

<b>Course title:</b> Water planning and management				
<b>Course code:</b> WSW 151		<b>No. of credits:</b> 3	<b>LTP distribution:</b> 2-1-0	
<b>Pre-requisite course code and title (if any)</b> No prerequisites required				
<b>Course Description</b> World population is set to increase further in the coming decades and shift of population from rural to urban areas will make urban areas more stressed in terms of water demands and sanitation needs. Intensive planning is required in the water sector to meet future water needs, restore water quality of fresh water reserves many of which are currently compromised. In addition climate change is likely to modify the current precipitation patterns, thereby putting more pressure due to extreme events of drought or floods on rising urban sprawls. Together with all comprehensive water resource planning, efficient water management tools and decision making involving all stake holders shall play a key role if long term planning is to succeed, only then will sustainable water use and equitable water distribution become a reality. This course is a stepping stone towards that direction and the various modules included are chosen so as to give an insight into the nature of current challenges faced by water planners and water managers				
<b>Course objectives</b>				
<ul style="list-style-type: none"> <li>▪ Introduce students to the stages of water planning</li> <li>▪ To apprise students about the multi dimensionality of water management</li> <li>▪ To understand that changing water demands and streams flow levels (expected in the future) will continually put tremendous pressure on water planners and water managers to devise tools and methods to provide sustainable and more optimal solutions</li> </ul>				
<b>Course content</b>				
<b>Module</b>	<b>Topic</b>	<b>L</b>	<b>T</b>	<b>P</b>
1	<b>Introduction and basic concepts</b> Objectives and principles of water planning, long-term planning of multi-structure, multi-purpose and multi-source water systems. Planning at all levels (macro and micro) river basin, watershed, urban areas, distribution and estimation of different fresh water resources, accessibility. Integration of water planning with land use planning and national plans, integration of blue and green water flows. Water security and water scarcity	6		
2	<b>Historical perspectives</b> River water sharing agreements between countries (Indus water treaty, Nile treaty) Learning from efficient water management systems (including ground water management) from ancient civilizations through medieval times. Traditional methods of water management and sustainability	6		
3	<b>Stages in water resource planning process</b> Statement of needs, data collection, formulation and screening of alternatives, models for water resources planning(methods like optimization, multi objective analysis, hierarchical analysis), sensitivity analysis, institutional set up, public involvement,	4	2	

	development of final project specification, project design (Case studies)			
<b>4</b>	<b>Principle categories of water use (water demand, consumptive use, conjunctive use and water withdrawal)</b> Assessment of present situation of basins, projections of demand, identification of gap and means to bridge the gap. Identification and solution of problems like land degradation/deforestation (impacts on flooding and siltation of reservoirs), salinization, water logging, water contamination, falling ground water table, river restoration. Irrigation and farm scale management, minor irrigation and major irrigation techniques, root cause of water resources problems and their effects, water trade, water footprint, problems related to water resource management in India	6	2	
<b>5</b>	<b>Management of Water</b> Multidimensional process involving need for water, policy to meet such needs and strategic implementation of policy by water managers. Aspects of quality and quantity management, balancing water demands between various users, adoption of cleaner technologies. Case studies	4	2	
<b>6</b>	<b>Integrated water management</b> Management tools such as interactive decision support model systems, public involvement and institutional aspects, international dimensions. Models for integrated water management, capacity building for flood management, surface and ground water management, water charges, water rights. Monitoring and protection of water resources under different geographic and socio-economic conditions. Real-time operation, control and maintenance of water management systems. Regional water project management (industrial, agricultural), capacity expansion (e.g. of treatment facilities, reservoir systems). Design and operation of water distribution systems. Case studies	6	2	
<b>7</b>	<b>Water Frameworks Directive-European Union</b> Learning from experiences	2		
		<b>34</b>	<b>8</b>	
<b>Evaluation criteria</b>				
Minor 1	15%			
Minor 2	15%			
Tutorial and Quizzes	20%			
Major	50%			

### **Learning outcomes**

- Students by the end of the course will be aware of policies and strategies involved in planning and management of developed water resources, their conservation, control and protection.
- They will understand that water management must be dynamic to respond to changing needs and objectives and try account for vagaries of nature.
- Water planning and management are key to improve the quality of river basins, lakes, wetlands, in fact all water bodies and riparian areas. Modification of human activities is a must for sustainable use of water.
- The knowledge base gained during this course can be used for multi-disciplinary projects involving water science.

### **Pedagogical approach**

Course shall be conducted using black board, power point presentations, MS Excel. Effort shall be made to through case studies to highlight the incorporation of adaptability and resilience in water planning for various parts of the water use system as it is this vision of long term planning and management which will assist in handling crises scenarios in the future.

### **Materials**

#### **Textbooks**

Jain S.K. and Singh V.P. (2006). *Water Resources Systems Planning and Management*, Reed Elsevier India Pvt. Ltd., New Delhi.

Larry M. (2003). *Urban Storm Water Management Tools*, McGraw Hill Publication.

#### **Suggested Readings**

David S. (1998). *Water Supply Management*, Kluwer Academic Publisher, Dordrecht.

Dyck, S.(ed.) (1990). *Integrated Planning and Management of Water Resources* (Guiding material for course for engineers, planners and decision makers). International Hydrological Programme, UNESCO, Paris.

Government of India (1980). *Guidelines for preparation of detailed project report of irrigation and multi-purpose projects*. Working Group Report. Government of India, New Delhi

Goodman, A.S. (1984). *Principles of Water Resources Planning*. Prentice-Hall Inc., Englewood Cliffs, New Jersey, USA.

Loucks, D.P. and J.R.da Costa (Editors). *Decision Support Systems*. Water Resources Planning, NATO Series G., Vol.26, Springer-Verlag, Berlin.

Mostert, E. (ed.) (1999). *River Basin Management and Planning*; Institutional structures, approaches and results in five European countries and six international basins, RBA Series on River Basin Administration. Research Report No.10, RBA Centre Delft, The Netherlands.

TAC (2000). *Integrated Water Resources Management*. Background Paper No.4, Technical Advisory committee of Global Water Partnership, Stockholm, Sweden.

World Bank (1993). *Water Resources Management*. A World Bank Policy Paper, The World Bank, Washington, D.C.

#### **Journals**

1. Advances in Water Resources

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| <ol style="list-style-type: none"><li>2. Environmental Management</li><li>3. Environmental Modelling and Software</li><li>4. Journal of Water Resources Research</li><li>5. Journal for Water Resources Planning and Management</li></ol>                                                                                                                 |
| <b>Additional information (if any)</b>                                                                                                                                                                                                                                                                                                                    |
| <b>Student responsibilities</b><br>Attendance and class participation will be given utmost importance. All assignments should be submitted as per the given timeline. Students will be expected to take up assignments which will compare implications of planning and management on water infrastructure between different states, cities and countries. |

**Course reviewers**

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