. Punmia B.C. Dr., *Reinforced Concrete Structure, Vol. I & II* (Latest Edition)
12. व्यञ्जनकार मोहनमान, गाढो लगाउने प्रविधि
13. चौधरी महेश कुमार, गाढो लगाउने प्रविधि

Engineering Drawing I

Total	234	hours
Theory	60	hours
Practical	174	hours

Course Description: This course is designed to provide basic knowledge and skill in engineering drawing. It intends to provide skill and knowledge in handling tools for preparing drawings and sketches required in constructional activities. They will be able to prepare standard engineering drawings as required for different purposes.

Module: Technical Drawing

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
1	Handle basic drawing tools/equipment.	<ul style="list-style-type: none"> ▪ Concept/Importance and uses of drawings ▪ Introduction of drawing tools instrument & their uses. ▪ Handling techniques of drawing tools and instrument. 	4	4
2	Layout drawing sheet with title block.	<ul style="list-style-type: none"> ▪ Introduction of Drawing sheets and their standard sizes. ▪ Labeling of title blocks. 	1	3
3	Draw free hand sketches.	<ul style="list-style-type: none"> ▪ Introduction of Sketch & sketching techniques of different figures. <ul style="list-style-type: none"> – Straight lines. – Circles – Arcs & curves ▪ Uses of sketches. ▪ Difference between drawing & sketch. 	2	6
4	Familiarize with different scales	<ul style="list-style-type: none"> ▪ Definition ▪ Types of scales; Plain, Reducing and Enlarging scale ▪ Representative Fraction 	2	2
5	Draw different types of lines.	<ul style="list-style-type: none"> ▪ Type of lines 	2	4

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ Properties of lines ▪ Thickness of lines ▪ Uses of line. 		
6	Script English letter/Script of numbers	<ul style="list-style-type: none"> ▪ Introduction ▪ Different lettering; Single-stroke letters and Gothic Letters & their writing rules. ▪ Stroke, case, vertical, inclined ▪ Essential features of lettering. 	2	6
7	Construct regular geometrical figures; rectangle, square, triangles, parallelogram, rhombus, circle etc.	<ul style="list-style-type: none"> ▪ Introduction ▪ Angle & their types. ▪ Triangle & their types. ▪ Quadrilaterals & their types. 	1	9
8	Construct different regular polygons. (Pentagon, Hexagon, Octagon)	<ul style="list-style-type: none"> ▪ Introduction ▪ Regular polygon & their types. ▪ Construction methods.(Inscribed/circumscribed) 	1	9
9	Bisect a straight line.	<ul style="list-style-type: none"> ▪ Construction procedure of bisection. 	1	1
10	Divide a straight line into equal parts.	<ul style="list-style-type: none"> ▪ Procedure of division of straight line into equal parts. 	1	1
11	Bisect / Divide an angle.	<ul style="list-style-type: none"> ▪ Angles & their types. ▪ Procedure of bisection of an angle. 	1	3
12	Bisect circular arc.	<ul style="list-style-type: none"> ▪ Different engineering curves. ▪ Procedure of bisection of circular arc. 	2	2
13	Find the center point of a circular arc.	<ul style="list-style-type: none"> ▪ Procedure of finding center point of an circular arc 	2	2
14	Draw a parabola.	<ul style="list-style-type: none"> ▪ Introduction ▪ Terminology used in parabola ▪ Construction procedure of parabola. 	2	4

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ Tangent, rectangle, offset method, focus and directrix 		
15	Draw an ellipse.	<ul style="list-style-type: none"> ▪ Definition ▪ Concept of conic sections. ▪ Concentric circle & Arc of circle methods 	2	4
16	Dimension the drawing	<ul style="list-style-type: none"> ▪ Introduction ▪ Terminology of dimensioning ▪ Dimension types/system ▪ Principles of dimensioning ▪ Dimensioning in pictorial and orthographic 	2	6
17	Draw orthographic projection of simple object. (I & III angle projection)	<ul style="list-style-type: none"> ▪ Introduction of drawing ▪ Pictorial and orthographic drawing ▪ Projection & their types. ▪ Methods of orthographic projection (I & III angle projection) ▪ Glass box (Projection box) 	4	16
20	Draw isometric views.	<ul style="list-style-type: none"> ▪ Introduction ▪ Isometric projection ▪ Isometric scale. ▪ Process of preparation of isometric drawing. ▪ Free hand sketch of isometric view 	1	6
21	Draw oblique views.	<ul style="list-style-type: none"> ▪ Introduction ▪ Rules of preparation of oblique views. 	1	6
22	Draw different side views.	<ul style="list-style-type: none"> ▪ Name & type of side. ▪ Side views, in views I & III angle projection. 	2	6
23	Draw sectional views.	<ul style="list-style-type: none"> ▪ Introduction of sectioning. ▪ Types of section 	2	8

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ Cutting plane or section plane. ▪ True shape of a section. ▪ Section lines. 		
24	Draw development.	<ul style="list-style-type: none"> ▪ Introduction of development ▪ Method of surface development (parallel and radial line method). ▪ Surface development of prism, cylinder, pyramid and cone ▪ Surface development of truncated prism cylinder, pyramid and cone. 	2	6
	Sub-total		40	114

Duty 2: Building Drawings

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
25	Draw plan of simple building.	<ul style="list-style-type: none"> ▪ Introduction ▪ Types of buildings. ▪ Building plans. ▪ Standard sizes of rooms. ▪ Location of rooms. ▪ Plinth area of building. ▪ Openings in building. ▪ Dimensioning & their rules. 	2	4
26	Draw elevations of simple building.	<ul style="list-style-type: none"> ▪ Introduction ▪ Different elevations. ▪ Flat & sloped roof elevations. ▪ Position of elevations in drawing sheet. 	1	5
27	Prepare site plan.	<ul style="list-style-type: none"> ▪ Introduction ▪ Site plan & its necessity. ▪ Elements to be shown in the 	1	3

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		site plan. <ul style="list-style-type: none"> ▪ Scale & orientation of site plan. ▪ Composition of drawing. 		
28	Prepare location plan.	<ul style="list-style-type: none"> ▪ Introduction ▪ Location plan and its use. ▪ Technique of showing north direction. ▪ Showing road & other important features. ▪ Use of symbols. 	1	3
29	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. 	2	4
30	Draw elevation of 4 roomed residential building.	<ul style="list-style-type: none"> ▪ Positions of doors, windows. 	1	3
31	Draw trench / foundation plan.	<ul style="list-style-type: none"> ▪ General types of foundation. ▪ Procedures to draw trench / foundation plan. 	1	3
32	Draw roof plan.	<ul style="list-style-type: none"> ▪ Definition ▪ Types. ▪ Slope on roof. ▪ Symbols used in sloped roofs & terraces. 	1	5
33	Draw sections of building.	<ul style="list-style-type: none"> ▪ Concept of building section ▪ Section plane in building plan. ▪ Foundation type & its detail. ▪ Ground Level, Plinth Level., D.P.C. Sill level, lintel level, 	2	6

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		sun shade/ chhajjah, walls, roof, & its type roof covering.		
34	Draw building details.	<ul style="list-style-type: none"> ▪ Necessity of detail drawing. ▪ Scale used in detailed printing. ▪ Showing different parts in drawing. 	2	6
35	Draw plan/ elevation/section of staircase.	<ul style="list-style-type: none"> ▪ Introduction ▪ Parts of staircase ▪ Essential features of staircase. ▪ Types of staircase. ▪ Merits & demerits of different types of staircases. 	1	5
36	Draw doors/windows plan elevation/section(including various shutters)	<ul style="list-style-type: none"> ▪ Introduction ▪ Types of doors & windows. ▪ Selection of doors & windows. ▪ Sizes of doors & windows. ▪ Symbol of door & windows. 	1	3
37	Draw steel-bar diagram /schedule.	<ul style="list-style-type: none"> ▪ Thumb rule for calculation of steel bars. ▪ Spacing & diameter of steel bars. ▪ Process of preparation of bar bending diagram. 	2	4
38	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. 	2	4
39	Manage/Store drawing management of drawing/Storage of drawing	<ul style="list-style-type: none"> ▪ Compile drawing ▪ Filing procedure 		
	Sub-total		20	60
	Total		60	174

Suggested texts and references:

1. Newa Dilli Raj *Technical Drawing* CTEVT 2050.
2. Luzzadar W. I *Fundamental of engineering drawing*. Prentice-Hall of India
3. Gill. P. S., *Engineering Drawing*, S. K. Kataria and sons India.
4. Bhatt N.D., *Elementary Engineering Drawing*, Chartor Publishing House India.
5. Lakshminarayan V., *A Text Book on Practical Geometry* (Latest Edition).
6. Singh Gurucharan, *Civil Engineering Drawing*, Jain Book Publication, India
7. Singh Gurucharan *Text book of Engineering Drawing*, Jain Book Publication, India
8. Sushil Kumar, *Building construction*, Standard publishers, India, 2010
9. J jha and VK Jain, *Building Construction*, Khanna Publisher, India

Engineering Surveying I

Total: 234 hrs

Theory: 33 hrs

Practical: 201 hrs

Course Description: This course is designed to provide basic knowledge and skill in engineering surveying. It intends to provide skill and knowledge in handling tools and equipment for conducting various types of survey and preparing necessary drawings/maps. They will be able to conduct survey using simple survey tools and equipment and they will be acquainted with the sophisticated survey tools and techniques as per the latest technological innovations. According to the nature and volume of the practical tasks, the trainees can work in group.

Module: Fundamentals of Surveying

S.No.	Task	Knowledge	Time	
			T	P
1	Develop the concept of surveying.	<ul style="list-style-type: none"> ▪ Definition. ▪ Classification based on nature of the field , object of survey and use of instrument ▪ Objective of surveying. ▪ Concept of precision, accuracy, errors and tolerance. 	3	
2	Explain the basic principles of surveying.	<ul style="list-style-type: none"> ▪ Principles of surveying 	1	
3	Describe units of measurement.	<ul style="list-style-type: none"> ▪ Basic units of length, Basic units of area and basic units of volume. ▪ Basic units of angular measure ▪ Unit conversions. 	2	
4	Perform scale conversion	<ul style="list-style-type: none"> ▪ Introduction of scale ▪ Types of scale ▪ Scale conversion, Vernier and digital enlarged and reduced scale ▪ Size of scale for map and plan. 	3	5

S.No.	Task	Knowledge	Time	
			T	P
5	Handle survey tools/equipment. (i.e., tape, chain, ranging poles, arrows, optical square, builders level, plumb-bob, speedometer, pedometer etc.)	<ul style="list-style-type: none"> ▪ Basic survey tools and equipment. ▪ Handling purpose and procedure. ▪ Safety precautions 	1	12
6	Measure distance [Using chain, tape and ranging poles]	<ul style="list-style-type: none"> ▪ Tools and equipment used for measurement ▪ Linear measurement procedure in plain and sloped surface ▪ Various corrections (pulling, sagging, temperature and tape standardization) ▪ Error adjustment ▪ Direct and indirect ranging ▪ Signaling procedure 	3	18
7	Set out perpendicular lines.	<ul style="list-style-type: none"> ▪ Objective swing method, 3-4-5 method. 	1	12
8	Establish altitude points/ Bench marks using different tools.	<ul style="list-style-type: none"> ▪ Definition of bench mark and types ▪ Selection of reference points/Bench mark ▪ Different type of tools (Altimeter, Barometer and Clinometers) and their handling procedure 	2	15
9	Layout simple building foundation.	<ul style="list-style-type: none"> ▪ Basic Concept, Methods of layout ▪ Error adjustment ▪ Type of building ▪ Tools for layout; [tape, mason thread, hammer, pegs and lime] 	1	15
10	Perform chain survey.	<ul style="list-style-type: none"> ▪ Definition ▪ Principle 	3	30

S.No.	Task	Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ Establishment of main lines and base line ▪ Check line ▪ Tie line ▪ Types of offset and offset taking procedure ▪ Field book & its types 		
11	Plot chain survey data.	<ul style="list-style-type: none"> ▪ Calculation of data & error adjustment ▪ Scale ▪ Selection of paper its layout ▪ Map legend 	1	18
12	Calculate area/volume.	<ul style="list-style-type: none"> ▪ Purpose ▪ Types of common geometry of figures or objects. ▪ Area and Volume of different regular and irregular figures. ▪ Measurement of area and volume (Graphical methods) 	2	10
13	Perform compass survey.	<ul style="list-style-type: none"> ▪ Introduction ▪ Principle ▪ Selection of area and stations ▪ Setting and reading of instrument ▪ Bearing and length of first main line. ▪ Measurement of lengths and bearings of various locations from first station. ▪ Take details similarly from other different stations. 	3	30
14	Calculate bearings/angles	<ul style="list-style-type: none"> ▪ Introduction ▪ Types of bearing: [WCB and QB] and their calculations. ▪ Calculation of fore and back bearing 	3	5

S.No.	Task	Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ Meridians, difference between angle and bearing. ▪ Angle of dip and declination ▪ Local attractions ▪ Calculation of closing error 		
15	Plot compass survey data.	<ul style="list-style-type: none"> ▪ Calculation of data and error adjustment ▪ Selection of scale ▪ Selection of paper its layout ▪ Map legend ▪ Bearing corrections 	1	8
16	Perform Abney Level survey.	<ul style="list-style-type: none"> ▪ Introduction ▪ Principle ▪ Types ▪ Different parts of Abney level and their function ▪ Handling procedure ▪ Concept of Abney level survey ▪ Purposes of Abney level survey ▪ Conducting abney level survey [water supply line, Road, Irrigation etc.) 	2	15
17	Calculate/Plot Abney level survey data	<ul style="list-style-type: none"> ▪ Introduction ▪ Calculation procedure ▪ Reduced levels slope distances. ▪ Plotting for layout 	1	8
	Total		33	201

Suggested texts and references:

1. श्रेष्ठ माधव नारायण (अनु.) सर्वेक्षण भवन, सडक र पुल तथा खानेपानी र सिंचाई, CTEVT and UMN २०५२ ।
2. Punamia B.C., *Surveying and Levelling Vol I & II* (Latest Edition).
3. Kanitekar T.P., *Surveying* (Latest Edition).
4. Basak N.N., *Surveying and Levelling* (Latest Edition).
5. प्रधानांग तीर्थ बहादुर, *जमीन सर्वेक्षण* साभ्ना प्रकाशन ।
6. Hussain and Nagraj, *Surveying and Levelling* (Latest Edition)
7. Ayor R, *Surveying and Levelling*

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 ▪ Lay out tools, cutting tools, curve line cutting/shaving tools, drilling/boring, striking, driving & holding/clamping tools. 	2.00	

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		<ul style="list-style-type: none"> Explain the function of different 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 	0.5	2.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		<ul style="list-style-type: none"> ▪ Shape and size of teeth ▪ 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 (planing 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

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
17.	Make rebated joint.	<ul style="list-style-type: none"> Joint making procedure 		2.00
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

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
	Sub total			15.00

Project works

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. 	1.00	2.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		<ul style="list-style-type: none"> ▪ 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 cloth and Putting. ▪ 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. 	0.50	1.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		<ul style="list-style-type: none"> Explain the necessity of filing on different pipes. 		
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 lubricant during thread cutting. Explain the types of thread(inner and outside) 	1.00	4.00
36.	Connect pipes with GI fittings	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Cutting procedure 		0.50
40.	Install CPVC pipe lines with fittings	<ul style="list-style-type: none"> Installing procedure 		2.00
41.	Perform drilling using drill machine.	<ul style="list-style-type: none"> State different types of drill machine. 	0.50	2.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		<ul style="list-style-type: none"> ▪ 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 while drilling using drill machine. 		
	Sub total		6.5	33.50

Project works

S.N.	Project works	Time (hrs)	
		T	P
42.	<p>Students have to accomplish the following project work/s either individually or in a group.</p> <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 ▪ Define Voltmeter, Ammeter and Multi-meter. ▪ Explain different electrical symbols ▪ Describe the types of electrical circuit (closed and open circuit) 	1.00	1.00
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 	1.00	3.50

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		schematic diagram.		
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 switch 	0.5	1.00
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 		1.00

S.N.	Task Statements	Related Technical Knowledge	Time (hrs)	
			T	P
		kit-kat fuse		
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. ▪ State the procedure for earthing. 	0.50	1.00
	Sub total		6.50	28.50

Project works

S.N.	Project works	Time (hrs)	
		T	P
59.	<p>Student has to accomplish the following project work/s either individually or in a group.</p> <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, दोबबरलाल, *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 Mc Graw-Hill Publishing Company Limited, 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*

Second Year

1. Construction Technology II
2. Computer Aided Drafting
3. Engineering Drawing II
4. Engineering Surveying II
5. Entrepreneurship Development
6. Estimating, Costing & Supervision
7. Highway & Trail Bridge
8. Project Work
9. Water Supply, Sanitary and Irrigation Engineering

Construction Technology II

Total 234 hrs

Theory 66 hrs

Practical 168 hrs

Course Description: This course is designed to provide knowledge and skill in Building Construction including household water supply, sanitary and building electrification. It intends to provide skill and knowledge in handling tools for preparing drawings and sketches required in constructional activities of a building. It also deals with concept of earthquake resistant building construction technique.

Module: 1 Building construction

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
1	Be familiar with building	<ul style="list-style-type: none"> • Introduction • Types of buildings • Loads on building (general idea on dead, live and wind load.) • Components/parts of the building • Considerations in building design 	2	
2	Erect spread/combined footings	<ul style="list-style-type: none"> • Definition of foundation • Function of foundation • Essential requirement of good foundation • Types of foundation (General idea on shallow foundation) • Footing at different level 	2	4
3	Design dog-legged stair	<ul style="list-style-type: none"> • Definition of stair • Technical terminology • Requirement of good stair • Classification of stairs • Design criteria (except structural design) 	2	4
4	Make stone/ brick piers/arches	<ul style="list-style-type: none"> • Types of arch (Semicircular arch Segmental arch) • Types of piers (Simple and attached 	1	4

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		piers).		
5	Fix door/window	<ul style="list-style-type: none"> • Introduction • Parts of door/window • Location of door/window • Terminology • Sizes and types of door/window • Ventilator and sky lights 	2	4
6	Perform roof/roof covering works and ceiling works	<ul style="list-style-type: none"> • Definition • Requirement of roof • Types of roof (Pitched or sloping roof only) 	1	4
	Sub-total		10	20

Module: 2 Earthquake Resistant Building Constructions

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
7	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
8	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 safety • Construction of stone masonry house 	2	4
9	Be familiar with earthquake resistant design of reinforced concrete frame	<ul style="list-style-type: none"> • Concept of reinforced concrete frame building • Requirements of reinforcement for 	2	4

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
	building	foundation <ul style="list-style-type: none"> • 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 		
10	Be familiar with retrofitting techniques of existing building	<ul style="list-style-type: none"> • Concept of retrofitting in existing building • Assessment of building damage • Repair and strengthening of different components of building 	2	6
	Sub-total		8	15

Module: 3 Temporary constructions

Task No.	Task Statements	Related Technical Knowledge	Time	
			Th.	Prac.
11	Erect shoring	<ul style="list-style-type: none"> • Definition • Types 	1	6
12	Be familiar with underpinning	<ul style="list-style-type: none"> • Definition • Methods 	1	6
13.	Erect scaffolding	<ul style="list-style-type: none"> • Definition • Types and its uses • Component parts 	1	6
14.	Erect formwork for slab/beam/column	<ul style="list-style-type: none"> • Introduction • Requirement of good formwork • Formwork for slab / beam/column 	1	12
	Sub-total		4	30

Module: 3 Sanitary works

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
15.	Install sink/wash basin/cistern	<ul style="list-style-type: none"> • Types of sink/wash basin/cistern • Purpose of sink/wash basin/cistern 	1	6
16.	Install cold/hot water supply pipe line	<ul style="list-style-type: none"> • Water pressure & pressure head. • Position of out let/ inlet & overflow pipes in water tanks • Connection to tank • Connection to sanitary and kitchen fixtures • Hot and cold water connection accessories • General fitting procedure 	3	9
17.	Install urinals / water closet.	<ul style="list-style-type: none"> • Function of urinals/water closet. • Alignment procedures. • General fitting procedure 	1	6
18.	Construct pit latrine/ bore hole latrine	<ul style="list-style-type: none"> • Types of latrine. • Characteristics of pit latrine. • Design criteria. • Selection of site. • Construction material. • Soil type. • Method of casting squatting pan. 	2	9
19.	Construct ventilated improved pit latrine (VIP)	<ul style="list-style-type: none"> • Design guidelines for VIP latrine. • Pipe size & type. • Quantity of waste. • Material for superstructure. • Brick/stone/mud. • Lining of trenches. 	2	4
20	Design a house-hold septic-tank with soak pit	<ul style="list-style-type: none"> • Working principle of septic tank & soak pit. • Capacity calculation/determination of septic tank & soak pit. • Operation & maintenance • Construction procedure • Detention time 	2	10

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> • Effluent disposal 		
21.	Dispose dry solid waste.	<ul style="list-style-type: none"> • Types of solids wastes • Method of identifying types of wastes. • Organic & inorganic wastes. • Composting method. • Incineration & volume reduction. • Sanitary land filling. 	2	4
	Sub-total		19	48

Module: 4 Building Electrification

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
22.	Be familiar with electrical concept/terminology.	<ul style="list-style-type: none"> • Current, Voltage, Resistance • Potential difference • Ohm's law • Calculation of current, voltage, resistance • Electrical symbol • Electrical circuit (closed and open circuit) 	3	1
23.	Follow occupational safety precautions.	<ul style="list-style-type: none"> • Accident • Safety Program • Personal protective equipment • Electrical shocks • First aid procedure on dealing with accident 	2	4
24	Prepare layout drawing for domestic electrical installation	<ul style="list-style-type: none"> • Concept of layout diagram, wiring diagram and schematic diagram • Electrical drawing • Layout and circuit diagram, symbol • Handling of drawing instrument 	2	3
25	Layout on the ceiling / wall/ floor	<ul style="list-style-type: none"> • Exposed and concealed wiring 	1	3
26.	Fix battens/pipes for	<ul style="list-style-type: none"> • Drawing plan 	1	6

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
	wiring	<ul style="list-style-type: none"> Preparing battens for wiring Tool handling (Drill machine, Saw, Chisel, Hammer, clips, claps) 		
27.	Fix distribution board	<ul style="list-style-type: none"> Distribution board MCB Ampere rating of MCB 	1	3
28.	Install lamp-single pole switch	<ul style="list-style-type: none"> Wire cutting and joining Techniques for fixing holder and switch 	1	5
29.	Install lamp through junction box with single pole switch	<ul style="list-style-type: none"> Splicing, Wire joints and insulation Procedure for wire connection to junction box and switch. 	1	6
30.	Install 5/15A switch socket	<ul style="list-style-type: none"> Procedure for wire connection to junction box and switch socket. 	1	3
31.	Install energy meter	<ul style="list-style-type: none"> Procedure for wire connection energy meter. 	1	2
	Sub-total		14	36

Module:5 Rural technology/ alternate energy

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
32.	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 	2	1
33.	Be familiar with indigenous technologies.	<ul style="list-style-type: none"> Working principle of जाँतो, ढिक्र, कोल, पानी घट्ट इत्यादी 	1	2
34.	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 	2	4

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		room • Advantages and disadvantages of smokeless stoves		
35.	Be familiar with biogas technology.	• Introduction • Sources of bio-gas • Types of plants (Chinese and Indian) • Parts of biogas plant • Working principle • Advantages and disadvantages	2	4
36.	Be familiar with solar energy technology.	• Introduction • Working principle (thermal and electrical) • Parts of solar energy set-up • Appropriate area • Advantages and disadvantages	2	4
37.	Be familiar with micro hydro technology.	• Concept of micro hydro • Functional division of micro hydro <ul style="list-style-type: none"> ▪ Generation division ▪ Transmission and Distribution division ▪ Consumption division • Components of generation • Components of distribution • Components of consumption	2	4
	Sub-total		11	19
	Total		66	168

Suggested texts and references:

1. अधिकारी राजेन्द्र प्रसाद र के.सी. अर्जुन भवन निर्माण, प्रा.शि.तथा व्या.ता परिषद् २०५४
2. Punmia B.C. Dr., *Building Construction*(Latest Edition).
3. Kumar Sushil *Building Construction* (Latest Edition).
4. Sharma S.K. & Kaul B.K., *Building Construction* (Latest Edition).
5. Singh Gurucharan, *Building Planning & Design* (Latest Edition)
6. Department of Urban Development, *Nepal Building Code*
7. C.R.Dargan, *Electrical Drawing and Estimating*
8. Heinz Graff, *Electrical Installation*
9. Code of Practice for Electrical Wiring Installation, CTEVT
10. S.K.Malice, *Electric Trade Theory and Practical*
11. *Electric Trade Technology*, CTEVT
12. *Skill Standard Level 2 & 3*, CTEVT
13. B.L. Thereja, *Text Book of Electrical Technology*

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 through 		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	43.0
	Total	8	70
	Grand total	78	

Suggested texts and references:

- Recent CAD packages available in the market

Engineering Drawing II

Total	234 hours
Theory	40 hours
Practical	194 hours

Course Description: This course is designed to provide basic knowledge and skill in engineering drawing. It intends to provide skill and knowledge in handling tools for preparing drawings and sketches required in constructional activities. They will be able to prepare standard engineering drawings as required for different purposes.

Module:1Water supply and Sanitary Drawing

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
1.	Sketch schematic plan of Water Supply system.	<ul style="list-style-type: none"> ▪ Concept of water supply system ▪ Main components of water supply system. 	1	3
2.	Draw L-section of a pipe - line.	<ul style="list-style-type: none"> ▪ Concept on section ▪ L-section & its necessity. ▪ Process of drawing L-section of pipeline. ▪ Horizontal & vertical scales. 	1	5
3.	Draw intake structures of water supply.	<ul style="list-style-type: none"> ▪ Introduction ▪ Sources of water. ▪ Types of intake structures. ▪ Function of intake structure. ▪ Major parts of intake structure. ▪ Safety & security of intake structure. ▪ Design guidelines 	1	6
4.	Draw reservoir tanks	<ul style="list-style-type: none"> ▪ Introduction ▪ Reservoir tanks its necessity. ▪ Types of reservoir tanks. ▪ Components of reservoir 	2	8

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
		tanks. <ul style="list-style-type: none"> ▪ Capacity of reservoir tank. ▪ Design guidelines 		
5.	Draw tap-stands.	<ul style="list-style-type: none"> ▪ Introduction ▪ Function of tap stands. ▪ Types of tap stands. ▪ Typical design of tap stands in rural areas. 	1	4
6.	Draw main water supply pipeline layout for residential building.	<ul style="list-style-type: none"> ▪ Concept on water supply system ▪ Process of preparing lay out sketch. ▪ Points to be considered before preparing lay out sketch. ▪ Symbol used for showing different fixtures. 	2	6
7.	Draw typical valve chamber.	<ul style="list-style-type: none"> ▪ Introduction ▪ Elements of valve chamber. ▪ Size of valve chamber. ▪ Material used in valve chamber. ▪ Design guidelines 	1	4
8.	Draw typical hand tube well.	<ul style="list-style-type: none"> ▪ Introduction ▪ Different parts of hand tube well. ▪ Use of hand tube well for drinking water & irrigation purpose. ▪ Depth of tube well. 	1	6
9.	Draw pipe sewer line.	<ul style="list-style-type: none"> ▪ Types of sewer pipes. ▪ Pipe joints & its construction method. 	1	4
10.	Draw manhole.	<ul style="list-style-type: none"> ▪ Introduction ▪ Manhole and its function. 	1	6

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ Depth of manhole. ▪ Internal sizes of manholes. ▪ Design guidelines 		
11.	Draw break pressure tank(BPT)	<ul style="list-style-type: none"> ▪ Introduction ▪ Function of BPT 		2
12.	Draw building plan with water supply/ sanitary connections.	<ul style="list-style-type: none"> ▪ Introduction ▪ Points to be considered while preparing plan with w/s and sanitary connection. ▪ Symbols used in drawing w/s and sanitary connections. 	1	6
13.	Draw combined bath and water closet.	<ul style="list-style-type: none"> ▪ Introduction ▪ Water supply and sanitary fittings. ▪ Sanitary fixtures. ▪ Available sizes and selection of fixtures. 	1	6
14.	Draw septic tank.	<ul style="list-style-type: none"> ▪ Introduction ▪ Calculation of capacity of septic tank. ▪ Parts and function of septic tank. ▪ Design guidelines 	1	6
15.	Draw of soak-pit/seepage pit.	<ul style="list-style-type: none"> ▪ Introduction ▪ Necessity of seepage pit. ▪ Types of seepage pit and their selection. ▪ Parts and size of seepage/soak pit. ▪ Design guidelines 	1	6
	Sub-total		16	78

Module: 2 Irrigation Drawing

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
16.	Draw L-section/ X-section of canal.	<ul style="list-style-type: none"> ▪ Concept on Section ▪ Process of preparing L-section and X-section. ▪ Different types of canal cross section. ▪ Gradients of slopes. ▪ Horizontal & vertical scale. 	2	8
17.	Draw schematic plan of canal Head Works.	<ul style="list-style-type: none"> ▪ Introduction ▪ Canal head works and its components. ▪ Function different parts. ▪ Weirs, barrage dam. ▪ Head regulator. ▪ Design guidelines 	2	5
18.	Draw structure of Falls	<ul style="list-style-type: none"> ▪ Introduction ▪ Canal falls and its parts. ▪ Function of falls. 	2	5
19.	Draw structure of Siphon	<ul style="list-style-type: none"> ▪ Introduction of Siphons and its function. ▪ Parts of Siphons. 	1	4
20.	Draw structure of Aqueduct / Siphon Aqueduct	<ul style="list-style-type: none"> ▪ Introduction of Aqueduct and its function. ▪ Siphon aqueduct. ▪ Parts of aqueduct Siphon aqueduct. 	1	6
21.	Draw structure of Super Passage.	<ul style="list-style-type: none"> ▪ Introduction of Super Passage and its function. ▪ Different parts of super passage. 	1	6
	Sub-total		9	34

Module: 3 Road, Trail Bridge and Culvert Drawing

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
22.	Draw road alignments/L-section.	<ul style="list-style-type: none"> ▪ Definition of Road alignments. ▪ Obligation points. ▪ Deviation angles. ▪ Fore Bearing and Back Bearing. ▪ L-section and drawing procedure. 	1	6
23.	Draw different road cross section	<ul style="list-style-type: none"> ▪ Definition ▪ Typical cross-sections of roads. ▪ In cutting, in handing, cutting partly in handing. ▪ Sizes of different types of roads. ▪ Right of way. ▪ Side slopes in cutting and filling. ▪ Camber, Super Elevation. 	2	6
24.	Draw slab culverts.	<ul style="list-style-type: none"> ▪ Introduction ▪ Culverts and its types. ▪ Different parts of slab culverts. ▪ Span, breadth, H.F.L, formation level, slab thickness, steel bars in slabs. 	1	6
25.	Draw pipe culverts.	<ul style="list-style-type: none"> ▪ Introduction ▪ Suitability of pipe culverts. ▪ Types of pipe culverts. ▪ Comparison of slab culvert and pipe culvert. 	2	6

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ Sizes and quality of pipes used in pipe culvert. ▪ Joints of pipes. ▪ Different parts of pipe culvert. 		
26.	Draw Gabion works	<ul style="list-style-type: none"> ▪ Introduction of gabion ▪ Gabion works and their use. ▪ Standard sizes of Gabion boxes. ▪ Process of preparation of Gabion walls. ▪ Steel wires used for Gabion boxes. 	2	6
27.	Draw retaining walls.	<ul style="list-style-type: none"> ▪ Introduction of Retaining walls. ▪ Types and functions. ▪ Selection of retaining wall ▪ Dimensions of walls. ▪ Weep - holes. ▪ Side slopes. 	2	6
28.	Draw simple wooden bridge	<ul style="list-style-type: none"> ▪ Bridges and their types. ▪ Selection of type of bridge. ▪ Wooden bridge and its use. ▪ Main parts of wooden bridge. 	1	6
29.	Draw plan/elevations of simple suspension/Suspended bridge.	<ul style="list-style-type: none"> ▪ Types. ▪ Main parts 	1	6
	Sub-total		12	48

Module 4: Copying of Drawing

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
30.	Carry out tracing.	<ul style="list-style-type: none"> • Concept of tracing • Tracing paper and their type. • Technique of tracing work. • Points to be considered while 	1	4

S.No.	Tasks Statements	Related Technical Knowledge	Time	
			T	P
		performing tracing work. <ul style="list-style-type: none"> ▪ Use of lamp and glass for tracing work 		
31.	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	3
32.	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. 	1	2
33.	Project Work <i>Prepare complete drawing for one of the following works.</i> <ul style="list-style-type: none"> – <i>Building (residential or public)</i> – <i>Water supply or sanitary works.</i> – <i>Irrigation works.</i> – <i>Road, culvert and bridge</i> 			25
	Sub-Total		3	34
	Total		40	194

Suggested texts and references:

1. Singh Gurucharan *Text book of Engineering Drawing*, Jain Book Publications Delhi, India, 2002
2. Gurcharan Singh, *Civil Engineering Drawing*, Jain Book Publications, Delhi, India, 2002
3. G.S. Birdie and J.S. Birdie, "*Water Supply and Sanitary Engineering*", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2002.
4. C E G Justo, S K Khanna, *Highway Engineering*, Khanna Publications, New Delhi, India.
5. M. Chakraborti "*Estimating, costing, specification and valuation in civil engineering*" Author Publication, 2012
6. S K Garg, *Irrigation Engineering and Hydraulic Structures*, Khanna publishers, , Delhi 1983
7. A training manual on trail bridges, RTU, Department of Civil Engineering, and Institute of Engineering.
8. Short-span Trail Bridge Standard, Technical Handbook, Trail Bridge Section, GoN.

Engineering Surveying II

Total **234 hrs**

Theory **37 hrs**

Practical **197 hrs**

Course Description: This course is designed to provide basic knowledge and skill in engineering surveying. It intends to provide skill and knowledge in handling tools and equipment for conducting various types of survey and preparing necessary drawings/maps. They will be able to conduct survey using simple survey tools and equipment and they will be acquainted with the sophisticated survey tools and techniques as per the latest technological innovations. According to the nature and volume of the practical tasks, the trainee can work in group.

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
1.	Conduct plain table surveying (Radiation, intersection and traversing methods)	<ul style="list-style-type: none"> ▪ Definition ▪ Objectives ▪ Accessories ▪ Temporary adjustment and orientation ▪ Methods of plain table surveying ▪ Closing errors and corrections 	3	24
2.	Conduct level survey.	<ul style="list-style-type: none"> ▪ Definition and objectives ▪ Types of leveling: simple leveling, differential leveling, fly leveling, reciprocal leveling, profile leveling and cross sectioning ▪ Technical terms used in leveling ▪ Temporary adjustment of level ▪ Datum level line. ▪ Line of collimation ▪ Parallax ▪ Back sight, intermediate 	6	30

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		sight, foresight. <ul style="list-style-type: none"> ▪ Reduced Level (R.L.) ▪ Calculation of R.L. using HI as well as rise-fall method ▪ Data checking method 		
3.	Plot longitudinal profile.	<ul style="list-style-type: none"> ▪ Definition & type of profile ▪ Concept on longitudinal profile ▪ Select suitable graph paper ▪ Plotting guide lines: horizontal and vertical scale and datum line selection 	2	8
4	Plot cross section profile.	<ul style="list-style-type: none"> ▪ Concept. ▪ Practical scales in plotting: horizontal as well as vertical 	2	8
5.	Set out a Theodolite over a given point and calculate mean horizontal angles for traverse.	<ul style="list-style-type: none"> ▪ Introduction of Theodolite functions of its parts. ▪ Types ▪ Centering ▪ Leveling ▪ Orientation :setting for 0deg-0min-0 sec ▪ Data observation ▪ Tabulation for traverse by face left and face right readings ▪ Calculation of data ▪ Mean of face left and face right readings. 	4	28
6.	Set out simple curves	<ul style="list-style-type: none"> ▪ Definition and purposes ▪ Coordinates ▪ Chord arcs ▪ Deflection angle ▪ Tangent points ▪ Simple calculations 	4	16

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> ▪ Procedures to set out the curves:(a)linear method –by ordinates from long chord, offset from tangents(b)deflection angle method –by Rankines method, two Theodolite method. 		
7.	Carry out road/canal/water supply/trail bridge alignments	<ul style="list-style-type: none"> ▪ Definition of alignment ▪ Reconnaissance survey, Pegging, Detail Survey, Booking, Gradient and Plotting 	2	20
8.	Conduct tachometric survey	<ul style="list-style-type: none"> ▪ Introduction ▪ Objectives ▪ Orientation, cross hair, stadia readings and stadia intercept ▪ Tabulate tacheometric data ▪ Calculation of horizontal angles of different points after orientation ▪ Tabulation of vertical angles ▪ Calculation of horizontal and vertical distances. ▪ Simple trigonometric relationship ▪ Safety measures 	6	30
9.	Prepare contour map	<ul style="list-style-type: none"> ▪ Introduction ▪ Importance ▪ Contour interval, horizontal equivalent, general contours and index contour ▪ Characteristics of contour ▪ Use of contour map ▪ Plotting procedures: Direct method: Selecting points with 	6	25

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		same staff readings from a instrument station; Grid method : Prepare square grids with elevations of cross points and interpolate contours; Random method : Taking elevations of random points and interpolate.		
10.	Conduct hydrographic survey	<ul style="list-style-type: none"> ▪ Purpose ▪ Importance ▪ Types of measurement ▪ Depth of flow: average depth ▪ Velocity of flow: Use of a float to travel a defined distance ; recording of time ▪ Cross sectional area of streams and lakes ▪ Discharge calculation procedure. 	2	8
	Total		37	197

Suggested texts and references:

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

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	Assessment of entrepreneur's characteristics: <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	Entrepreneur and other occupations: <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	Entrepreneur and employee: <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"	"Self" assessment: <ul style="list-style-type: none"> • Understanding "self" 	0.6	0.4	1.0

		<ul style="list-style-type: none"> Self disclosure and feedback taking 			
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 Personal risk taking attitude Do and don't do while taking risk 	1.5	1.0	2.5
14	Make decision	<u>Decision making:</u> <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	Identify/ select potential business idea <ul style="list-style-type: none"> Analyze strength, Weakness, Opportunity and Threat (SWOT) of business idea 	<u>Identification and selection of potential business:</u> <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	<u>Market and marketing:</u> <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	Business exercise: Explore small business management concept	<u>Business exercise:</u> <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	<u>Business plan/Market plan</u> <ul style="list-style-type: none"> Concept of business plan Concept of market plan 	2.0	2.0	4.0

		<ul style="list-style-type: none"> Steps of market plan 			
19	Prepare production plan	<p><u>Business plan/Production plan:</u></p> <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	<p><u>Business plan/Business operation plan:</u></p> <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	<p><u>Business pan/Financial plan:</u></p> <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	<p><u>Information collection and preparing business plan:</u></p> <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	<p><u>Business plan appraisal:</u></p> <ul style="list-style-type: none"> Return on investment Breakeven analysis Cash flow 	0.5	5.5	6.0

		<ul style="list-style-type: none"> • Risk factors 			
24	Maintain basic book keeping	<p>Basic book keeping:</p> <ul style="list-style-type: none"> • Concept and need of book keeping • Methods and types of book keeping • Keeping and maintaining of day book and sales records 	1.0	2.0	3.0
Total:			30	48	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 234 hrs

Theory 78 hrs

Practical 156 hrs

Course Description: This course is designed to provide knowledge and skill on preparing quantity estimate and calculation of cost of any civil construction works.

Module1: Quantity Estimating

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
1.	Procedure of estimating	<ul style="list-style-type: none"> • Introduction • Purpose of estimating • Data required for estimating: Drawing, Specification and Rate 	1	
2.	Types of estimate	<ul style="list-style-type: none"> • Preliminary estimate • Plinth area estimate • Cube rate estimate • Approximate quantity estimate • Detailed estimate • Revised estimate • Supplementary estimate • Revised and Supplementary estimate • Annual Repair and Maintenance estimate • Complete estimate 	2	6
3.	Be familiar with units of various items in civil construction works	<ul style="list-style-type: none"> • Unit of measurement for different items • System of measurements: mks, fps • Conversion of systems of units:- 	1	2

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
4.	Calculate area/volume of regular/irregular shapes	<ul style="list-style-type: none"> • Area of regular, shaped and irregular shaped objects • Volume measure of different shaped bodies 	1	2
5.	Measure volume of trench	<ul style="list-style-type: none"> • $V = \text{Area} \times \text{length or ht}$ (Rect. & Circular) 		
6.	Estimate earthwork	<ul style="list-style-type: none"> • Format for detail estimate and insertion of numbers, dimensions, and quantity • Specification/ drawing of work 	1	4
7.	Estimate quantity of masonry footings	<ul style="list-style-type: none"> • Drawing for masonry footings • Items of work for footing construction, soling, pcc, brickwork • T, 2T and 2T+300 for footings 	1	4
8.	Estimate simple superstructure wall of a building	<ul style="list-style-type: none"> • Drawing and specification of wall • Deduction items (door, windows etc.) 	1	3
9.	Estimate simple concrete flooring works	<ul style="list-style-type: none"> • Drawing and specification of the flooring works 	1	3
10.	Estimate simple RCC works of beam, slab, column, lintel	<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 	2	4
11.	Estimate plastering / punning/ pointing works	<ul style="list-style-type: none"> • Drawing and specification 	1	6
12.	Methods of Building estimate	<ul style="list-style-type: none"> • Introduction • Long wall -Short wall method • Centre line method 	1	3
13.	Estimate CGI sheet roofing works	<ul style="list-style-type: none"> • Drawing and specification of roof works 	1	3
14.	Estimate a single room/	<ul style="list-style-type: none"> • Drawing and specification 	2	10

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
	two roomed building/ multi roomed building	<ul style="list-style-type: none"> • Position of DPC, doors and windows 		
15.	Estimate water intake works	<ul style="list-style-type: none"> • Drawing and specification of water intake works 	1	4
16.	Estimate reservoir	<ul style="list-style-type: none"> • Drawing and specification of reservoir 	1	4
17.	Estimate break pressure tank	<ul style="list-style-type: none"> • Drawings and specification of break pressure tank. 	1	4
18.	Estimate tap stand	<ul style="list-style-type: none"> • Plan and elevation of tap stand 	1	4
19.	Estimate of earth work , road pavement , WBM, BBM, Seal coat, BSD	<ul style="list-style-type: none"> • Longitudinal and cross section of roads • Cutting and filling • Road pavement 	1	10
20.	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 	2	7
21.	Estimate Trail bridge/ Canal / Channel work/ Sewer line <i>(for Trail Bridge part please refer to Trail Bridge construction module on Duty3)</i>	<ul style="list-style-type: none"> • Drawing and specification of Trail bridge of specified span canal/channel and sewer line 	2	20
	Sub-total		25	99

Module 2: Analysis of rate

S.No.	Task	Related Technical Knowledge	Time	
			T	P
22.	Be familiar with rate analysis	<ul style="list-style-type: none"> • Definition • Factor affecting rate analysis • Rate of material • Transportation rate related to capacity of vehicles • Procedure of rate analysis • Explanation of water charge, overhead and types, tools and plants, profit and vat 	1	
23.	Analyze rate for earthwork in excavation	<ul style="list-style-type: none"> • Norms and current district rates of GoN • Material consumption 	1	4
24.	Analyze rate of PCC Concrete works (1:2:4)	<ul style="list-style-type: none"> • Ratios of PCC • Dry volume and wet volume quantities of ingredients • current district rates and Norms • Water charge, Profit, T & P, VAT and overhead 	0.5	3
25.	Analyze rate for steel reinforcement works	<ul style="list-style-type: none"> • Drawing and specification • Proceed of Cutting, Bending, and Binding and in positioning the steel reinforcement works. • District rates of materials 	0.5	3
26.	Analyze rate for centering/shuttering for	<ul style="list-style-type: none"> • Providing, fixing and dismantling centering 	1	2

	slab	and shuttering		
27.	Analyze rate for rubble stone masonry in 1:4 cement sand mortar	<ul style="list-style-type: none"> • Drawing and specification 	0.5	2
28.	Analyze rate of brick soling	<ul style="list-style-type: none"> • Norms and current district rates • Unit of measurement • Water charge, overhead, T& P, Profit and VAT 	0.5	2
29	Analyze rate for brick work	<ul style="list-style-type: none"> • Number of bricks per m³ • Ratio of volume of bricks and mortar • Norms and current district rates • Water charge, overhead, T & P, Profit and VAT 	0.5	2
30	Analyze rate for Plastering work	<ul style="list-style-type: none"> • Norms and current district rates • Unit of measurement • Water charge, overhead, T& P, Profit and VAT • Drawing and specification 	0.5	2
	Sub-total		7	23

Module 3: Supervision

S.N	Task Statements	Related Technical Knowledge	Time	
			T	P
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 	2	
2.	Familiarize with local area condition	<ul style="list-style-type: none"> • Definition of community, groups, user's group, caste etc. • Communication skill with local people 	2	
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 • Imperative of safety construction • Safety rules and programs 	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 	2	

S.N	Task Statements	Related Technical Knowledge	Time	
			T	P
		drawing		
5.	Set up site store	<ul style="list-style-type: none"> • Introduction to store and stock • Filing system • Inventory control • Maintaining register for entry and exit of materials • Methods to store materials 	2	
6.	Keep a builder's diary/maintain progress report	<ul style="list-style-type: none"> • Definition of builder's diary • Purpose of builder's diary • Methods to entry diary • Daily work progress report • Monthly progress report 	1	
7.	Prepare log book	<ul style="list-style-type: none"> • Log book and its uses • Format of log book • Maintaining site order book 	1	
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
9.	Measure work done	<ul style="list-style-type: none"> • Unit of different items • Measurement procedure 	1	2
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 • Endorsement procedure of MB 	1	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 • Procedure of running bill 	1	2

S.N	Task Statements	Related Technical Knowledge	Time	
			T	P
		payment		
12.	Follow tendering/contract award procedures	<ul style="list-style-type: none"> • Definition of contract and agreement • 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 	2	3
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
14.	Explain completion certificate	<ul style="list-style-type: none"> • Virtual completion certificate • Midterm completion certificate • Final completion certificate 	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) 	2	
	Sub-total		23	13

Module 4: Quality Control

S.N	Task Statements	Related Technical Knowledge	Time	
			T	P
1.	Explain basics of construction management	<ul style="list-style-type: none"> • Planning, organizing, Scheduling, directing and Monitoring and controlling 	1	

S.N	Task Statements	Related Technical Knowledge	Time	
			T	P
2.	Explain elements of construction	<ul style="list-style-type: none"> • Scheduling, staffing, estimating, evaluation 	1	
3.	Explain leadership	<ul style="list-style-type: none"> • Definition of leadership • Types of leadership • Autocratic, bureaucratic, democratic, spectator • Quality of leader 	2	
4.	Assess site condition	<ul style="list-style-type: none"> • Soil types and condition • Concept of sub surface water flow and water logged area • Occurrence and quality of local construction material 	1	
5.	Prepare organization chart	<ul style="list-style-type: none"> • Definition of organization • Types of organization • Functions of organizations 	1	2
6.	Prepare time schedule (operation calendar)	<ul style="list-style-type: none"> • Importance of time schedule • Different methods of preparing time schedule 	1	2
7.	Arrange/control workforce	<ul style="list-style-type: none"> • Skilled, Semi-skilled and unskilled workers • Calculation of quantity of workforce • Assessment of ability to do of workforce • Creating and maintaining effective workforce • Motivation, counseling and training • Health, welfare and safety • Workforce contract system and types • Prevailing system for hiring and terminating daily workers 	1	2
8.	Manage sub-contract	<ul style="list-style-type: none"> • Definition and Necessity of sub contract 	1	

S.N	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> • Sub contract awarding process • Advantages and disadvantages of sub contract system 		
9.	Arrange pre-construction meeting	<ul style="list-style-type: none"> • Importance of pre-construction meeting • Probable agenda of meeting 	1	
10.	Prepare specification	<ul style="list-style-type: none"> • Definition of specification • Importance of specification • Specification writing of earthwork, brickwork, concrete work and wood work 	1	3
11.	Control construction material and equipment	<ul style="list-style-type: none"> • Different standards (NS, ISI, BS, AS) and trade marks • Wastage control • Scrap use • Equipment efficiency • Care of equipment 	1	
12.	Apply field test for quality assurance of materials	<ul style="list-style-type: none"> • Sieve analysis for size of fine and coarse aggregate • Sound test for brick • Slump test and mould test for concrete • Hammer test for concrete work • Water test for sand 	2	3
13.	Explain construction claims and compensation	<ul style="list-style-type: none"> • Delay compensation • Construction claim • Causes of construction delays • Concept and process of time extension • Definition of arbitration/mediation • Role of mediator 	2	
14.	Explain cost variation	<ul style="list-style-type: none"> • Cost variation • Causes of variation 	1	

S.N	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> Process of endorsing variation 		
15.	Manage disputes/conflict	<ul style="list-style-type: none"> Dispute and conflict Causes of disputes (from contractor side, consultant side and client side) 	1	1
	Sub-Total		18	13

Module 5: Property Valuation

S.N	Task Statements	Related Technical Knowledge	Time	
			T	P
1.	Be familiar with valuation	<ul style="list-style-type: none"> Definition Purpose of valuation Principle of valuation Factor affecting the valuation 	1	
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	8
	Sub-Total		5	8
	Total		78	156
			234	

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 बहादुर, लागत अनुमान, मूल्य निर्धारण तथा सुपरिवेक्षण, 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 234 hrs

Theory: 69 hrs

Practical: 165 hrs

Course Description: This course contains two parts as Road and Trail bridge construction. First parts intend to provide knowledge and skills road design concept, road construction and maintenance. Similarly, second part is designed to impart basic knowledge and skills of Trail Bridge design concept, construction and maintenance following an approach adopted by Helvetas.

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 • Road statistics in Nepal 	1	
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	4
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 	2	3
4.	Identify/enumerate road Materials	<ul style="list-style-type: none"> • Road materials (Common soil, Stone and brick aggregates, Cement and 	1.0	4.0

S. No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		lime, Reinforcement steel, gabion wires, Timber, Stone and bricks and Bitumen)		
5.	Classify road pavements	<ul style="list-style-type: none"> • Elements of road pavements • Types of road pavements 	1.5	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		6	18

Module: 2 Roads construction and maintenance

S. No.	Task Statements	Related Technical Knowledge	Time	
			T	P
7.	Identify road construction equipments 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 • Pneumatic roller • Sheep foot roller 2 Earth moving equipment <ul style="list-style-type: none"> • Tipper truck • loader • Back hoe • Excavator • Dozer • Belt conveyor 3 Miscellaneous equipment <ul style="list-style-type: none"> • Concrete mixer • Drag line • Clam shell • Dredger 	2	3

S. No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> • Pile driving equipment • Crane • Water pump • Air compressor 		
8	Assess Earthen Road in Cutting	<ul style="list-style-type: none"> • Cross section • Different hand tools • Setting out drawing on the ground • Field density 	1	5
9	Assess Earthen Road in Embankment	<ul style="list-style-type: none"> • Cross section • Soil stabilization 	1	5
10	Construct gravel road	<ul style="list-style-type: none"> • Materials required • Equipment required, • Construction procedure • Gradation requirements 	1	5
11	Construct soil stabilized roads	<ul style="list-style-type: none"> • Soil Stabilization: definition and Types • Mechanical Stabilization: Materials, Equipments, Construction Procedure • Lime Stabilization: Materials, Equipments, Construction Procedure • Cement Stabilization: Materials, Equipments, Construction Procedure 	2	5
12	Be familiarize with sub base course construction	<ul style="list-style-type: none"> • Material selection/grading • Procedure 	0.5	2
13	Be familiarize with base course construction	<ul style="list-style-type: none"> • Material selection/grading • Procedure 	0.5	1
14	Be familiarize with dry bound macadam construction	<ul style="list-style-type: none"> • Material selection/grading • Procedure 	1	5
15	Be familiarize with wet bound macadam	<ul style="list-style-type: none"> • Material selection/grading • Procedure 	1	5

S. No.	Task Statements	Related Technical Knowledge	Time	
			T	P
	construction			
16	Be familiarize 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 	2	5
17	Assess Road crossing structures	Road crossing structures <ul style="list-style-type: none"> • Pipe Culverts • Slab Culverts • Arch Culverts • Box Culverts • Minor Bridges 	1	7
18	Perform road protection works	Gravity walls Retaining wall <ul style="list-style-type: none"> • Gabion retaining wall • Dry stone retaining wall • Stone masonry retaining wall • RCC retaining wall Breast wall <ul style="list-style-type: none"> • Gabion breast wall • Dry stone breast wall • Stone masonry breast wall Miscellaneous walls <ul style="list-style-type: none"> • Toe wall • Check dam • Chute • Cascade 	2	6
19	Observe road drainage	<ul style="list-style-type: none"> • Seepage of water in road, 	2	2

S. No.	Task Statements	Related Technical Knowledge	Time	
			T	P
	system	<ul style="list-style-type: none"> • Effects of moisture in pavement • Importance of water management in road • Longitudinal drainage (side drain) • Cross drainage (culverts) 		
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	6
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	1. Introduction of road maintenance <ol style="list-style-type: none"> Types of road maintenance <ul style="list-style-type: none"> ▪ Routine maintenance ▪ Recurrent maintenance ▪ Periodic maintenance ▪ Emergency maintenance 	2	4
23	Repair Potholes		0	4
	Sub-total		21	72
	Total		27	90
	Grand total		117	

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 	2		2

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		Bridges and Future Demand			
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>	1	1	2
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 	2	2	4
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 • Checking list of survey equipment 	2	2	4
5	Conduct Reconnaissance Survey	<ul style="list-style-type: none"> • Existing Crossing Point • Selection of bridge site • Detour Range • River bank condition • Span and Freeboard situation 	1	2	3
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	2	3
7	Conduct Bridge Axis Survey	<ul style="list-style-type: none"> • Axis Fixation and Span 	3	7	10

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		calculation			
8	Prepare Survey Report	<ul style="list-style-type: none"> Data Plotting Procedures 	1	2	3
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 	2	2	4
10	Select Cable Combination	<ul style="list-style-type: none"> Survey Data & Calculation of Freeboard Loads on Trail Bridge Selection of Cable size and number Calculation of Cable Length 	2	1	3
11	Select Bridge Foundation Structures	<ul style="list-style-type: none"> Typical Designs of Anchor Block & its selection 	0.5	1	1.5
12	Assist in designing Adjacent Structures	<ul style="list-style-type: none"> Retaining Structure Slope Protection works River Bank Protection Drainage works 	0.5	2	2.5
13	Compile Bridge Construction Standard Drawing	<ul style="list-style-type: none"> Standard Steel Drawing Standard Construction Drawing Relation Between Construction and Steel Drawing 	1	1	2
14	Prepare General Arrangement Drawing	<ul style="list-style-type: none"> 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 	2	2	4

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		method) • Calculation of f_{min} and "e" distance			
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		0.5
Module 4 : Supervision and Supporting of Trail Bridge Construction					
16	Layout Trail Bridge	• Survey Tools and Equipment handling procedures • Distance and angle measurement • Offset setting • Axis pegs • Bench Mark • General Arrangement Drawing • Safety Measures	0.5	5	5.5
17	Construction of Trail bridge	• Setting Out of Bridge • Transportation, handling and hoisting of cable • Fabrication / erection / construction of bridge	1	5	6
18	Supervise Collection of Local Materials	• 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	1.5	2
19	Supervise Stone Dressing	• Characteristics of good stones	0.5	1.5	2

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
	Works	<ul style="list-style-type: none"> 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 			
20	Supervise Civil Construction Works	<ul style="list-style-type: none"> • Stability of cutting slopes for different types of soil/rock • 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 	1	2	3
21	Supervise non-local material Transportation/Storage	<ul style="list-style-type: none"> • Material Handing Over • Cable, Cement, Steel parts and Tools Transportation • Material Inventory Lists • Storage of materials at construction site • Security/Safety of stored Materials 	1	2	3
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	2	2.5

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
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	2	2.5
24	Conduct Final Assessment	<ul style="list-style-type: none"> • Technical evaluation procedures of bridge components 	0.5	2	2.5
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	3	4
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 	0.5	2	2.5
27	Be familiarize 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 	0.5	2.5	3

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		drilling works • Cable crossing on both banks			
28	Hoist Cables Manually	<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 	1	3	5
29	Walkways Fixation	<ul style="list-style-type: none"> • Fixing procedures of crossbeam suspender and steeldeck • GI Wiremesh knitting procedure 	0.5	2	2.5
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	• Facilitating users Committee	0.5	1	1.5

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
	resources	<ul style="list-style-type: none"> Meeting • Local Resource Mobilization Techniques • 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 • 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
Module: 7 Self-orientation on Social Organizational Support at District Level					

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
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
Module: 8 Trail Bridge Maintenance					
41	Explain maintenance concepts	<ul style="list-style-type: none"> • Definition of maintenance • Maintenance need 	1		1
42	Classify Maintenance Types	<ul style="list-style-type: none"> • Classification of Maintenance 	1		1
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 	1		2
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	1.5	2
45	Be familiar with Conducting Major Maintenance	<ul style="list-style-type: none"> • Bridge Condition Investigation report Analyzing Procedure • Preparing major maintenance report • Possible Major Maintenance Activities • Responsible Organization for 	2	0	2

S. No.	Task Statements	Related Technical Knowledge	Time (hrs)		
			T	P	Tot
		Major Maintenance			
	Sub-total		42	75	117
	Total		69	165	234
	Grand total		234		

Selected texts and references:

1. Khanna and Justo, Highway Engineering
2. Gurucharan Singh, Highway Engineering
3. Nepal Road Standards, Department of Road
4. Gupta B.L. Road, Railway, Bridge and Tunnel Engineering
5. Karahenbutil J. & A. Wagner, Survey, Design and Construction of Trail Suspension Bridge for Remote Areas
6. सर्वेक्षण पुल पुलेसा, CTEVT .
7. A Course Manual on Trail Bridge Construction for Civil Sub-Overseer (Pre and Post SLC) Volume I, II and III, CTEVT Curriculum Development Division, 2003.

Water Supply, Sanitary and Irrigation Engineering

Total 234 hrs
Theory 78 hrs
Practical 156 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.

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 or water demand • Population survey • Design period • Concept of population forecasting • Different method of population forecasting and their suitability • Water demand (house hold, school, public use, industries, firefighting and losses and wastes) 	3	2
2.	Select sources of water	Introduction 1. Types of sources <ul style="list-style-type: none"> • Surface water (river stream and Lake) sources • Ground water (Surface 	3	4

S.No.	Task Statement	Related Technical Knowledge	Time	
			T	P
		spring, Gravity spring Artesion spring, Shallow well, Deep well and Artesion well) 2. Sources / selection investigation criteria (Location, quantity, quality and cost.) 3. Current water sources 5. Water rights		
3.	Measure discharge	Concept 1. Discharge measuring techniques <ul style="list-style-type: none"> • Bucket and stopwatch • V-notch weir • Velocity area method 2. Safe yield and design yield	1	4
4.	Design/select pipeline/intake/sedimentation tank/break pressure tank/reservoir tank/tapstand/special crossing section or component	1. Design/concept/selection of <ul style="list-style-type: none"> • Pipeline section (mainline, branch line and tap line)with hydraulic grade line • Intake section (intake and collection tank) • Sedimentation tank section (design flow, detention time and capacity calculation) • Design parameter • Types of intake • Break-pressure tank section (masonry, HDP and float valve • Design of intake • Reservoir tank section (capacity) • Importance of BPT • Tapstand section and its 	4	9

S.No.	Task Statement	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> 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), tapstand and special crossing section 	2	10
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 pipe HDP pipe joining Backfilling Marking the pipeline Rejoining the buried pipe 	2	6
7.	Observe the installing	<ul style="list-style-type: none"> Permeability & capillary action. Soil strata Water table Use of drawings Use of cow dung Scaffolding needed. 	2	6
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 	3	2

S.No.	Task Statement	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> • 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 • Concept 		
9.	Identify components of water treatment units	1. Treatment units <ul style="list-style-type: none"> • Screening • Sedimentation • Coagulation • Aeration • Filtration • Chlorination/disinfection 	1	4
10.	Identify supply system	1. Introduction of supply system Category of system <ul style="list-style-type: none"> • Open system • Closed system 2. Type of systems <ul style="list-style-type: none"> • Open system without faucets • Open system with faucets • Closed system with reservoir • Closed systems with intermittent services • Closed system with float – valves 	2	4
11.	Identify distribution system	Purpose of distribution and distribution system Purpose mit Distribution systems <ul style="list-style-type: none"> • Gravity system • Pumping system • Dual systems 	1	2

S.No.	Task Statement	Related Technical Knowledge	Time	
			T	P
12.	Maintain/repair pipeline/reservoir tank/tap stand	<ul style="list-style-type: none"> • Minor maintenance • Major maintenance 	1	2
	Sub-total		25	55

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 	2	2
21.	Dispose sewage	<ul style="list-style-type: none"> • Importance of disposal of sewage • Land treatment • Dilution Method • Self-purification of River 	1	3
22.	Dispose of Excreta in un-sewer area	<ul style="list-style-type: none"> • Pit privy • VIP latrine • Pour flush latrine • Septic tank 	1	4
	Construct ventilated improved pit latrine (VIP)	<ul style="list-style-type: none"> • Design guidelines for VIP latrine. • Pipe size & type. • Quantity of waste. • Material for superstructure. • Brick/stone/mud. • Lining of trenches. 	2	4
	Construct a house-hold septic-tank with soak pit	<ul style="list-style-type: none"> • Definition • Working principle of septic tank & soak pit. • Capacity calculation/determination of septic tank & soak pit. • Detention time • Effluent disposal 	2	4

		<ul style="list-style-type: none"> • Construction procedure • Operation & maintenance 		
23.	<p>Manage/dispose solid waste</p> <p>Impact of wastes.</p>	<ul style="list-style-type: none"> • Definition • Types of wastes • Onsite Management • Waste segregation • Collection of solid waste • 4R Principle • Composting • Disposal 	2	3
			10	20

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 • 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. • Distribution boxes. • Cross-Drainage works • (Aqueducts, Siphon aqueducts, Super passage, Siphon, Level crossing, Inlet or Inlet and Outlet 	3	4
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 		8
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 	1	4

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		way, Spoil banks, Bed bars, Right of way, Side drains		
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. 	2	3
31.	Calculate peak water requirement.	<ul style="list-style-type: none"> • Fundamental concept on • Crop (major crop) water requirement, • 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 	3	4
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) 	3	4
33.	Calculate discharge of a channel/stream.	<ul style="list-style-type: none"> • Methods of velocity measurement 	3	5

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> • 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, $P=B+2D(1+Z^2)^{1/2}$ • 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 	2	4
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. 	2	4
36.	Carryout the lining works of simple canal section.	<ul style="list-style-type: none"> • Importance and need • Different types of canal lining (Concrete lining, Brick lining) • Brick/stone pitching. 	1	4
37.	Enlist Irrigation Policies.	<ul style="list-style-type: none"> • Important of relevane policied • Irrigation Policy (2049,1st amendment 2053, 2060) & Irrigation Regulation (2056). 	2	1

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
		<ul style="list-style-type: none"> Irrigation policies/regulation in the context of operation & management. 		
Sub-total			25	47

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 Importance Definitions of the terms used. Construction materials (Suitability, Merits / demerits) Design criteria. 	2	4
39.	Perform brush /hedge layer.	<ul style="list-style-type: none"> Brush/Hedge layer. Construction materials (Suitability, Merits / demerits). 	1.5	2
40.	Perform vegetation stone wall (bio wall)	<ul style="list-style-type: none"> Vegetation-stone wall. Construction method. Suitability. Merits/demerits 	1.5	4
41.	Perform vegetation gabion.	<ul style="list-style-type: none"> Vegetation gabions, turfing. Construction method Suitability Construction material Merits/demerits Design criteria. 	2	5
42.	Measure river stages	<ul style="list-style-type: none"> Bed level High Flood Level Normal Flow Level Measuring method Plotting method. 	2	2
43.	Weave Gabion mattress (steel-	<ul style="list-style-type: none"> Introduction to gabion- 	2	5

S.No.	Task Statements	Related Technical Knowledge	Time	
			T	P
	wire mesh)	mattress <ul style="list-style-type: none"> • Materials used • Weaving method • Recommended sizes of boxes & their mesh. • Types of joints used 		
44.	Construct gabion wall.	<ul style="list-style-type: none"> • Guiding rules of construction • Construction method • Construction material • Suitability • Advantages/disadvantages 	2	6
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. 	3	3
46.	Identify launching Apron	<ul style="list-style-type: none"> • Definition& functions of launching apron. • Guiding rules for construction. • Bank pitching • Construction materials 	2	3
	Sub-total		18	34
	Total		78	156
	All Total		234	

Suggested texts and references:

1. Arun Prasad Parajuli
2. Sujan Adhikary
3. Drinking Water Installation and Drainage Department in Nepal, SKAT
4. Gravity Flow Water System, UNICEF
5. Gravity Water Supply System In Nepal, UNICEF
6. Birdie G.S., Birdie J.S. Water Supply and Sanitary Engineering,
7. Leternon, Josse Water Supply and Sanitation Manual, Remote Area Development Committee
8. Water Supply Manual, Department of Water supply and Sewerage
9. पौडेल बोध प्रसाद, खानेपानी प्रणाली, प्रा.शि.व्या.ता.प. ।
10. श्रेष्ठ शशिराज, खानेपानी तथा ढल निकास (भाग १)
11. Hill irrigation Manual, Department of Irrigation
12. Punmia B.C. Dr.Introductory Irrigation Engineering
13. Sharma S.K. Irrigation Engineering
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On-the- Job Training (OJT)

Duration: 5 months (800 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 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 had 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 a plot of land for building layout.
 - Collect materials and labour rate for rate analysis.
 - Carryout architectural design and drawing of a 3 roomed residential/office building (site plan, floor plans, elevations, sections).
 - Prepare internal plumbing and electrical 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 rate 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 basic surveying or study contour map
 - Collect materials and labour rate 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 rate 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 works 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' supervisor where trainees are placed (continuous evaluation)	300			300
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	500

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, 2014

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