Workshop Practice II
EG 2102 CE

Year: II
Semester: I

Total: 12 Hrs. /week
Lecture: 3 Hrs./week
Tutorial: Hrs./week
Practical: 9 Hrs./week
Lab: Hrs./week

Course Description:
This course intends to impart basic knowledge and skills on bricklaying and plumbing works.

Course Objectives:
After the completion of this course students will be able to:
1. Introduce brick laying;
2. Introduce household plumbing:
3. Perform different bricklaying works.
4. Perform simple plumbing joining and installation works.

Part I: Bricklaying

Total: 4 Hrs. /week
Lecture: 1 Hr./week
Tutorial: Hrs./week
Practical: 3 Hrs./week

Course Description:
This part of the course focuses on familiarization of bricklaying and its standard requirements to be used on to-days construction. It also deals with pointing and curing works.

Course Objectives:
After the completion of this course students will be able to:
1. Introduce bricklaying;
2. Identify major operation related to civil engineering works;
3. Identify and select the tools and equipment required for bricklaying and
4. Perform bricklaying works on various bonding patterns.

Course Contents:

Theory

Unit 1: Bricklaying: **[1 Hr.]**
- 1.1. Introduction
- 1.2. History of Bricklaying
- 1.3. Importance of Bricklaying
- 1.4. Scope of Bricklaying
- 1.5. Beauty of Bricklaying (Aesthetics of Bricklaying)

Unit 2: Safety Precaution: **[1 Hr.]**
- 2.1. Use of protective clothing and equipment
- 2.2. Maintaining tools and equipment
- 2.3. Awareness of personal safety and safety of others in all aspects of works
- 2.4. Observation of workshops safety rules and regulations

Unit 3: Bricklaying Materials: **[2 Hrs.]**

3.1. Bricks in common use
3.2. Bricks in Chinese bricks/Dachi Bricks
3.3. Bricks in hand made bricks
3.4. Bricks in 5% cement added sun dried soil bricks
3.5. sand used in Bricklaying
3.6. Lime/Cement used in Bricklaying
3.7. Amount of water used in mixing Mortar/concrete
3.8. Admixture and their properties.

Unit 4: Use of Hand Tools: **[1 Hr.]**

4.1. Introduction
4.2. Types of bricklaying hand tools: trowel, pointing trowel, plum bob, sprit level, line and pin/corner block, Mason's line, Straight edge/storey rod, Gang rod, Club Hammer, Bolster and closer or bat gauge.

Unit 5: Handling Bricklaying Equipment/Machines: **[1 Hr.]**

5.1. Shovel, spade, wheel barrow, buckets, jugs, sponge, Hesign Rags, Foam, Runner/Jointer, Mortar Boards, Mortar pan and Brooms for cleaning floor
5.2. Protective equipment e.g. Hand gloves, ear plugs and Mask etc.
5.3. Mortar mixer

Unit 6: Constructing Walls using Bricks in lime mortar English Bond: **[2 Hrs.]**

6.1. Building ½ Brick (4.5" thick wall) to stretcher Bond
6.2. Building 1 Brick (9" thick wall) to English Bond

Unit 7: Constructing Walls: Using Bricks in lime mortar: Flemish Bond: **[2 Hrs.]**

7.1. Flemish Bond-1 Brick thick, 1.5 Brick and 2 brick thick double Flemish bond wall.
7.2. Making of one end stopped and other end racked back.
7.3. Constructing cavity wall, 12" thick making cavity of 3” wide.
7.4. Constructing rat trap bond 1 brick thick (9" thick wall)

Unit 8: Pointing: **[2 Hrs.]**

8.1 Introduction
8.2 Mortar for pointing/Ratio and proportion
8.3 Pointing procedure
8.4 Pointing as the work proceeds
8.5 Pointing after the Brick work is completed
8.6 Types of pointing:
  (a) flush pointing
  (b) Struck joint or pointing
  (c) Weather struck and cut pointing
  (d) Rounded or tooled pointing
  (e) Recessed pointing
  (f) Tuck pointing
  (g) V-joint pointing
  (h) Purpose of pointing
  (i) Advantage of pointing.

Unit 9: Curing Walls: **[1 Hr.]**

9.1 Curing wall both side by water pouring from top
9.2 Curing wall both side by sprinkling water at face
9.3 Temporary covering wall by heavy rain, frost and dirty materials nearby building operation
9.4 Liquid curing in hot climate
9.5 Cleaning wall by chemicals and acids

Unit 10: Building Foundation Footing Courses Wall (Square footing): **[2 Hrs.]**

10.1 2.5 Bricks*2.5 Bricks square footing
10.2 3.5 Bricks*3.5 Bricks square footing
10.3 3.0 Bricks*3.0 Bricks square footing
10.4 Purpose and advantage of foundation footing

Practical

Project-1 **[5Hrs.]**

Identify and handle tools/equipment/materials related to bricklaying.

Project -2 **[4 Hrs.]**

2.1 Prepare workshop floor area and set out the work area
2.2 Prepare/handle/spread mortar with trowel
2.3 Lay stretcher bond wall making 1.5 m long and 6 courses high true to horizontal and vertical line and level properly.

Project -3 **[4 Hrs.]**

3.1 Prepare workshop floor area and set out the work area
3.2 Prepare/handle/spread mortar with trowel
3.3 Build English bond wall 1 brick thick (9") up to 6 courses high and ending at 1.5 m length true to horizontal and vertical line and level properly.

Project -4 **[4 Hrs.]**

4.1 Prepare workshop floor area and set out the work area
4.2 Prepare/handle/spread mortar with trowel
4.3 Build Flemish bond wall 1 brick thick (9") up to 6 courses high and ending at 1.5 m length true to horizontal and vertical line and level properly

Project -5 **[4 Hrs.]**

5.1 Prepare workshop floor area and set out the work area
5.2 Prepare/handle/spread mortar with trowel
5.3 Build English bond wall 1 brick thick (9") up to 6 courses high and 1.5m length with return corner true to horizontal and vertical line and level properly.

Project -6 **[4 Hrs.]**

6.1 Prepare workshop floor area and set out the work area
6.2 Prepare/handle/spread mortar with trowel
6.3 Build Flemish bond wall 1 brick thick (9") up to 6 courses high and 1.5m length with return corner true to horizontal and vertical line and level properly.

Project -7 **[5 Hrs.]**

7.1 Prepare workshop floor area and set out the work area

7.2Prepare/handle/spread mortar with trowel

7.3Build a T-junction 1 brick thick main wall with 1.5 m length in English bond and partition wall with 1.5 m length in stretcher bond up to 6 courses high.

Project -8 **[5 Hrs.]**

8.1Build a T-junction 1 brick thick main wall with 1.5 m length in Flemish bond and partition wall with 1 m length in stretcher bond up to 6 courses high

Project -9 **[5 Hrs.]**

9.1 Build a cross-junction 1 brick thick main wall with 1.5 m length in English bond and partition cross wall with 1 m length both side in stretcher bond up to 6 courses high.

Project -10 **[5 Hrs.]**

10.1Build a cross-junction 1 brick thick main wall with 1.5 m length in Flemish bond and partition cross wall with 1 m length both side in stretcher bond up to 6 courses high.

References:

1. Punmia, B.C., Jain, A.K.,(latest edition). Building Construction, Laxmi publication pvt.ltd.
2. Byanjakar, Mohan Man, (latest edition). Garo laghaune prabidhi

Evaluation Scheme

No. of students in each shift = 16
No. of students in each group= 2
No. of groups =8

S. N	Description	Time (Hrs.)	Marks
1	Any one project from project no. 3 to 10	36	24
2	Viva from theory		6
	Total		**30**

Part II: Plumbing

Total: 4 Hrs. /week
Lecture: 1 Hr./week
Tutorial: Hrs./week
Practical: 3 Hrs./week

Courses Description:
This part of the course focuses on familiarization of plumbing works related to civil constructions. It also includes basic knowledge and skills on welding and bar bending.

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

1. Apply operating systems of plumbing works;
2. Identify the tools and equipment required to plumbing works;
3. Perform simple pipe fittings works and
4. Prepare the PVC fittings.

Course Contents:

Theory

Unit 1: Introduction to Plumbing: **[1 Hr.]**

1.1. History of plumbing.
1.2. Importance of plumbing
1.3. Plumbing and sanitary
1.4. Scope of plumbing

Unit 2: Plumber's Hand Tools: **[2 Hrs.]**

2.1. Pipe wrench of size 12", 9", and up to 18" long.
2.2. Pair of footprints.
2.3. Stocks and dies, up to 2" diameter, replacement of cutters
2.4. Wrench chain
2.5. Hack's saw frame and blade
2.6. Measuring tape
2.7. Soldering iron
2.8. Tin snips
2.9. Rasp
2.10. Caulking iron
2.11. Adjustable wrench up to 12 long.
2.12. Claw hammers /Ball pin hammer/Claw hammer
2.13. Pipe cutter-use and care adjustment of cutting wheels.
2.14. Drilling machine and its bits.
2.15. Pipe vise
2.16. Bench vice
2.17. Spanners of various size
2.18. Folding rules metallic/steel
2.19. Try square, Vernier caliper joining elements: - Nuts, bolts, washer, pins, screws and rivets and jute/pipe tape and lead.

Unit 3: Galvanized Pipe Fittings: **[2 Hrs.]**

3.1. G.I pipe nipples
3.2. G.I. elbows
3.3. G.I tee

3.4. G.I cross
3.5. G.I reducing elbow
3.6. G.I reducing tee and reducing cross
3.7. G.I sockets
3.8. G.I reducing sockets
3.9. G.I lock nut
3.10. G.I plugs or caps
3.11. Flange unions (Gasket)
3.12. G.I gate valve (heavy and light)
3.13. Foot valve/Glove valve
3.14. Pipe tape
3.15. Float valve or ball valve.

Unit 4: Pipe Threading to Dimension: [2 Hrs.]

4.1. Fixing pipe to pipe vice
4.2. Measuring pipe to millimeter
4.3. Measuring methods
4.4. Die holding/threading methods
4.5. Die checking/cleaning/oiling
4.6. Die tightening and loosing/fixing cutter
4.7. Checking accurate threading and its sharpness
4.8. Doing loosen the die fixing the pipe to die and repeat the threading twice for sharpness. (Repeat)

Unit 5: Assembling the Threaded Pipe to Fittings with Pipe Tape [2 Hrs.]

5.1. Visualization of drawing in detail
5.2. Collecting the fittings
5.3. Collecting the threaded pipes in position
5.4. Fixing the fittings with pipe tape to pipe in position
5.5. checking the tightness/testing pipe joints
5.6. Adjusting measurement
5.7. Marking, laying, using chalk line to wall/floor/ceiling
5.8. Accurate pipe cutting with margin of necessary threads to pipe
5.9. Fixing pipe to pipe vice
5.10. Positioning techniques.

Unit 6: H.D.P fittings: [3 Hrs.]

6.1. Definition of HDP pipe and fittings
6.2. Collecting hot plate with power
6.3. Collecting HDP pipe with necessary diameters
6.4. using miter box cutting pipe to 90^0
6.5. Clean, trim and weld the two halves of pipe to form 90^0 elbow (L)
6.6. Making Tee
6.7. Making Wyes(Y)

Unit 7: P.V.C. fittings: [3 Hrs.]

7.1 Definition of PVC pipe and fittings
7.2 Collecting hot plate with power
7.3 Collecting PVC pipe with necessary diameters
7.4 Using miter box cutting pipe to 900
7.5 Clean, trim and join the two halves of pipe to form 900elbow (L)

7.6 Making Tee
7.7 Making Wyes(Y)

Practical

1. Identify/enumerate/use hand tools and equipment [1 Hrs.]
2. Demonstrate various types of pipes with different sizes. [2 Hrs.]
3. Cut, file cut end and make thread to prepare nipples of different sizes of G.I pipe needed for assembling [6 Hrs.]
4. Assemble previously threaded pipes and fittings to make a loop by using various fittings as Elbow, Union and tee. [5 Hrs.]
5. Make L, cross and T bends of HDP pipe [6 Hrs.]
6. Join HDP fittings with HDP pipe. [3 Hrs.]
7. Make L, cross and T bends of PVC pipe [6 Hrs.]
8. Join PVC fittings with PVC pipe. [4 Hrs.]
9. Install PPR pipe with fittings. [6 Hrs.]
10. Perform external (wall) pipe layout and join fittings for water supply. [6 Hrs.]

References:

1. Birdie, G.S., Birdie, J.S., (latest edition). Water supply and sanitary engineering.
2. Deolakar, S.G.,(1994). Plumbing Design and Practice, Tata McGraw-Hill Publishing Company Limited.
3. McConnell, C., (1986). Plumbers and pipe fitters library, volume I, II, and III, Macmillan publishing company.
4. Tailor, J.D., I.L.O., (1975). Plumbing practice vol 1.
5. Pudasaini Loknath (2019), Plumbing handbook, Bhudipuran publication

Evaluation Scheme

No. of students in each shift = 16
No. of students in each group= 2
No. of groups =8

S. N	Description	Time (Hrs.)	Marks
1	make thread to prepare nipples of different sizes of G.I pipe	6	3
2	Make cross of HDP pipe	6	3
3	Join HDP cross with HDP pipe.	3	3
4	Make cross of PVC pipe	6	3
5	Join PVC cross with PVC pipe.	6	3
6	Viva voce from theory		5
	Total		**20**

Part III: Carpentry and Scaffolding

Total: 4 Hrs./week
Lecture: 1 Hr./week
Tutorial: Hrs./week
Practical: 3 Hrs./week

Course Description:
This part of the course focuses on familiarization of carpentry work and its tools and equipment required. It intends to provide knowledge and skills on Timber seasoning, Detecting timber defects and joints and Wood carving techniques.

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

1. Explain principles of carpentry works;
2. Select and collect the hand tools required for conduction of carpentry works;
3. Apply the technology of wood and its conversion techniques and
4. Perform shaving and joints making**.**

Course Contents:

Theory

Unit 1: Introduction to Carpentry: [1 Hr.]

- 1.1. Introduction and uses of hand tools/equipment
- 1.2. Types of carpentry trades as per
  - 1.2.1. Carpenter
  - 1.2.2. Joiner
  - 1.2.3. Cabinet and furniture maker
  - 1.2.4. Tree cutter and lumber producer
  - 1.2.5. Wood working machine setter-operator

Unit 2: Wood as Construction Materials: [1 Hr.]

- 2.1. Temporary structure
- 2.2. Structural medium (permanent structure)
- 2.3. Joinery works
- 2.4. Furniture making
- 2.5. Tools handle making
- 2.6. Plywood makings

Unit 3: Methods of Conversion of Lumber (Log): [1 Hr.]

- 3.1 Ordinary sawing
- 3.2 Tangential sawing
- 3.3 Radial sawing
- 3.4 Quarter or rift sawn

Unit 4: Identifying and Enumeration of Hand and Power Tools: [1 Hr.]

- 4.1 Different hand tools (Lay Out Tools, Tooth edge cutting tools (Straight line cutting saw, Curve line cutting saw, Saving Tools, Shaping Tools, Drilling and Boring, Striking and Driving)
- 4.2 Different types of power tools

Unit 5: Insects and Wood borers: **[1 Hr.]**

5.1 Define Borers
5.2 Identify termites or white ants
5.3 Removal of termites
5.4 Reason of termites develop in home
5.5 Wood preservatives
5.6 Defects caused by dampness

Unit 6: Simple and Complicated Wood joints: **[4Hrs.]**

6.1 Function of joint
6.2 Types of joints (Lengthening, widening and framing joints)
6.3 Miscellaneous joints
6.4 Types of beam hangers
6.5 Use of gusset plates in framings of frame construction
6.6 Uses and application of;
   A. Lengthening joint
      a. Table scarf joint
      b. Spliced joint
   B. Widening joint
      a. Butt joint
      b. Tongued and grooved joint
      c. Dowel joint
      d. Tongued and grooved joint with chips
   C. Framing joint
      a. Dovetail bridle joint
      b. Tusk tenon joint
   D. Rail joint
      a. Stub mortise and tenon joint with hunch
      b. Housing joint

Unit 7: Plywood: **[1 Hr.]**

7.1 Definition
7.2 Types
7.3 Sanding
7.4 Properties of plywood

Unit 8: Formworks: **[2 Hrs.]**

8.1 Requirements of formworks
8.2 Various Loads on formwork
8.3 Shuttering for column
8.4 Shuttering and centering for beam

Unit 9: Scaffolding: **[3 Hrs.]**

9.1 Definition and component parts
9.2 Single or brick layer (wood/bamboo) scaffolding
9.3 Double or mason (wood /bamboo) scaffolding
9.4 Cantilever or needle scaffolding
9.5 Tubular (single and double) scaffolding

Practical **[45 Hrs.]**

1.Make cross lap joint [2Hrs.]
2. Make notched joint [2Hrs.]
3.Make dovetail half lap joint [2Hrs.]
4.Make mortise and tenon joint [2Hrs.]
5. Make Rebated butt joint [2Hrs.]
6. Prepare a tool using above joints. [5Hrs.]
7.Make formwork for Square or Rectangular column. [5Hrs.]
8.Make formwork for beam [5Hrs.]
9.Make single scaffolding using wood/bamboo. [5Hrs.]
10.Make double scaffolding using wood /bamboo. [5Hrs.]
11.Make single tubular scaffolding [5Hrs.]
12.Make double tubular scaffolding [5Hrs.]

References:

1. Singh Surendra.,(latest edition). Engineering materials, Vikas publishing house pvt.ltd.
2. Silakar, D.L., (2054). An introduction of wood work.
3. Pudasaini, Lok Nath., (2075). Wood and woodwork technology, Bhudipuran publication.
4. Byanjankar, Mohan Man, (1996). The essential views in carpentry and masonry, Nepal Engineering College
5. Sthapit, Chinikaji, Baidhya Keshav Das, (latest edition). Sikarmi byabasaya.
6. Punmia, B.C., Jain, A.K.,(latest edition).Building construction, Laxmi publication pvt.ltd

Evaluation Scheme

No. of students in each shift = 16
No. of students in each group= 2
No. of groups =8

S. N	Description	Time (Hrs.)	Marks
1	Make a cross lap joint or a notched joint or a dovetail half lap joint or a mortise and tenon joint	8	5
2	Make formwork for a square or rectangular column or a formwork for a beam	10	10
3	Make single or double tubular scaffolding or single or double scaffolding using wood/bamboo	20	10
4	Viva voce from theory		5
	Total		30

The overall assignment will be as follows:

		Assessment marks	Final marks
A. Bricklaying	4 Hrs. /week	45	30
B. Plumbing	4 Hrs. /week	30	20
C. Carpentry & Scaffolding	4 Hrs. /week	45	30