

Concrete Technology and Masonry Structures
BEG 351 CI

Year: III

Semester: I

Teaching Schedule Hours/week			Examination Scheme				Total Marks		
			Final		Internal Assessments				
			Theory	Practical	Theory	Practical			
L	T	P	Duration	Marks	Duration	Marks			
3	2	2/2	3	80	-	-	20	25	125

Course Objective:

After completion of this course, the students will be well aware of concrete technology and masonry structures. They will be well aware of various properties of concrete ingredients and will also be able to design concrete mix of different grades using different methods. The students will also learn the tools and techniques of quality control in different stages of use of concrete. They will also learn classification, construction technologies and behavior of masonry structures. The students will be able to analyze and design masonry structures for gravity and lateral loads.

Course Contents:

1.0 Constituents of Concrete

(8 hrs)

- 1.1 Aggregates
 - 1.1.1 Classification
 - 1.1.2 Gradation
 - 1.1.3 Characteristics and significance
- 1.2 Cement
 - 1.2.1 Oxide and compound composition
 - 1.2.2 Hydration of cement
- 1.3 Admixtures
 - 1.3.1 Types, uses and effects
 - 1.3.2 Local materials as admixtures in Nepal
- 1.4 Water
 - 1.4.1 Quality of water for use in concrete for various purposes
 - 1.4.2 Water cement ratio, workability, segregation, bleeding and other Properties of fresh concrete

2.0 Mix Design of Cement Concrete

(8 hrs)

- 2.1 Introduction of Nominal mix
- 2.2 Mix design by DOE, ACI and IS methods
- 2.3 Some aspects of probabilistic approach on strength
- 2.4 Choice of constituents in different mixes
- 2.5 Curing
- 2.6 Properties of hardened concrete

3.0 Strength of Concrete

(6 hrs)

- 3.1 Concrete as a three-phase system
- 3.2 Strength - porosity relationship
- 3.3 Various types of strengths and their tests
- 3.4 Behavior of concrete under various conditions: Stress variation, effect of time and temperature, cyclic and dynamic loads

4.0 Dimensional Stability of Concrete

(3 hrs)

- 4.1 Stress-Strain relationship of concrete
- 4.2 Modulus of elasticity
- 4.3 Durability
- 4.4 Shrinkage and Creep
- 4.5 Thermal Properties

5.0	Constituents of Masonry Structures	(3 hrs)
5.1	Masonry Units	
5.1.1	Bricks	
5.1.2	Stones	
5.1.3	Adobes	
5.1.4	Concrete blocks	
5.1.5	Bonds in Bricks	
5.2	Mortar	
5.2.1	Properties of wet mortar	
5.2.2	Strength of mortar	
6.0	Testing of Masonry Structures	(3 hrs)
6.1	Basic Physical Tests	
6.2	Determination of mortar strengths	
6.3	Determination of brick strengths	
6.4	Determination of stone strengths	
7.0	Design of Masonry Structures	(12 hrs)
7.1	Design of masonry in compression	
7.2	Design of masonry in bearing	
7.3	Design of masonry in bending	
7.4	Design of masonry in shear	
7.5	Design and detailing of reinforced masonry structures	
8.0	Strengthening of Masonry Structures	(2 hrs)
8.1	Traditional and modern methods: Use of bond stones, bands in masonry Structures	
8.2	Introduction of composite masonry	
8.2.1	Infill walls in reinforced concrete frames	
8.2.2	Use of bamboo in masonry structures	

Laboratories:

- (i) Mixed design of concrete by DOE, ACI and IS methods
- (ii) Compressive strength test of cube and cylinder
- (iii) Compressive and Tensile test of brick masonry

References:

- A. M. Neville, J. J. Brook, Concrete Technology, International Students' Edition
- M. S. Shetty, Concrete Technology: Theory and Practice, S. Chand, New Delhi, 2005
- P. K. Mehta, Paulo J. M. Monteiro, Concrete, Microstructure, Properties and Materials, University of California, Berkley (Indian Edition)
- A. S. Arya, Masonry and Timber Structures Including Earthquake Resistant Design, Nem Chand and Bros, Roorkee, 1987
- A.W. Handry, B.P. Sinha, S.R. Davies, An Introduction to Load Bearing Brick Design, University of Edinburgh, 1981
- P. Dayaratnam, Brick and Reinforced Brick Structures, Oxford and IBH Publishing Co. Pvt. Ltd. 1987
- IS: 456 – 2000
- IS: 383 – 1970
- IS:1905 – 1987
- SP 20: 1991
- Nepal National Building Code (NBC) 109, 1994
- Course Manual on Concrete Technology by M. P. Aryal
- Course Manual on Masonry Structures by M. P. Aryal