BUILDING CONSTRUCTION IV

ENAR 352

Lecture	**: 2**	**Year : III**
Tutorial	**: 0**	**Part : II**
Practical	**: 3**	

Course Objectives:

The objective of this course is to familiarise students with terminology, concepts, principles, components, materials and details of advanced construction techniques and equip them to understand, apply theoretical knowledge of construction details and develop working drawings for architectural projects. Students will explore the practical applications through lectures and illustrative drawings.

1 Portal Frames (6 hours)

1.1 Definitions; Working principle; Components; Types; Uses
1.2 Timber portal frame: Types (Materials - solid, plywood, laminated); Construction techniques
1.3 Concrete portal frame: Construction techniques (Connections- base, beam, joint)
1.4 Steel portal frame: Types (Based on pin); Construction techniques

2 Shell Structure (4 hours)

2.1 Definitions; Working principle; Components; Types (Single curvature - Barrel vault and its types; Folded plate; Double curvature - Dome, hyperbolic paraboloid, conoid); Uses
2.2 Concrete barrel vault: Components; Types (Based on span), construction techniques (Beams, arches, edge beams)
2.3 Dome: Types; Construction techniques
2.4 Folded plate: Components; Types; Construction techniques

3 Traditional Timber Construction (3 hours)

3.1 Traditional timber construction of Nepal, Components
3.2 Post, Doors, Window, Roof

4 Insulation: Sound and Thermal (5 hours)

4.1 Sound and thermal insulation
4.2 Acoustic material and its characteristics; Construction techniques (Materials and methods) applied in building components
4.3 Thermal material and its characteristics; Construction techniques (Materials and methods) applied in building components

5 Moisture Prevention and Remedy (2 hours)

5.1 Sources, types and effects of moisture on building material
5.2 Barriers and retarders
5.3 Moisture preventions: Construction techniques (Materials and methods) in building components
5.4 Remedial Measures: Timber; Brick; Steel; Concrete

6 Fire Prevention (4 hours)

6.1 Fire triangle and fire behaviour, causes, fire load and occupancy risk; Human safety
6.2 Evacuation principles
6.3 Fire prevention: Planning, fire-resistant materials

7 Mechanical Vertical Circulations and Façade system (2 hours)

7.1 Function and purpose
7.2 Elevators: Types, components, working principle
7.3 Escalators: Types, components, working principle
7.4 Advance façade system: Definition; Types; Construction techniques (Materials and methods); Advantages and disadvantages

8 Earthquake-Resistant Building Prototype and Construction (4 hours)

8.1 History and terminology
8.2 Building assessment and diagnostic
8.3 Earthquake-resistant prototypes
8.4 Earthquake-resistant design and construction: Architectural, structural, functional
8.5 Retrofitting techniques and strategies: Structure, energy and envelope
8.6 Case study (Masonry, RCC frame, heritage)

Practical (45 hours)

1. Draw plan, elevation, section, and details related to timber portal frame illustrating layout, grid spacing, and connection details at beam-column, roof ridge, and base foot connection
2. Draw plan, elevation, section, and details related to concrete portal frame illustrating layout, grid spacing, span, and details of beam, column junction, base foot
3. Draw plan, elevation, section, and details related to steel portal frame illustrating layout, grid spacing, span, and details of the beam-column junction, base plate, purlin, ridge connection, and bracing system
4. Draw plan, sections, edge beam, and support condition for barrel vault, and Plan, section, and ring beam and top detail for dome
5. Draw plan, elevation, section, and typical structural details of joint, edge beam, and support condition.

6. Draw plan, elevation, and section illustrating post-lintel- beam, floor, wall, and roof systems, and typical details of joineries (post, column, beam system, strut, floor joist with chuku), door and widow details (inner and outer frame), and roof details (eaves, rafter+ purlin+ tile with struts and use of Chuku)
7. Construction detail of sound and thermal insulation across wall, floor, and roof systems
8. Blowup details across foundation-plinth, wall, floor, and roof (timber, steel, brick, and concrete or mix), illustrating moisture preventive measures
9. Draw site plan with setbacks, access road; floor plan and section with escape routes, fire exits, staircase locations, and corridor widths showing enclosed stair, and details of fire-resistant walls, and doors
10. Draw floor plan and section highlighting elevator core, lift shaft across multiple floors, escalator pair, and incline, and typical details showing steps, handrail, landing zones; details of advanced façade system, curtain wall, and double-skin façade
11. Draw earthquake-resistant shapes and forms, failure mechanisms, seismic construction details for adobe, concrete, and masonry structures; details of retrofitting techniques across different building components

Final Exam

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

Chapter	Hours	Mark distribution*
1	6	6
2	4	4
3	3	3
4	5	6
5	2	2
6	4	4
7	2	2
8	4	3
Total	**30**	**30**

* There may be minor deviation in marks distribution.

References

1. Allen, E., Rand, P. (2016). Architectural detailing: Function, constructability, aesthetics. Wiley.
2. Chudley, R., Greeno, R. (2019). Building construction handbook. Routledge.
3. Douglas, J. (2006). Building adaptation. Routledge.
4. Emmitt, S., Gorse, C. A. (2018). Barry's advanced construction of buildings. Wiley-Blackwell.
5. Ministry of Urban Development. (2016). Seismic retrofitting guidelines of buildings in Nepal: Compilation of adobe, masonry and RCC. Ministry of Urban Development.