Irrigation Engineering
BEG363CI

Year: III **Semester: II**

Teaching Schedule Hours/week			Examination Scheme						Total Marks
			Final				Internal Assessments		
			Theory		Practical		Theory	Practical	
L	T	P	Duration	Marks	Duration	Marks			
3	2	-	3	80	-	-	20	-	100

Course Objective:
The objective of the course is to provide fundamental knowledge of irrigation engineering. After completing this course students are expected to address the irrigation problems properly.

Course Contents:

1.0 Introduction (2 hrs)
- 1.1 Definition of irrigation
- 1.2 Functions, advantages and disadvantages of irrigation
- 1.3 Status of irrigation development in Nepal

2.0 Soil Water Relationship (5 hrs)
- 2.1 General classification of soil for agricultural purposes
- 2.2 Soil-Moisture / Crop-water requirement
- 2.3 Factors affecting Crop-Water Requirements
- 2.4 Crop-Water requirement calculation by Penman method and computer software (CROPWAT-8)
- 2.5 Principal crops, their seasons and water requirements
- 2.6 Method of applying water to irrigation field as surface, sub-surface and Sprinkler methods
- 2.7 Techniques of surface irrigation and their suitability
- 2.8 Advantage and disadvantage of surface, sub-surface and sprinkler irrigation
- 2.9 Design of sprinkler irrigation system

3.0 Canals (4 hrs)
- 3.1 Classification of canals according to function, discharge, alignment
- 3.2 Components of the canal system, head works, major Canal, Branch Canal, distributary and water Courses
- 3.3 Canal alignment
- 3.4 Canal losses due to seepage and evaporation
- 3.5 Assessment of water requirement in canals and command Area
- 3.6 G. C. A., C. C. A., N. C. A., Duty, delta and their relationships
- 3.7 Base period, kor period and kor depth

4.0 Design of Canals (7 hrs)
- 4.1 Manning's uniform flow equation
- 4.2 Semi-theoretical approaches of canal design
- 4.3 Design of stable canal in alluvium
- 4.4 Silt theory of Kennedy and Lacy and their comparison
- 4.5 Lined canals, various types of lining, advantages and economics of Lining
- 4.6 Design of lined Canals

4.7 Cross-Section of Canal, berms, banks, roadways and spoil banks, balance depth

5.0 Headwork's and Distribution System (7 hrs)

5.1 Function and components of head works, their types
5.2 Principle of design for surface flow, (Location, waterway, shapes, crest level, length and thickness of impervious flow)
5.3 Principle of design for sub-surface flow of structure: Bligh's, Lane's and Khosla's seepage theory.
5.4 Different types of canal outlets, design of pipe outlet (free and submerged)
5.5 Design consideration of distribution system

6.0 Hydraulic Structures for Canals (7 hrs)

6.1 Different types of hydraulic structures
6.2 Types of cross drainage structures, conditions of applications and their designs (Aqueduct and siphon aqueducts)
6.3 Distributary heads regulator and cross regulator and their design
6.4 Escapes and their types
6.5 Falls, their types and design of vertical drop fall (crest, length and thickness of impervious floor)

7.0 Water Logging and Drainage (4 hrs)

7.1 Causes and effects of water logging
7.2 Preventive measures of water logging
7.3 Surface drainage, sub-surface drainage and their design.
7.4 Reclamation of water logged areas by different methods

8. River Training (4 hrs)

8.1 River training and its necessity
8.2 Stages of rivers and their meandering processes
8.3 Methods of river training,
8.4 Design of guide bund and launching apron
8.5 Design of spurs (layout geometry, length, spacing and cross-section)
8.6 Effects of degradation on the hydraulic structures

9.0 Planning and Management of Irrigation System (3 hrs)

9.1 General irrigation system planning
9.2 Organization and irrigation management
9.3 Operation and maintenance of irrigation systems
9.4 Institutional aspects of irrigation system management

10.0 Introduction to Farmer managed irrigation system (2 hrs)

10.1 Introduction of FMIS in Asian & Nepalese context
10.2 Introduction to water resources act, policy, water plan, water strategy and irrigation regulation and legislation, environment act & guidelines, formation and management of FMIS organization (by participatory approach)
10.3 Water right issues – statuary & customary right, water allocation & arrangement, water related disputes & resolutions, use of Uphoff's matrix on irrigation management

Field Visit:
Three days field visit of irrigation system, group presentation and submission of individual report to the respective teacher.

References:

- R. S. Varshney, S. C. Gupta and R. L. Gupta, Theory and Design of Irrigation Structures, Nem Chand and Bros., Roorkee, 2010.
- Bharat Singh, Fundamentals of Irrigation Engineering, Nem Chand and Bros., Roorkee, 2008.
- Design Manual for Irrigation Projects in Nepal, PDSP Manuals, February, 1990.
- S. N. Poudel, Irrigation Development in Nepal, Kathmandu, 1986.
- S. K. Garg, Irrigation Engineering and Hydraulic Structures, Delhi, 1983.
- Design Guidelines for Surface Irrigation in Terai and Hills of Nepal, Volume I and II, WECS, Kathmandu, 1988.
- Choudhari, L.N.: A course manual on FMIS (Farmer Managed Irrigation System), nec publication (2004)
- Guidelines for Predicting Crop water Requirements, FAO Irrigation and Drainage paper 24 (1977)
- Pradhan, Prachanda, (1989): Partners of Irrigation Organization in Nepal: Country paper-Nepal No. 1: Comparative Study of 21 farmer managed irrigation system, Colombo Srilanka
- Uphoff, Norman (1986): Improving Irrigation management with farmer participation, Boulder, Colorado and London, West view Press.