GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL AND INFRASTRUCTURE ENGINEERING
IRRIGATION AND WATER RESOURCES ENGINEERING
SUBJECT CODE: 2174001
B.E. 7th SEMESTER

Type of Course: Core

Prerequisite: Fluid Mechanics and Hydraulics

Teaching and Examination Scheme:

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Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA(M)	Viva	PA (I)	
3	2	0	5	70	30	30	20	150

Contents:

Sr.No.	Topics	Hrs.	% Weightage
1	**Hydrology** **Surface Water Hydrology:** Hydrologic cycle, water budget, precipitation and Abstractions; Evaporation and Evapotranspiration. Runoff and Hydrographs: Rainfall runoff relations, time area concept, flow duration curve, mass curve, flow hydrograph, Unit Hydrograph (UH), its analysis, S-curve hydrograph, Discharge Measurement: Stream gauging, Flow rating curve, Use of current meters for velocity measurement, Estimation of discharge. **Ground Water Hydrology:** Types of aquifers and properties (storage coefficient, coefficient of transmissibility), confined and unconfined aquifer, Tube wells and Open wells. Yield from an open well. Water logging, land drainage, benefits, classification of drains, surface drains, subsurface drains, design principles and maintenance of drainage systems.	**10**	**25%**
2	**Basics of Irrigation Engineering:** Crop water requirements, Irrigation methods, necessity of Irrigation in India, advantages and	**3**	**7.5%**

	disadvantages, techniques of irrigation water, quality of irrigation water, crop water requirements, consumptive use, Irrigation requirements, estimation of consumptive use of water by climatic approaches, Irrigation efficiencies, Soil moisture-irrigation relationship.		
3	**Canal Irrigation:** Classification of canals, Canal losses, alignment of canals, Design of Irrigation Canals, Design of stable channels using Kennedy's and Lacey's theory, Cross section of irrigation canals, Lining of Irrigation Canals, Design of lined canals. Types of Cross-Drainage Works, Canal Falls, Weirs and Barrages, Layout of a diversion head work, Design of weirs and barrages: Bligh's creep theory, Design of weir using theory, Lane's weighted creep theory, Khosla's theory, Khosla's method of independent variables, Exit gradient	**8**	**20%**
4	**Dams:** Various forces acting on gravity dam, Combination of forces for design, modes of failure and criteria for structural stability, High and low gravity dam, Design of high dam, Earth and Rock fill Dams: Types, Causes of failure, Stability analysis of earthen and gravity dam, Seepage control in earth dams, Spillways: Descriptive study of various types of spillways Reclamation of Water Logged and Saline Soils: Causes and control of water logging. Reclamation of saline and alkaline land.	**10**	**25%**
5	**Reservoir planning** - Investigations - zones of storage in a reservoir, determination of storage capacity and yield, reservoir sedimentation Floods, Routing and Drought management, Concepts of return period, flood frequency analysis, Hydrologic storage routing, Flood forecasting - Flood routing, water harvesting, check dams.	**9**	**22.5%**
	Total	**40**	**100**

Reference Books:

1. SK Garg ,Irrigation engineering and hydraulic structures,, Khanna Publishers
2. BC Punamia, Pandey BB Lal, Irrigation and water power engineering, Standard Publishers
3. SK Sharma,Principles and practice of irrigation engineering, S Chand and Company
4. Punmia, B.C., Irrigation and Water Power Engineering, Standard Publishers, 2001.Ragunath. H.M., Hydrology, Willey Eastern Limited, New Delhi, 2000.
5. K.Subramanya (2004), Engineering Hydrology, Tata-McGraw Hill, New Delhi.
6. Asawa, G.L. (2005). Irrigation and Water Resources Engineering, New Age International Ltd.
7. Elizabeth M Shaw ,Hydrology in practice

8. M.H.Ali, Fundamentals of irrigation and on-farm water management volume - 1
9. M.H.Ali, Practices of irrigation and on-farm water management volume - 2
10. Irrigation Engg. By Birdie and Das, Dhanpat Rai, New Delhi
11. Irrigation Engg. By Sharma and Sharma, S. Chanda and Company, New Delhi
12. Todd D.K., "Groundwater Hydrology", John Wiley & Sons, Inc, New York,
13. Bear J., "Hydraulics of Groundwater", McGraw-Hill, New York,
14. Irrigation, Water Resources and water power engineering-P. N. Modi ,Standard Book House,
15. Srivastava, R. (2008). Flow through Open Channels, Oxford University Press,
16. Ven Te Chow, David Maidment and Larry Mays (2001), Applied Hydrology, Tata McGraw
17. Hill, New Delhi, India,
18. C.S.P. Ojha, R, Berndtsson and P. Bhunya, Engineering Hydrology, Oxford University Press, New Delhi,
19. R.A. Wurbs and W.P. James, Water Resources Engineering, Prentice Hall of India, New Delhi,
20. R.K. Sharma and T.K. Sharma, Hydrology and Water Resources Engineering, Dhanpat Rai Publications, New Delhi,
21. R.K. Linsley, J.B. Franzini, D.L. Freyberg and G. Tchobanoglous, Water Resources Engineering, McGraw Hill Singapore,
22. V.P. Singh, Elementary Hydrology, Prentice Hall, Englewood Cliffs, New Jersey.

Course Outcome:

After learning the course the students should be able to:

1. Conceptual understanding of Irrigation engineering,
2. Compute mean precipitation from a catchment
3. Compute infiltration rate and capacity
4. Calculate runoff from a catchment
5. Compute peak flood flow
6. Compute reservoir capacity using mass curve
7. Compute dependable flow using flow duration curve for the requirement of irrigation, power generation etc.
8. Basic idea about reservoir sedimentation and its control
9. Compute the capacity of well
10. Estimation of design flood for the design of hydraulic structure
11. Measures of water conservation to battle drought

List of Tutorials:

1. To determine rate of infiltration and infiltration capacity using double ring infiltrometer.
2. Measurement of rainfall
3. Estimation of flood using unit hydrograph
4. Computation of rate of infiltration using infiltrometer
5. Computation of live and dead storage capacity of reservoir

6. Flood routing of reservoir and channel
7. Calculation of dependable flow.
8. Determination of capacity of well.
9. Calculation of power of a hydro-power plant

List of Open Source Software/learning website: http://en.wikipedia.org/wiki/Hydrology
http://nptel.ac.in/courses/105104103/

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N	E Level	C
10	**15**	**20**	**20**	**25**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above

Active Learning Assignments

Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.