



FARWESTERN UNIVERSITY
FACULTY OF ENGINEERING
Mahendranagar, Kanchanpur, Nepal

Syllabus for Lab Assistant (Civil Engineering)

Full Marks: 75

Pass marks:30

Time: 3 hrs

1.0 Knowledge on Construction Materials	
1.1	Type of construction materials available in different part of Nepal.
1.2	Properties of construction materials: physical, chemical, constituents, thermal etc.
1.3	Stone: Types, characteristics and requirements of stones as building materials. to confirm their strength and durability.
1.4	Brick: Types, properties of good bricks and requirements of bricks as building materials. Required tests to confirm their strength and durability.
1.5	Ceramic materials: Ceramic tiles, mosaic tiles, their uses and tests to confirm strength and durability.
1.6	Cementing materials: Types and properties of lime and cement. Constituents of lime and cement mortars, their uses and required tests to confirm their strength and durability.
1.7	Metals: Steel; types and properties; alloys their uses and tests. Aluminum, its properties, uses and tests.
1.8	Timber and wood: Different timber trees in Nepal, types and properties of wood, their uses and necessary tests.
1.9	Miscellaneous materials: Asphaltic materials (Asphalt, Bitumen and Tar); paints and varnishes; polymers; composites, etc.
2.0 Concrete Technology	
2.1	Constituents and properties of concrete (physical and chemical)
2.2	Water cement ratio, its importance
2.3	Grade and strength of concrete, concrete mix design, testing of concrete
2.4	High strength concrete: Ingredients, preparation, importance and uses.
2.5	Mixing, transportation pouring and curing of concrete
2.5	Admixtures and construction chemicals
2.6	Special concrete and concreting methods
2.7	Elasticity, creep and shrinkage of concrete
2.8	Durability of concrete
2.9	Pre-stressed concrete technology
2.10	Form work
2.11	Curing
3.0 Engineering Drawing	
3.1	Drawing sheet, its size, composition and essential components
3.2	Suitable scales, selection of scales, site plans, preliminary drawings, working drawings etc
3.3	Theory of projection drawing: perspective, orthographic and axonometric projection; first and third angle projection

3.4	Handling of drafting tools, equipments
3.5	Drafting conventions and symbols
3.6	Topographic, electrical, plumbing, sewage and structural drawings
3.7	Techniques of free hand drawing
3.8	Importance of drawing
4.0	Engineering Survey
4.1	Introduction, importance and basic principles of surveying
4.2	Linear measurements: techniques; chain, tape, ranging rods and arrows; representation of measurement and common scales; sources of errors; effect of slope and slope correction; correction for chain and tape measurements; Abney level and clinometers
4.3	Compass and plane table surveying: bearings; types of compass; problems and sources of errors of compass survey; principles and methods of plane tabling
4.4	Leveling and contouring: Principle of leveling; temporary and permanent adjustment of level; bench marks; booking methods and their reductions; longitudinal and cross sectioning; reciprocal leveling; trigonometric leveling; contour interval and characteristics of contours; methods of contouring
4.5	Theodolite traversing: Need of traverse and its significance; computation of coordinates; adjustment of closed traverse; closing errors
4.6	Uses of Total Station and Electronic Distance Measuring Instruments
4.7	Importance of GIS in surveying
5.0	Soil Mechanics
5.1	General 5.1.1 Soil types and classification 5.1.2 Three phase system of soil 5.1.3 Unit Weight of soil mass: bulk density, saturated density, submerged density and dry density 5.1.4 Interrelationship between specific gravity, void ratio, porosity, degree of saturation, percentage of air voids air content and density index
5.2	Soil Water Relation 5.2.1 Terzaghi's principle of effective stress 5.2.2 Darcy's law 5.2.3 Factors affecting permeability
5.3	Compaction of soil 5.3.1 Factors affecting soil compaction 5.3.2 Optimum moisture content 5.3.3 Relation between dry density and moisture content
5.4	Shear Strength of Soils 5.4.1 Mohr-Coulomb failure theory 5.4.2 Cohesion and angle of internal friction
5.5	Earth Pressures 5.5.1 Active and passive earth pressures 5.5.2 Lateral earth pressure theory 5.5.3 Rankine's earth pressure theory
5.6	5.6 Foundation Engineering 5.6.1 Terzaghi's general bearing capacity formulas and their application
6.0	Structural Analysis and Design

6.1	R.C. Sections in Bending 6.1.1 Under reinforced, over reinforced and balanced sections 6.1.2 Analysis of single and double reinforced rectangular sections
6.2	Shear and Bond for R.C. Sections 6.2.1 Shear resistance of a R.C. section 6.2.2 Types of Shear reinforcement and their design 6.2.3 Determination of anchorage length
6.3	Axially Loaded R.C. Columns 6.3.1 Short and long columns 6.3.2 Design of a rectangular column section
6.4	Design and Drafting of R.C. Structure 6.4.1 Singly and doubly reinforced rectangular beams 6.4.2 Simple one-way and two-way slabs 6.4.3 Axially loaded short and long columns

7.0 Building Construction Technology

7.1	Foundations 7.1.1 Subsoil exploration 7.1.2 Type and suitability of different foundations: Shallow, Deep 7.1.3 Shoring and dewatering 7.1.4 Design of simple brick or stone masonry foundations
7.2	Walls 7.2.1 Type of walls and their functions 7.2.2 Choosing wall thickness, Height to length relation 7.2.3 Use of scaffolding
7.3	Damp Proofing 7.3.1 Source of Dampness 7.3.2 Remedial measures to prevent dampness
7.4	Wood work 7.4.1 Frame and shutters of door and window 7.4.2 Timber construction of upper floors 7.4.3 Design and construction of stairs
7.5	Flooring and Finishing 7.5.1 Floor finishes: brick, concrete, flagstone 7.5.2 Plastering

8.0 Water Supply and Sanitation Engineering

8.1	General 8.1.1 Objectives of water supply system 8.1.2 Source of water and its selection: gravity and artesian springs, shallow and deep wells; infiltration galleries.
8.2	Gravity Water Supply System 8.2.1 Design period
8.3	Design of Sewer 8.3.1 Quantity of sanitary sewage 8.3.2 Maximum, Minimum and self cleaning velocity

8.4	Excreta Disposal and Unsewered Area 8.4.1 Pit latrine 8.4.2 Design of septic tank
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9.0 Irrigation Engineering

9.1	General 9.1.1 Advantages and Disadvantages of irrigation
9.2	Crop Water Requirement 9.2.1 Crop season and crop water requirement for principal crops 9.2.2 Duty delta and base period
9.3	Irrigation Canals 9.3.1 Canal losses and their minimization 9.3.2 Maximum and minimum velocities 9.3.3 Design of irrigation canal section using Manning's formula 9.3.4 Need and location of weir/barrage 9.3.5 Head works for small canals

10.0 Highway Engineering

10.1	General 10.1.1 Introduction to transportation systems 10.1.2 Historic development of roads in Nepal 10.1.3 Classification of road in Nepal 10.1.4 Basic requirements of road alignment
10.2	Geometric Design 10.2.1 Basic design control and criteria for design 10.2.2 Elements of cross section, typical cross-section for all roads in filling and cutting 10.2.3 Camber 10.2.4 Determination of radius of horizontal curves 10.2.5 Super elevation 10.2.6 Sight distances 10.2.7 Gradient 10.2.8 Use of Nepal Road Standard and subsequent revision in road design
10.3	Drainage System 10.3.1 Importance of drainage system and requirements of a good drainage system
10.4	Road Pavement 10.4.1 Pavement structure and its components: subgrade, sub-base, base and surface
10.5	Road Machineries 10.5.1 Earth moving and compacting machines
10.6	Road Construction Technology
10.7	Bridge 10.7.1 T-beam bridge 10.7.2 Timber bridges
10.8	Road Maintenance and Repair 10.8.1 Type of maintenance Works

10.9	Tracks and Trails
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Type of Questions	Number of questions	Marks for each questions	Total marks
Subjective Type Questions	6	10	60
Objective Type Questions	15	1	15
Total			75