

4. SCHEME OF STUDIES AND EXAMINATIONS:

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

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit; ESE - End Semester Examination; PA - Progressive Assessment

5. COURSE DETAILS

Unit	Major Learning outcomes (in cognitive domain)	Topics and Sub Topics
Unit- I Introduction	1a. Discuss the concepts and importance of Water Resources Management (WRM). 1b. Identify various agencies associated with Water Resource Management.	1.1 Scope of W.R.M. 1.2 Necessity of W.R.M. 1.3 Role of various agencies in W.R.M.: - Agriculturists - Meteorologists - Geologists - Industrialists - Scientists - Biologists - Water quality Control (Authority) - Mechanical Engg. - Electrical engg.- Economists - Social workers- NGO's - Politicians - General Public
Unit-II Hydrology	2a. Explain Hydrological cycle. 2b. Describe various forms and types of precipitation. 2c. Explain various types of rain gauges. 2d. Compute average precipitation by various methods. 2e. Compute runoff using empirical formula. 2f. Describe evaporation process and factors	2.1 Define Hydrology 2.2 Hydrological cycle 2.3 Forms of precipitation 2.4 Precipitation occupancy & its types. 2.5 Measurement of rain fall 2.5.1 Rain gauges Non Recording Recording - Float type - Tipping bucket - weighing bucket 2.5.2 Methods of determining average rainfall b. Arithmetic average method

	affecting it.	c. Theissen polygon method d. Isohytel method 2.5.3 Determine optimum no. of rain gauges for given catchment area. 2.6 Runoff 2.6.1 Factors affecting runoff 2.6.2 Runoff calculation using empirical formula only 2.7 Evaporation, Transpiration & Evapo - transpiration 2.7.1 Factors affecting evaporation.
Unit-III Ground Water	3a. Identify various sources of water. 3b. Describe various terms related to “ground water” 3c. Explain various types of wells with their features. 3d. Discuss necessity of recharging ground water. 3e. Describe various methods of recharging ground water.	3.1 Sources of water 3.2 Importance of ground water and present scenario 3.3 Terms related to groundwater engineering: Aquifer, Aquiclude, Aquifuge, Aquitard, porosity, Specific yield, Specific retention, storage coefficient, coefficient of permeability, coefficient of transmissibility, Yield, specific yield 3.4 Types of well - Open, Tube and flowing well - concept, location and importance 3.5 Necessity of recharging 3.5.1 Artificial recharging as today’s need. 3.5.2 Types of artificial recharge - Spreading method. - Pit method / khet-talavadi - Induced recharge method - Recharge well method. - Sub-surface dam. - Check dam series - Ponds - Unlined canals
Unit-IV Storage Works	4a. Describe various surveys / investigations to be carried out in storage works including their classification.	4.1. Survey and investigations. a. Investigations for hydrologic data b. Geological data. c. Topographic investigations. d. Collection of legal data, water right.

	<p>4b. Compute reservoir capacity and losses.</p> <p>4c. Discuss purpose of various storage zones of reservoir.</p> <p>4d. Draw cross-sections of gravity and earthen dam at various points.</p>	<p>e. Investigation of reservoir site, land acquisition Environmental considerations</p> <p>f. Economical data - Benefit cost ratio.</p> <p>4.2. Site selection for reservoir</p> <p>4.3. Methods of estimating reservoir capacity</p> <p>4.4. Storage zones</p> <p>4.5. Reservoir losses</p> <p>4.6. Reservoir sedimentation and its control</p> <p>4.7. Classification of storage works .</p> <p>4.8. Factors for selecting type of dam</p> <p>4.9. Concept of low and high dam</p> <p>4.10. Component parts of gravity and earthen dam</p>
Unit-V Distribution Works	<p>5a. Explain purpose of distribution works</p> <p>5b. Differentiate between barrage and weir by means of a diagram</p> <p>5c. Describe silt control structures</p> <p>5d. Classify canals based on their functions.</p> <p>5e. Explain factors affecting canal alignment</p> <p>5f. Discuss suitable construction techniques, materials & equipments for "canal lining."</p> <p>5g. Explain the causes, effects & prevention of water logging.</p>	<p>5.1 Purpose of distribution works</p> <p>5.2 Component parts & sketches.</p> <p>5.3 Barrage.</p> <p>5.4 Weir</p> <p>5.4.1 Comparison of weir and barrage.</p> <p>5.4.2 Causes of failure of weir and remedial measures</p> <p>5.5 Safe exit gradient</p> <p>5.6 Control of silt entry Scouring sluices, silt excluder, silt ejector, head regulator.</p> <p>5.7 Classifications of canal</p> <p>-Ridge and contour</p> <p>Functions of each according to network.</p> <p>Line diagram of network of canal.</p> <p>5.8 Canal Alignment Factors influencing canal alignment .</p> <p>5.9 Regime & semi-regime conditions.</p> <p>5.10 Canal lining.</p> <p>a. Advantages.</p> <p>b. Types of canal lining materials</p> <p>c. Methods of canal lining.</p> <p>5.11 Regulation works.</p> <p>5.12 C.D. Works. -Types , functions & sketches</p> <p>5.13 Outlets. - types, situation, functions & sketches</p> <p>5.14 Water-logging, effects, causes &</p>

		prevention
Unit –VI Watershed Development	6a. Describe important characteristics of "water shed". 6b. Evolve strategies of enhancing people's participation in watershed management.	6.1. Concept of 'watershed' 6.2. Characteristic of watershed, size, shape, physiography, slope, climate, drainage, land use, vegetation, geology, hydrology, hydrogeology, socio-economics. 6.3. Watershed management & people's participation.. 6.4. Role of co-operative society in watershed management.
Unit-VII Water Harvesting Structures	7a. Describe necessity and importance of rain water harvesting . 7b. Discuss various 'rain water harvesting' methods, structures and their suitability in various conditions.	7.1 Necessity of Rain water harvesting 7.2 Importance of Rain water harvesting 7.3 Rain water harvesting methods - Check dams. - Nala / Gully plugging - Percolation tank. - Khet-talawadi - Roof harvesting - Vegetation and plantation

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I.	Introduction	3	2	3	2	7
II.	Hydrology	8	4	3	7	14
III.	Ground Water	7	3	5	6	14
IV.	Storage Works	8	3	4	7	14
V.	Distribution Works	6	2	2	3	7
VI.	Water Shed Development	6	3	2	2	7
VII.	Water Harvesting Structures	4	3	2	2	7
		42	20	21	29	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers.

The actual distribution of marks in the question paper may vary slightly from above table.