

# Optimization Methods to Groundwater Resources Management.....

## Overview

In several parts of the world, burgeoning population and socio-economic development are causing depletion of ground water resources, seawater intrusion, reduction in base flows of rivers etc. Climate change, affecting total annual rainfall depth and precipitation pattern, may aggravate the problems. In order to satisfy the several environmental and hydrologic requirements, optimization approaches should be used to develop a systematic method of determining optimum water supply strategies. This resource management problem requires the use of optimization techniques, quite often combined with ground water flow and mass transport simulation, in order to identify desirable scenarios of resource allocation; otherwise, resources may not be used in the most effective and efficient manner. The course aims to take a step forward to develop skills of the participants toward optimization of ground water resources management.

This course is organized in two modules that should be taken together. The topics in Module A will expose the participants to the role of groundwater in water resources systems and their management, classification of aquifers, direct and indirect methods for estimation of aquifer parameters, governing equations for flow through porous medium, flow towards systems of wells and the method of images. In Module B, the optimization techniques with application are emphasized. The topics in the module include classification of optimization problems, need for optimal design, formulation of optimal design problems, linear programming and evolutionary optimization techniques (mainly genetic algorithms), including applications in civil engineering beside ground water resources management, e.g. reservoir operation problems, release storage functions etc.

Course participants will learn these topics through lectures. Also case studies and assignments will be shared to stimulate research motivation of participants.

<b>Modules</b>	<b>A: Groundwater Hydrology : March 07 - March 08</b> <b>B: Optimization Applications : March 09 - March 11</b> <b>Number of participants for the course will be limited to fifty.</b>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ You are a student or faculty from academic institution interested in learning about groundwater and optimization.</li> <li>▪ You are a civil engineer, or research scientist interested in learning about optimization techniques in water resources planning and management.</li> <li>▪ You are a water resources engineer, consultant working in broad area of water resources planning and management</li> </ul>
<b>Fees</b>	<p>The participation fees for taking the course is as follows:</p> <p><b>Participants from abroad : US \$500</b></p> <p><b>Industry/ Research Organizations: 15000 INR (any one module), 25000 INR (for both modules)</b></p> <p><b>Academic Institutions:</b></p> <p><b>Course fee for student: 1000 INR, refundable subjected to joining of course</b></p> <p><b>Course fee for non-student: 10,000 INR</b></p> <p>The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.</p>

## The Faculty



Doctoral Degree in Civil Engineering.

**Prof. Konstantinos Katsifarakis** is professor of the Department of Civil Engineering of Aristotle University of Thessaloniki, Greece. He holds a Diploma in Civil Engineering and a Bachelor Degree in Geology, a M.S. Degree in Engineering Mechanics and a

His research interests include groundwater flows and contamination control, management of water resources, optimization techniques, low enthalpy geothermal energy, environmental impact mitigation, education of engineers and history of hydrology. He has published more than 100 scientific papers and he has supervised more than 200 undergraduate and graduate Diploma Theses and 7 Ph.D. Theses.



**Dr. Manish Kumar Goyal** is faculty in the Dept of Civil Engineering, Indian Institute of technology, Guwahati. His research interest is climate change, water resources management, snowmelt hydrology and data mining techniques. He has published about more than 60 technical papers in journals and conferences.

## Course Co-ordinator

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