FUNDAMENTALS OF CIVIL ENGINEERING

ENCE 157

Lecture : 4 **Year : I**
Tutorial : 0 **Part : II**
Practical : 2

Course Objectives:
This course will provide the fundamental knowledge of civil engineering projects and infrastructures to the geomatics engineering students. After completion, geomatics engineers will be able to achieve the basic knowledge to measure the geomatics parameters from the field, analyze and provide parameters for planning, design and construction pertaining to develop civil projects and infrastructures.

1 Building Infrastructures, Construction Technology, Building Codes and Guidelines (12 hours)

1.1 Types of building (Use case): Residential, commercial, institutional, hospital, educational
1.2 Types of building structures (Based on construction): Stone masonry, brick masonry, timber, steel, RCC
1.3 Building plan, elevation and sections
1.4 Setting out of building foundation
1.5 Selection of quarry sites for construction materials
1.6 Soil investigation and bearing capacity of foundation
1.7 Building codes and guidelines
1.8 Disaster management: Preventive measures, early warnings, preparedness, rescue and relief works, rehabilitation and reconstruction

2 Water Supply and Sanitation Engineering (8 hours)

2.1 Source of water, types of water supply system, components of water supply system in rural and urban area, estimation of water demand, population forecasting, survey and planning of water supply project
2.2 Drainage system, waste management system, sewer discharge calculation, setting out of sewer lines, house drainage, suitability of landfill site, component of landfill, disposal of sewage and solid waste, survey and planning of sanitary projects

3 Water Resources Engineering and Management (16 hours)

3.1 Introduction to open channel and pipe flow, classification of open channel flow, head loss, pressure variation in pipe, geometric elements of open channel flow

3.2 Introduction to hydrology and its scope, hydrological cycle, introduction in precipitation, infiltration, evapotranspiration, percolation, measurement of precipitation, interpolation techniques, hydrographs, flow duration curve
3.3 Importance of irrigation, status and need of irrigation in Nepal, different types of irrigation systems, components of irrigation system, layout of headworks and channel of irrigation system
3.4 Energy sources, introduction and need of hydropower, status of hydropower in Nepal, planning of hydropower project, components of hydropower projects, layout of hydropower system, installed capacity of hydropower project, run-off-the-river (RoR), peaking, storage and pumped storage projects
3.5 Highlights of the environment protection acts, process and criteria of IEE and EIA, government guidelines for EIA., mitigation measures
3.6 Watershed management, groundwater resources and management
3.7 Land acquisition, rehabilitation

4 Transportation Engineering, Management and Operation (8 hours)

4.1 Highway alignment selection, introduction to geometric design of road (Information to elements, camber, super elevation, cross drainage of road)
4.2 Introduction to Nepal road standard, operation and maintenance of road
4.3 Other modes of transportation (Air transport, river navigation, ropeways, rail transport), feasibility study of other modes of transportation
4.4 Public transport and parking space management in urban areas, location of EV charging stations and fuel stations

5 Quantity Survey, Cost Estimate and Property Valuation (10 hours)

5.1 Quantity survey and rate analysis
5.2 Cost estimation for different types of buildings, roads, canals, hydropower projects
5.3 Feasibility of tunnels
5.4 Costing of highway and tunnels
5.5 Cost estimation of water-supply and sanitary works
5.6 Property valuation

6 Project Management (6 hours)

6.1 Project scheduling – Considering during monsoon in the contexts of Nepal
6.2 Public procurement procedures – Procurement of goods and services
6.3 National and international practices of public procurement
6.4 Mal-practices and good practices of construction in Nepal
6.5 Causes of delays and their mitigations

Practical (30 hours)

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

1. Building drawings, quantity survey and cost estimate
   - 1.1 Plans, elevations and sections of a building
   - 1.2 Building foundation layout and typical foundation sections
   - 1.3 Detailing of floors, roofs and doors and windows
   - 1.4 Estimating quantity of building components
   - 1.5 Rate analysis of main items
   - 1.6 Cost estimate of a building
2. Water supply and sanitation
   - 2.1 Planning small rural water supply system
   - 2.2 Sizing of storm drainage
3. Water resources engineering
   - 3.1 watershed hydrology
   - 3.2 Measurement and acquisition of rainfall and discharge data
   - 3.3 Flood frequency analysis and flow duration curves
   - 3.4 Identify potential hydropower sites and determine plant size
4. Transportation engineering
   - 4.1 Fixing road and canal alignments and drawing cross-sections
   - 4.2 Sizing of cross drainage structures – Bridges and culverts
5. Familiarize with national building codes, building guidelines

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	12	12
2	8	8
3	16	16
4	8	8
5	10	10
6	6	6
Total	**60**	**60**

* There may be minor deviation in marks distribution.

References

1. Ricketts, J. T., Loftin, M. K., Merritt, F. S. (2004). Standard handbook for civil engineers. McGraw-Hill.
2. Mays, L. W. (2019). Water Resources Engineering. Wiley.
3. EPANET: Application for modeling drinking water distribution systems.
4. Dulal, K.N., Baral, S. (2012). Engineering hydrology. Apex Educational Academy.
5. Baral, S. (2013). Fundamental of hydropower engineering. Engineering and Education Services.

6. Dutta, B. N. (2022). Estimating and costing in civil engineering: Theory and practice (25th ed.). CBS Publishers.
7. Khanna, S. K., Justo, C. E. G. (2019). Highway engineering. Nem Chand & Bros.
8. DUDBC. (2020). Nepal National Building Code, NBC: 105: 2020: Seismic design of buildings in Nepal. Government of Nepal, Ministry of Urban Development.
9. DUDBC. (2015). Nepal National Building Code, NBC: 105: 2015: Architectural design requirements. Government of Nepal, Ministry of Urban Development.
10. Municipalities. Building codes of different municipalities.