Building Construction
EG 2104 CE

Year: II **Total: 7 Hrs. /week**
Semester: I **Lecture: 6 Hrs./week**
Tutorial: 0 Hr./week
Practical: 0 Hr./week
Lab: 2/2 Hr./week

Course Description:
This course is designed to provide knowledge and skills in building construction techniques and technology including earthquake resisting construction technology. It intends to provide skills and knowledge on preparing drawings and sketches of building components.

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

1. Identify the different components of buildings;
2. Follow the steps of construction systematically;
3. Supervise and test on the workmanship and quality of materials to be used in construction and
4. Acquire knowledge and skills on earthquake resistant building construction techniques.

Course Contents:

Theory

Unit 1: Introduction to Building Construction: [4 Hrs.]

1.1 Definition of building and its uses
1.2 Building types
1.3 General components of a building
1.4 Technical terms used in buildings
1.5 General requirements of parts of building
1.6 General rules of Vaastu

Unit 2: Foundation and its types: [6 Hrs.]

2.1 Concept of Foundation and its purposes
2.2 Types of Foundation – Shallow and Deep
  2.2.1 Shallow Foundation – Construction Details of spread foundations for walls, thumb rules of depth and width of foundation and thickness of concrete blocks, Stepped foundation, masonry Pillars and concrete columns.
  2.2.2 Deep foundation and its types (introduction only)
2.3 Earthwork
  2.3.1 Layout/setting out for surface excavation, cutting and filing
  2.3.2 Excavation of foundation, trenches, shoring, timbering and de-watering

Unit 3: Walls: [6 Hrs.]

3.1 Purpose of walls
3.2 Classification of walls – load bearing, non-load bearing, dwarf wall, retaining, breast walls and partition walls.
3.3 Classification of wall as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls.

3.4 Partition wall: Construction details, suitability and uses of brick and wooden partition walls.
3.5 Mortars: types, selection of mortar and its preparation
3.6 Scaffolding, construction details and stability of mason's brick layer and tubular scaffolding, shoring, underpinning

Unit 4: Brick Masonry: [4 Hrs.]

4.1 Definition of terms: header, stretcher, queen closer, king closer, frog and quoin, course, bond, facing, backing, hearting, jambs, reveals, soffit, plinth, pillars and pilasters
4.2 Construction of brick walls – methods of laying bricks in walls, precaution observed in the construction of walls, method of bonding new brick works with old (toothing, racking, back and block bonding), Expansion and contraction joints.
4.3 Importance towards special care during execution on: soaking of bricks, maintenance of bonds and plumb, filing of horizontal and vertical joints, masonry work, restriction height of construction on a given day, every fourth course, earthquake resistance measure, making of joints to receive finishes.

Unit 5: Stone Masonry [4 Hrs.]

5.1 Glossary of terms- natural bed, bedding planes, string course, corbel, cornice, block in course grouting, moulding, corner stone, bond stone, throughstone, parapet, coping, buttresss
5.2 Types of stone masonry: Rubble masonry- random and coursed, Ashlar masonry, principle to be observed in construction of stone masonry walls
5.3 Importance towards special care and placing of bond and corner stones, filling joints, proper packing of internal cavities of rubble masonry wall, raking of joints to receive finishes.

Unit 6: Damp and Water Proofing: [5 Hrs.]

6.1. Dampness and its effects on construction works
6.2. Causes and sources of dampness
6.3. Methods of damp proofing
6.4. Materials used for damp proofing
6.5. Damp proofing treatment in
  6.5.1. Foundation
  6.5.2. Walls
  6.5.3. Floors
  6.5.4. Roofs
  6.5.5. Parapet walls

Unit 7: Concrete and Concrete Construction: [10 Hrs.]

7.1. Concrete and grades of concrete
7.2. Properties of concrete
7.3. Methods of proportioning concrete mixes
7.4. Mix design
  7.4.1. Design mix
  7.4.2. Nominal mix
7.5. Concreting processes
  7.5.1. Batching of materials
  7.5.2. Concrete mixing
  7.5.3. Transportation of concrete

7.5.4. Placing of concrete
7.5.5. Compaction of concrete
7.5.6. Curing of concrete
7.6. Concreting under water
7.7. Placing under cold weather
7.8. Placing concrete in hot weather
7.9. Water proofing of concrete
7.10. Steel reinforcement
7.11. Permissible stresses in reinforcement
7.12. Reinforced cement concrete and its characteristics
7.13. Advantages of reinforced cement concrete
7.14. Concreting equipment and accessories
7.15. Causes of failure of reinforced concrete structure

Unit 8: Formworks: [4 Hrs.]

8.1. Characteristics of good formwork
8.2. Materials for formwork
8.2.1. Timber formwork
8.2.2. Plywood formwork
8.2.3. Steel formwork
8.3. Construction of formwork
8.3.1 column
8.3.2 Beam and Slab
8.3.3 Stair
8.3.4 wall
8.4. Order and method of removing formwork

Unit 9: Sill /Lintels and Arches: [2 Hrs.]

9.1. Sill/Lintels and its uses
9.2. Types of sill/lintels in terms of material used
9.3. Arch and its uses
9.4. Types of arches and materials of construction

Unit 10: Floors and Floor finishes: [6 Hrs.]

10.1. Glossary of terms- floor finish, topping, under layer, base course, rubble filing and their purpose
10.2. Types of floor finishes – Cast –in –situ, concrete flooring (monolithic, bonded), Terrazzo tiles flooring, stone (marble and kota) flooring, PVC flooring, Glazed tiles flooring, timber flooring, description with sketches.
10.3. Specials emphasis on level/slope/reverse slope in bathroom, Toilet, kitchen, balcony and staircase

Unit 11: Stairs and Roofs: [6 Hrs.]

11.1. Glossary of terms: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing
11.2. Classification of staircase on the basis of materials- RCC, Timber, steel, aluminum
11.3. Planning and layout of staircase: Relation between rise and tread, Determination of width of stair, landing etc.
11.4. Various types of layout- straight flight, dog-legged, open well, quarter turn, half turn, bifurcated stair, spiral stair
11.5. Types of roofs, concept of flat, pitched and arched roofs

11.6. Glossary of terms for pitched roofs-batten, eaves, facia board, gable, hip, lap, purlin, rafter, rag bolt, valley, ridge, rain water gutter, anchoring bolts
11.7. False ceilings using gypsum, plaster boards, cellotex, fiber boards

Unit 12: Doors and Windows: [6 Hrs.]

12.1. Glossary of terms with neat sketches of doors and windows
12.2. Classification based on materials: wood, metal and plastics and their suitability for different situations. Different types of door- panel door, flush door, flazed door, rolling shutter, steel door, sliding door, UPVC and aluminum doors
12.3. Windows- panel window, glazed windows (fixed and openable) ventilators, sky light window, louvers shutters, and UPVC and aluminum windows
12.4. Door and windows frames: materials and sections, door closures, holdfast

Unit 13: Finishing Works: [6 Hrs.]

13.1. Plastering – Classification according to use and finishes like plain plaster, grit finish, rough cast, pebble dashed, concrete and stone cladding etc. Techniques of plastering and curing.
13.2. Pointing- different types of pointing and their methods
13.3. Painting- Preparation of surface, primer coat and application of paints on wooden, steel and plastered wall surfaces.
13.4. Application of white washing, colour washing and distempering, polishing, applications of cement and plastics paints.
13.5. Selection of appropriate paints/ finishes for interior and exterior surfaces

Unit 14: Miscellaneous Construction Works: [3 Hrs.]

14.1. Causes and prevention of cracks in buildings
14.2. Methods to prevent termite action
14.3. Maintenance of Existing Building

Unit 15: Earthquake: [10Hrs.]

15.1 Concept of earthquake [4 Hrs.]
- 15.1.1 Introduction
- 15.1.2 Terminologies
- 15.1.3 Causes of earthquake
- 15.1.4 Earthquake locations
- 15.1.5 Measurement of Earthquake
  - 15.1.5.1 Earthquake Magnitude
  - 15.1.5.2 Earthquake Intensity
- 15.1.6 Seismicity of Nepal
- 15.1.7 Seismic hazard of Nepal

15.2 Earthquake effect [2Hrs]
- 15.2.1. Ground effects
- 15.2.2 Effects of earthquake on buildings
- 15.2.3. Causes of failure

15.3 Building forms for earthquake resistance [4 Hrs.]
- 15.3.1. Building configuration
- 15.3.2. Height and number of storey
- 15.3.3 Distribution of load bearing elements
- 15.3.4. Location and size of door and window openings
- 15.3.5 Mass and stiffness distribution in buildings

Unit 16: Building Planning and Building Services [8Hrs.]

16.1 Site selection: factors to be considered for selection of site for residential, public, commercial and industrials

16.2 Basic principle of building planning and arrangement of doors, and windows for residential building.

16.3 Orientation of building in relation to sun and wind, direction, rains, internal circulation and placement of rooms within the available area.

16.4 planning of building services

16.5 Introduction to National Building code.

16.6 Introduction to firefighting systems, Ducting for Air-conditioning, service, lines for cable telephone, and electrical wiring, garbage disposal systems.

Laboratory/Practical

Unit 1: Laboratory: [15 Hrs.]

1. Layout building plan:
2. Perform slump test
3. Perform compressive strength test of concrete/Hollow blocks
4. Demonstrate the following items of work at construction site by:
   A. Timbering of excavated trenching
   B. Damp proof coarse laying
   C. Plastering and Pointing exercise
   D. Construction of RCC work

Textbooks:

1. Punmia B.C. Dr., *Building Construction* (Latest Edition).
2. Kumar Sushil *Building Construction* (Latest Edition).
3. Sharma S.K. &Kaul B.K., *Building Construction* (Latest Edition).
4. Singh Gurucharan, *Building Planning & Design* (Latest Edition)

References:

1. Department of Urban Development, *Nepal Building Code*
2. Arya A.S., *Masonry and Timber Structure including Earth* (Latest Edition)
3. Jain, *Plain Cement Concrete, Vol I & II* (Latest Edition)
4. Kumar Sushil, *Reinforced Concrete Structure* (Latest Edition)
5. Punmia B.C. Dr., *Reinforced Concrete Structure, Vol. I & II* (Latest Edition)
6. IS 4326-1993; Earthquake Resistant Design and Construction of Buildings-Code of Practice, Bureau of Indian Standards, New Delhi, India
7. NBC 108-1994; Site Consideration, Government of Nepal, Ministry of Housing and Physical Planning, Department of Buildings, Nepal, 1995.
8. NBC 109-1994; Masonry: Unreinforced, Government of Nepal, Ministry of Housing and Physical Planning, Department of Buildings, Nepal, 1995.
9. NBC 201-1994; Mandatory Rules of Thumb: Reinforced Concrete Buildings with Masonry Infill, Government of Nepal, Ministry of Housing and Physical Planning, Department of Buildings, Nepal, 1995.
10. NBC 202-1994; Mandatory Rules of Thumb Reinforced Concrete Buildings without Masonry Infill, Government of Nepal, Ministry of Housing and Physical Planning, Department of Buildings, Nepal, 1995.
11. NBC 202-1994; Mandatory Rules of Thumb: Load Bearing Masonry, Government of Nepal, Ministry of Housing and Physical Planning, Department of Buildings, Nepal, 1995.

12. *NSET-Nepal: Earthquakes, A manual for designers and builders,*

Evaluation Scheme

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Title	Hrs.	Mark distribution*
1	Introduction to Building Construction	4	2
2	Foundation and its types	6	6
3	Walls	6	6
4	Brick Masonry	4	4
5	Stone Masonry	4	4
6	Damp and Water Proofing	5	6
7	Concrete and Concrete Construction	10	10
8	Formworks	4	4
9	Sill /Lintels and Arches	2	2
10	Floors and Floor finishes	6	4
11	Stairs and Roofs	6	6
12	Doors and Windows	6	4
13	Doors and Windows	6	4
14	Miscellaneous Construction Works	3	4
15	Earthquake	10	8
16	Building Planning and Building Services	8	6

* There may be minor deviation in marks distribution.