FARM STRUCTURES AND BUILDING TECHNOLOGY

ENAE 354

Lecture	**: 3**	**Year : III**
Tutorial	**: 1**	**Part : II**
Practical	**: 3/2**	

Course Objectives:

The objective of this course is to provide fundamental knowledge of building technology and farm structures, enabling students to understand functional requirements and planning principles of buildings and farm buildings. Students will be able to prepare detailed drawings of buildings and farmsteads, analyze space and operational needs, and design or modify cattle housing and agricultural structures to ensure efficiency, safety, and suitability for agricultural operations.

1 Foundation (2 hours)

- 1.1 Function and types of foundation
- 1.2 Components of foundation
- 1.3 Simple spread footing foundations
- 1.4 Common problem with foundations

2 Masonry Work (3 hours)

- 2.1 Brick masonry
  - 2.1.1 Brick laying and bonding
  - 2.1.2 Damp proofing
  - 2.1.3 Reinforced brick work
  - 2.1.4 Types of walls: Load bearing and non-load bearing wall, partition wall; Thickness of wall
- 2.2 Stone masonry
  - 2.2.1 Types of stone masonry: Rubble and ashlar masonry
  - 2.2.2 General principles of stone masonry and dry-stone masonry
- 2.3 Hollow block masonry

3 Floors, Roofs and Staircase (6 hours)

- 3.1 Types of floors: Ground floor and upper floor
- 3.2 Types of ground floor: Mud flooring, flag-stone flooring, brick flooring, timber flooring, cement concrete flooring, plastic or PVC flooring
- 3.3 General principles for the selection of floor types and flooring materials
- 3.4 Requirements of a good roof
- 3.5 Classification of roofs: Flat and pitched
- 3.6 Basic terms related to pitched roof

3.7 Types of pitched roofs: Lean-to-roof, coupled roof, collar beam roof
3.8 Methods of securing pitched roofs against uplift
3.9 Constructional details of flat and pitched roofs
3.10 Roof covering materials and their selection
3.11 Staircase: Location, types, elements
3.12 Requirements of a good stair
3.13 Design of dog-legged stair
3.14 Introduction to ramps

4 Opening and Ventilation (4 hours)

4.1 Location, size and materials of doors and windows
4.2 Minimum openings for window
4.3 Components of door and window
4.4 Fittings of doors and windows
4.5 Types of lintels and their use
4.6 Types of arches and their use
4.7 Necessity, types and fundamental requirement of ventilation

5 Protection and Finishing Works (5 hours)

5.1 Sources and effect of dampness
5.2 Techniques and methods of damp prevention
5.3 Water proofing mixtures and water proof surface treatments
5.4 External and internal finishes of building
5.5 Plastering on new and old surfaces, plastering materials
5.6 Defects in plaster
5.7 Pointing: Types and use
5.8 Types of paints and defects on painting
5.9 Distempering; White washing and color washing

6 Electricity and Plumbing Service (2 hours)

6.1 Natural and artificial lighting
6.2 Requirements of electricity
6.3 Electrical wiring materials and electrical fittings and symbols
6.4 Introduction to pipes and fittings used for water supply, sanitary and irrigation purpose

7 Fundamentals of Farm Structures and Planning (3 hours)

7.1 Components and types of farm structures, criteria for efficient design of farm structures
7.2 Principles of farmstead planning and layout
7.3 Functional requirements, orientation, and sizing basics

7.4 Challenges and future trends in farm structures

8 Livestock Housing Structures (7 hours)

8.1 General requirements of livestock housing
- 8.1.1 Functional requirements, sizing, and orientation
- 8.1.2 Ventilation, sanitation, and waste management

8.2 Dairy cattle housing
- 8.2.1 Types, merits and demerits, structural details
- 8.2.2 Milking parlor: Functional and structural requirements
- 8.2.3 Calf pens housing and design of barns

8.3 Poultry housing: Functional requirements and components, types and their merits and demerits, structural details, feeding and watering structures

8.4 Swine housing, goat and sheep housing: Types and structural details, functional requirements, orientation and sizing

9 Aquaculture Structures (3 hours)

9.1 Functional Requirements of fish ponds, parts and components of fish ponds

9.2 Site selection criteria, construction and maintenance of fish ponds

9.3 Design of fish ponds

9.4 Fish hatchery: Layout, components, and design

10 Feed, Forage and Agricultural Storage Structures (6 hours)

10.1 Bag and bulk storage structures, warehouse

10.2 Silo, sizing and structural details of trench, pit and tower silo

10.3 Zero grazing units

10.4 Functional requirement, components and sizing of rustic storage and cellar storage

10.5 Functional requirement, sizing of cold storage and cold room

11 Protected Cultivation and Auxiliary Farm Structures (4 hours)

11.1 Greenhouse and polyhouse: Purpose and applications, types and functional requirements, construction materials and structural details

11.2 Farm fences and gates: Barbed wire, plain wire, electric, wooden, mesh, live fence and their merits and demerits

11.3 Low-cost mushroom cultivation structures: Site selection criteria and challenges, components of mushroom farm and functional and structural requirements

Tutorial (15 hours)

1. Preparation of site plan: Planning and layout of farm house/building
2. Structural detailing of various types of roofs and floor
3. Structural detailing of various types of foundations
4. Design and layout of dairy cattle, poultry and swine housing

5. Design and layout of a small farm house
6. Design and layout of simple fish pond
7. Design of silo, baggage storage structures and warehouse.
8. Design, drawing and detailing of a simple dog-legged stair

Practical **(22.5 hours)**

1. Detailed drawing of a small building from measurement
2. Structural drawing of various types of roof and floors
3. Structural drawing of various types of foundations
4. Planning, layout and drawing of dairy cattle, poultry, swine and goat and sheep housing
5. Planning, layout and drawing of fish pond and Silo
6. Planning and layout of farm shed with farm machineries and equipment
7. Design and drawing of a greenhouse shed
8. Planning and layout of electrical fixtures on existing drawing
9. Planning and layout of complete mushroom unit having compost facility and cropping room
10. Preparation of master plan of an agricultural farm

Final Exam

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

Chapters	Hours	Mark distribution*
1	2	2
2	3	4
3	6	8
4	4	6
5	5	6
6	2	3
7	3	3
8	7	10
9	3	4
10	6	8
11	4	6
Total	**45**	**60**

* There may be minor deviation in marks distribution.

References

1. Punmia, B. C., Jain, A. K., Jain, A. K. (2016). Building construction. Laxmi Publications.
2. Rangwala, S. C. (2014). Building construction. Charotar Publishing House.
3. Barre, H. J., Sammet, L. L. (1950). Farm structures. John Wiley & Sons.

4. Neubauer, L. W. (1961). Farm building design (Latest Edition). Prentice-Hall.
5. Bhatnagar, A. P. (1990). Farm buildings in Punjab (Latest Edition). Punjab Agricultural University.
6. American Society of Agricultural Engineers. (1997). CIGR handbook of agricultural engineering: Vol. II. Animal production and aquacultural engineering (Latest Edition). American Society of Agricultural Engineers.
7. De Chiara, J., Callender, J. H. (2001). Time-saver standards for architectural data (Latest Edition). McGraw-Hill.