

<b>Course title:</b> Water Conservation				
<b>Course code:</b> NRE 185	<b>No. of credits:</b> 3	<b>L-T-P:</b> 30-12-0	<b>Learning hours:</b> 42	
<b>Pre-requisite course code and title (if any):</b>				
<b>Department:</b> Department of Natural Resources				
<b>Course coordinator:</b>		<b>Course instructor:</b> Dr Amit Singh		
<b>Contact details:</b>				
<b>Course type:</b> Elective		<b>Course offered in:</b> Semester 2		
<b>Course Description</b>				
<p>The reasons for increased interest in protecting water concern over increased vulnerability to water-related stress are not difficult to discern. The users of water fall into three sectoral categories namely, agriculture, domestic and industrial sector. While agriculture sector demands a huge share of water for irrigation, the industrial and domestic sectors are mainly responsible for contaminating fresh water sources. Long term sustainability of fresh water resources cannot be guaranteed measured in terms of both availability and quality. Efficient water resources management and water conservation practices are a need of the time. This course will expose the students to (i) Introduction to water resources evaluation and assessment - SPAC, WUE, methods of assessment, sectoral water use and demand, assessment of water stress and need for water conservation and (ii) Water resources conservation and management including institutional and policy aspects such as rainwater harvesting, conjunctive water use, catchment planning, watershed management, irrigation use and efficiency, advanced treatment systems and zero discharge, participatory irrigation management including methods of minimizing evaporation losses, water pricing, river basin organizations, collective action and decentralization etc.</p>				
<b>Course objectives</b>				
<ol style="list-style-type: none"> <li>1. To understand and assess (quantify) fresh water resources</li> <li>2. To develop an understanding of various water conservation techniques</li> <li>3. To understand water policy guidelines, water conservation</li> </ol>				
<b>Course content</b>				
SNo	Topic	L	T	P
1.	Introduction to water conservation and assessment Severity of water crisis, importance of conservation Soil, Plant, Atmosphere Continuum (SPAC); Water use efficiency (WUE) Methods of water resources assessment (hydrology cycle, surface flow assessment, groundwater recharge assessment) Water stress: principles and indicators for assessing water stress Water quality assessment: indicators for assessing water quality	12	4	
2.	Water resources conservation and management Water conservation measures Soil moisture retention and conservation (cover crop, mulching, etc) Traditional systems and man-made structures (ponds, tanks, reservoirs, Minimizing evaporation losses Rainwater harvesting and groundwater recharging Irrigation: types, scheduling, efficiency and designing	12	6	

3.	Water auditing; Water treatment, recycling and reuse leading to water conservation, Industrial and urban water management leading to cleaner production, Institutional mechanisms for water management, programmes and policies for integrated water management	6	2	
	<b>Total</b>	<b>30</b>	<b>12</b>	
<b>Evaluation criteria</b>				
<ul style="list-style-type: none"> <li>▪ 2 minor tests: 20% each</li> <li>▪ Tutorial and Quizzes: 20%</li> <li>▪ Major: 40%</li> </ul>				
<b>Learning outcomes</b>				
<ol style="list-style-type: none"> <li>1. Ability to suggest efficient water use techniques and reduce water losses in the agriculture, domestic and industrial sectors</li> <li>2. Apply water auditing techniques including suggest measures for water recycling and reuse, so should be able to decide on water quality standards as well</li> <li>3. Management of artificial water recharge systems and judge their efficacy</li> </ol>				
<b>Pedagogical approach</b>				
<b>Materials</b>				
Required text				
<ol style="list-style-type: none"> <li>1. Larry M. (2003) <i>Urban Storm Water Management Tools</i>, McGraw Hill Publication.</li> <li>2. Michael A.M. (2008) <i>Irrigation Theory and Practices</i>, 2<sup>nd</sup> Edition, Vikas Publishing House Private Limited, Noida.</li> <li>3. Suresh R. (2005) <i>Soil and Water Conservation Engineering</i>, 2<sup>nd</sup> edition, Standard Publishers Distributors.</li> </ol>				
Suggested readings				
<ol style="list-style-type: none"> <li>1. David C.M. and Harry E.S. (1990) <i>Large-Scale Region Regional Water Resources Planning</i>, Kluwer Academic Publishers, Dordrecht.</li> <li>2. David S. (1998) <i>Water Supply Management</i>, Kluwer Academic Publisher, Dordrecht.</li> <li>3. Freeze A. and Cherry J.A. (1979) <i>Groundwater</i>, Prentice Hall.</li> <li>4. Larry M. (2003) <i>Urban Stormwater Management Tools</i>, McGraw Hill Publication, 320 pp.</li> <li>5. Larry M. (2003) <i>Urban Water Supply Management Tools</i>, McGraw Hill Publication, 208 pp.</li> <li>6. Russell J. (1915) <i>Soil Conditions and Plant Growth</i>, London, Longmans, Green and co., 635 p.</li> <li>7. Zdzislaw K., Kenneth M.S., LászlóSomlyódy V.P. (1996) <i>Water Resources Management in the Face of Climatic/Hydrologic Uncertainties</i>, Kluwer Academic Publishers, Dordrecht, 408 pp.</li> </ol>				
Case studies				
Websites				
Journals				
<ol style="list-style-type: none"> <li>1. Journal of Soil and Water Conservation</li> <li>2. Water Conservation Journal</li> </ol>				
<b>Additional information (if any)</b>				
<b>Student responsibilities</b>				
Attendance, feedback, discipline, guest faculty etc				

