URBAN HYDROLOGY AND MANAGEMENT OF STORM DRAINAGE SYSTEM

(Professional Elective-4)

II Semester

Course Code: 19CE2165	L	P	C
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Prerequisites: Water Resource Engineering

Course Outcomes:

At the end of the course, the student will be able to:

CO1 Identify basic requirements of urban water supply.

CO2 Examine the effects of urbanisation catchment and characteristics and hydrological cycle.

CO3 Estimate Urban Waste water using different methods in different disposal systems.

CO4 Examine and analyse different storm water disposal facilities.

CO5 Demonstrate the basic knowledge to improve storm water quality by proper operation, and maintenance of urban drainage system.

UNIT-I: (10 Lectures)

INTRODUCTION – HISTORICAL DEVELOPMENT

Sources of water, Water supply and waste water disposal systems. Urban water supply demand forecast, factors affecting rate of demand, water quantity requirements, water pressure requirements, hydraulics of distribution system.

Learning outcomes:

1. Illustrate the sources of Water, Water Supply and Waste Disposal System (L4)
2. Explain about Urban Demand Forecasting (L2)

3. Discuss about factors affecting the Demand (L2)

UNIT-II: (10 Lectures)

URBAN HYDROLOGICAL CYCLE

Effects of urbanization on catchment hydrology, planning objectives, interaction of urban and surrounding areas, approaches to urban drainage, separate and combined systems, data requirements, master drainage plans.

Learning outcomes:

1. Illustrate effects of urbanization on Catchment Hydrology (L4)
2. Discuss about various approaches to urban drainage (L2)
3. Explain the data requirements of drainage plans (L2)

UNIT-III: (10 Lectures)

ESTIMATION OF URBAN WASTEWATER QUANTITY AND QUALITY

Estimation of urban storm water quantity, catchment characteristics, process parameters, hydrological losses in developing, watersheds, design period, calculation of runoff and peak flow. Rational method, NRCS curve number method, hydrologic and hydrodynamic methods. Trends of urbanization and industrialization – domestic waste water and industrial wastewater, various types of urban-runoff, storm runoff and wastewater collection systems – types of sewer systems – sewer network analysis – quality aspects – receiving water quality standards.

Learning outcomes:

1. Illustrate the Estimation of Quantity of Urban Storm Water (L4)

2. Explain sewer system types, network analysis (L2)
3. Discuss about quality aspects Urban water (L2)

UNIT-IV: (10 Lectures)

STORM WATER STORAGE FACILITIES

Planning for local disposal by infiltration and percolation, roof top storage, detention ponds, storage at sewer treatment plants. Estimating the storage volumes – sizing of infiltration and percolation basins, detention facilities, design of storm sewer network systems – Linear Reservoir Model (Viessmen) – Chere and Shubinski model – QUURM model – TVA model, Stormwater assessment to design a system at city level.

Learning outcomes:

1. Illustrate the storage facilities of Storm Water (L4)
2. Discuss about various models for storm water(L2)
3. Design storm water system at city level (L6)

UNIT-V: (10 Lectures)

STORMWATER MANAGEMENT

Storm water quality enhancement – Storm water pollutants, suspended solids in stormwater, sedimentation principles. Use of models – SWMM, SMADA, Operation and maintenance of urban drainage system, interaction between urban drainage and solid waste management.

Learning outcomes:

1. Illustrate the enhancement of the quality of stormwater (L4)
2. Explain about operation and maintenance of Urban Drainage System (L2)
3. Discuss the interaction between urban drainage and solid waste management (L2)

Text Books:

1. Hal M J, Urban Hydrology, 2nd Edition, Wlsevier Applied Science Publishers, 1984.
2. Viessman W.I., Knapp J.W., Leuis G.L. and Heutrough, T.E.,Introduction to Hydrology, 2nd edition, Harper and Row Publishers, 1977.
3. Stephenon D. Stormwater Hydrology and Drainage 2nd edition, Elwiver publishers, 1981.

References:

1. Adams, B.J. and Papa F Urban Storm water Management Planning 2000.
2. Chertus D.E., and Madana M.E., StormWater Modelling Academic Press, 2 nd edition, NY, 1976.
3. Genger, W.F., Marsaiek, J. Zudimaand Rawis, G. J, (1987) Manual on Drainage in Urban Areas 2 volumes, UNESCO, Press.
4. Overterns D.E., and Medows M.E., Urban Hydrology,Acadmic Press, NY 1976.
5. Stalne PUrbonas B, StormWater Detention for Drainage, Water Quality and CSO Management, Prentice Hall, New Jersey, 1994.
6. Timothy R.Lopenz, Urban Hydrology, Ann Arbor Publishers Co. M.I., 1979.
7. Wanielista, M.P., and Yousef, Y.A, Stormwater Management, 2nd Edition, John Willy Sons, Inc. New York, 1993.