

## Fundamental Engineering

### Course Objective:

- 1.Acquire knowledge in the basic civil engineering area required for managing civil works
- 2.Acquire knowledge on the basic infrastructures and their element needed in the society
- 3.Gain knowledge on the computation of quantity and cost of basic infrastructure in the society
- 4.Gain knowledge on case study of repair and maintenance of infrastructures.

### 1.Building Technology (10 hours)

- a.Introduction – Building and its types
- b.Functional aspect of building
- c.Building and its components ( Foundation, DPC, floorings, doors and windows, Staircase, roofs, ceilings, plastering, pointing, painting works)
- d.Setting out of foundation
- e.Building plans and section.

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### 2.Water supply and sanitary (8 hours)

- a.Water supply system.
  - i.Quantity of water (Water demand, forecasting of population)
  - ii.Quality of water (Impurities and living organism in water, Examination , quality standards)
  - iii.Element of water supply system ( Intake, reservoir, distribution system, conveyance of water)
  - iv.Survey and planning of water supply project
- b.Sanitary system.
  - i.System of drainage, street drains, sewer and its shape and size
  - ii.Sewer discharge calculation, self-cleaning velocity, setting out of sewer lines
  - iii.House drainage- different plumbing system in the building, manholes, disposal of sewage, septic tanks and soak pits
  - iv.Survey and planning of sanitary project

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### 3.Transportation engineering (8 hours)

- a.Road and road structures (sub grade, grade (Soling), base surfacing)
- b.Road types, road gradients, geometrics of roads
- c.Cambers, and super elevation, road curve
- d.Survey and planning of road project

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### 4.Water resources engineering (9 hours)

- a.Hydrology and Irrigation
  - i.Hydrology and its scope, hydrological cycle, precipitation / evapotranspiration / infiltration / runoff, hydrograph analysis
  - ii.Irrigation structures (Dams, channels, notches, weirs, aqueduct and siphons etc)
  - iii.Gauging velocity and discharge measurement
  - iv.Survey and planning of irrigation project

## b. Hydropower

- i. Introduction to hydropower (Source of energy, hydropower)
- ii. Classification of hydropower projects (runoff-river, storage type, basin diversion type, pumped storage type)
- iii. Hydropower planning (Hydropower development cycle, topographic survey & geotechnical investigation, hydrometeorological & sedimentological investigation)
- iv. Reservoir & dams (reservoir: its site and storage capacity, Dam: its type and site selection)
- v. Hydropower elements (headworks, settling basin, penstocks, spillway and gates, hydroelectric machine, powerhouse)

## 5. Quantity surveying (10 hours)

- a. Introduction of quantity surveying (Estimating), different types of estimates
- b. Method of building estimating (wall, doors & windows, roofs, partitions, ceiling)
- c. Estimating of water supply & sanitary works
- d. Estimating of road works (Earthworks, culvert, pavements)
- e. Rate analysis and specifications

Practical:

The following drawing and quantity surveying will be performed in this course. These are:

1. Building construction
  - a. Plans, elevation and section of a two & three room building
  - b. Trench plan, typical foundation sections
  - c. Detailing of floors, roofs and doors and windows
2. Water supply and sanitary engineering
  - a. small rural water supply system
  - b. Drawing of typical structures used in rural water supply scheme
  - c. Sizing and materials used in sewer drains
3. Transportation engineering
  - a. Typical drawing of road longitudinal and cross sections
  - b. Typical drawing of different types culvert and drainages
4. Water resource engineering
  - a. Hydrology and irrigation
    - i. Catchment area, rainfall, discharge of stream
    - ii. Typical drawing of cross drainages, canals and headwork
  - b. Hydropower
    - i. Reservoir and dams
    - ii. Typical structures of hydropower headwork, settling basin and penstocks
5. Quantity surveying
  - a. Types of estimate
  - b. Preliminary estimate
  - c. Rate analysis of main items
  - d. Detailed estimate of one room building

References:

- 1.M. Goyal (2004), Hand book of building construction, Amrindrea Consultancy, Faridabad, India
- 2.J.R. Reddy (2004), A text book of hydrology, Laxmi publications
- 3.N. Dulal, S, Baral (2012) Engineering hydrology, Apex Educational Academy
- 4.K. Borrows, Water power engineering, New Delhi, Tata McGraw Hill
- 5.Baral (2013), fundamental of Hydropower engineering, Engineering and Education Services, Kathmandu
- 6.N.Dutta (2006), Estimatingand costing
- 7.Khanna & Justo (2004) Highway engineering