

<p align="center"><b>Course Title: Water Resources Management</b>  [As per Choice Based Credit System (CBCS) scheme]  SEMESTER: VI</p>			
Subject Code	15CV661	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
<b>CREDITS – 03</b>		<b>Total Marks-100</b>	
<p><b>Course objectives:</b> This course will enable students to;</p> <ol style="list-style-type: none"> <li>1. Judge surface and ground water resources.</li> <li>2. Address the issues of water resources management.</li> <li>3. Learn the principles of integrated water resources management.</li> <li>4. Understand the legal framework of water policy.</li> <li>5. Know the different methods of water harvesting.</li> </ol>			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<b>Module -1</b>			
<p><b>Surface and Ground water Resources:</b> Hydrologic Cycle, Global water resources and Indian Water resources, Surface Water Resources, Water Balance, Available Renewable Water Resources, Water Scarcity, The Water Balance as a Result of Human Interference, Groundwater Resources, Types of Aquifers, Groundwater as a Storage Medium</p>		8 hours	L2, L3
<b>Module -2</b>			
<p><b>Water Resources Planning and Management:</b> Necessity, System components, planning scales, Approaches, planning and management aspects, Analysis, Models for impact prediction and evaluation, Adaptive Integrated Policies, Post Planning and management Issues.</p>		8 Hours	L2, L3
<b>Module -3</b>			
<p><b>Integrated Water Resources Management:</b> Definition of IWRM, Principles, Implementation of IWRM, Legislative and Organizational Framework, Types and Forms of Private Sector Involvement.</p>		8 Hours	L3, L4
<b>Module -4</b>			
<p><b>Water Governance and Water Policy:</b> Legal Framework of Water – Substance of National Water Laws – Other key issues – Changing incentives through Regulation - National Water Policy – National-Level Commissions – Irrigation Management Transfer Policies and Activities – Legal Registration of WUAs – Legal Changes in Water Allocation, – Role of Local Institutions – Community Based Organizations – Water Policy Reforms: India.</p>		8 Hours	L2, L3
<b>Module -5</b>			

<p>Water Harvesting and Conservation: Water Harvesting Techniques – Micro-catchments - Design of Small Water Harvesting Structures – Farm Ponds – Percolation Tanks – Yield from a Catchment, Rain water Harvesting-various techniques related to Rural and Urban area.</p>	<p>8 Hours</p>	<p>L<sub>2</sub>, L<sub>3</sub></p>
<p><b>Course outcomes:</b> After studying this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Assess the potential of groundwater and surface water resources.</li> <li>2. Address the issues related to planning and management of water resources.</li> <li>3. Know how to implement IWRM in different regions.</li> <li>4. Understand the legal issues of water policy.</li> <li>5. Select the method for water harvesting based on the area.</li> </ol>		
<p><b>Program Objectives:</b></p> <ul style="list-style-type: none"> <li>• Engineering knowledge</li> <li>• Problem analysis</li> <li>• Interpretation of data</li> </ul>		
<p><b>Question paper pattern:</b></p> <ol style="list-style-type: none"> <li>1. The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks</li> <li>2. There will be two full questions (with a maximum of two subdivisions) from each module.</li> <li>3. Each full question shall cover the topics as a module</li> <li>4. The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.</li> </ol>		
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. K. Subramanya, “Engineering Hydrology”, Tata McGraw Hill Publishers, New Delhi.</li> <li>2. H.M. Raghunath, “Ground Water”, Wiley Eastern Publication, New Delhi.</li> <li>3. Daniel P. Loucks and Eelco van Beek, “Water Resources Systems. Planning and Management”, UNESCO Publication.</li> <li>4. Mollinga, P. et al, “Integrated Water Resources Management”, Water in South Asia Volume I, Sage Publications, 2006.</li> <li>5. Singh, Chhatrapati “Water Rights in India,” Ed: Chhatrapati Singh. Water Law in India: The Indian Law Institute, New Delhi, 1992.</li> <li>6. 6) Dhruva Narayana, G. Sastry, V. S. Patnaik, “Watershed Management”, CSWCTRI, Dehradun, ICAR Publications, 1997.</li> </ol>		
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Lal, Ruttan. “ Integrated Watershed Management in the Global Ecosystem”. CRC Press, New York.</li> <li>2. Heathcote, I. W. Integrated Watershed Management: Principles and Practice. 1988. John Wiley and Sons, Inc., New York.</li> </ol>		