REGISTRATION FORM

GIAN Course

on

Numerical Discrete-Continuum-Modelling for dualistic (Karst) systems (Oct. 30th - Nov. 3rd 2023)

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About MNIT Jaipur:

Malaviya National Institute of Technology Jaipur (Deemed University) is one of the premier NITs, designated with the status of "Institute of National Importance" by MHRD. The institute was established in 1963, and its campus spreads over 325 acres of lush green area in the central location of Jaipur city. The institute offers undergraduate and postgraduate courses (B.Tech., M.Tech. /MBA / M.Sc. & Ph.D.) to about 5500 students, in leading fields of engineering, technology, architecture, management & sciences. Through the internationally renowned faculty, laboratories with state of art equipment and excellent infrastructure, the institute is actively engaged in research, consultancy and developmental activities, besides imparting regular teaching. MNIT Jaipur is ranked at 37th position in NIRF 2023 Ranking.

About Mechanical Engineering Department:

The Department is one of the oldest departments of the institute, offering a fine blend of experience and innovation in teaching. Presently, offering undergraduate in Mechanical Engineering and post-graduate studies in Design Engineering, Thermal Engineering, Production Engineering and Industrial Engineering. The department is home to over 100 research scholars, pursuing Ph.D. in various fields of Mechanical Engineering. The department provides a life-long learning experience, through its state of art laboratories, vast pool of courses, and industry orientation.

Numerical Discrete-Continuum-Modelling for dualistic (Karst) systems
Malaviya National Institute of Technology Jaipur, Rajasthan, India

Oct. 30th - Nov. 3rd 2023

Overview

Karst aquifers are composed of a low-conductive fissured/fractured bedrock matrix with embedded highly-conductive solutions enlarged features like pipes. Advanced numerical tools are necessary to investigate the complex processes in such dualistic systems. Discrete-continuum models (DCM) couple 1D discrete pipe networks to a 3D matrix continuum. MODFLOW-2005 Conduit Flow Process (CFP) is such a DCM based on MODFLOW-2005. CFP can handle laminar and turbulent pipe flow based on the Darcy-Weisbach equation. Recent model enhancements allow to account for conduit associated storage, flow in partially filled pipes, and heat- and solute transport. The course intends to provide the necessary knowledge to understand, parameterize and run DCM models for complex dualistic (Karst) systems.

Objectives

The primary objectives of the course are as follows:

1. Participants will be introduced to dualistic systems (e.g., karst aquifers), their properties and their specific challenges when considered for groundwater management.
2. Participants will be introduced to numerical schemes useful for analyzing particular Karst systems. For this, they will be trained to the industry/research standard open-source USGS code MODFLOW-2005 Conduit Flow Process (CFP).
3. Participants will perform several case studies using the CFP numerical code and evaluate the results.
4. Comprehensive discussions that are part of the course will allow participants to be ready with independent work on modelling of complex systems in general and in particular of karst systems

Course Plan

Tentative lecture plan				
Day	Topic	Hours	Type	
1	Introduction to karst systems and dualistic flow systems	1.5	L	
	Model types and applications for dualistic systems	1.5	L	
	Introduction to CFP	1	L	
2	Coupling of discrete pipes with the continuum	1.5	L	
	Setting up and applying MODFLOW-CFP models	2.5	P	
3	Consideration of further processes and boundary conditions	1.5	L	
	Model applications with a specific view towards coupling to script based Pre and Post processing with CFP and auto calibration	1	L	
	Case study I: Complex MODFLOW-CFP models	1.5	P	
4	Transport simulation with CFP and CMT3D	1.5	L	
	Basic idealized models, application examples and comparison with analytical solutions	1.5	L	
	Case study II: MODFLOW-CFP transport models	1	P	
5	Multi-criteria inverse simulations	1.5	L	
	Regional scale applications of flow and transport simulation	1.5	L	
	Case study II cont.: MODFLOW-CFP transport models	1	P	
	Conclusions, outlook and explanation about open questions	1	L	

Who Can Attend?

- Practicing engineer/scientist/researcher from government/research organization, laboratories/consulting groups/industries working in areas related to groundwater quantity, quality and conservation issues.
- Students (UG/PG/PhD) and faculty from academic institutions interested in hydrogeology, earth science, environmental science and engineering, civil engineering, and related fields.

About the Faculty

Dr.-Ing. Thomas Reimann

Dr.-Ing. Thomas Reimann is Research Scientist and Lecturer at the Institute for Groundwater Management at TU Dresden (Dresden, Germany). His research interest comprises applied numerical groundwater modeling in complex groundwater systems, for example karst or mining sites.

Prof. (Dr.) Steffen Birk

Steffen Birk is Full Professor of Hydrogeology at the University Graz, Austria, where he teaches hydrogeology within the Bachelor Master programmes in Geosciences. His research focus is on the development and application of quantitative approaches for the simulation and analysis of groundwater systems. He has developed and employed various research codes and cooperated with the USGS in the release of the Conduit Flow Process (CFP) for MODFLOW.

Prof. (Dr.) Andreas Hartmann

Prof. Andreas Hartmann holds the professorship for Groundwater Systems and is Director of the Institute for Groundwater Management. His research focus on groundwater systems from local to global scales.

Organizing Members

Prof. Mahesh Kumar Jat is Professor in the department of Civil Engineering at MNIT Jaipur. The major areas of his research are Integrated Water Resources Management; Hydrological modelling; Climate change, Remote Sensing and GIS Applications.

Dr. Ram Dayal is Assistant Professor in the department of Mechanical Engineering at MNIT Jaipur. His research interests lies in the fields of computational fluid dynamics and Numerical modelling, simulation of two-phase flows and metal additive manufacturing.

Dr. Harlal Singh Mali is Associate Professor in the department of Mechanical Engineering at MNIT Jaipur.

Dr. Anup Malik is Assistant Professor in the department of Mechanical Engineering at MNIT Jaipur.

Registration Procedure

Step 1: GIAN Web Portal Registration: Register in the GIAN portal http://www.gian.iitkgp.ac.in/GREGN/index., by paying 500/- online. Registration to this portal is one time affair and will be valid for lifetime of GIAN. Please note that Course fee is separate.

Step 2: Course Registration: Login to the GIAN portal with the registered User ID and Password. Choose the Course registration option. Select the course titled "Balancing between goal specification, groundwater contamination modelling and subsurface characterization efforts" from the list and click the "Save" option. Confirm your registration by clicking the suitable option. The last date for the registration is Oct. 20th 2023.

Step 3: Course Fee Remittance: Once selected for the course, the fee (as applicable) has to be paid. The course fee is as follows:

Students from other Academic Institutes : Rs. 500
Faculty from other Academic Institute : Rs. 1500
Industry / Research Organizations : Rs. 3000
Participants from abroad : US $ 50.00

Note: The above fee is exclusive of GIAN portal registration fee. The Registration fee covers the cost of lectures, tutorials, demonstrations, course material. The details of fee payment by Electronic Clearing Service/NEFT/RTGS in the name of **"Registrar (Sponsored Research) MNIT Jaipur"**

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Step 4: Fill Registration Form: Fill up the online google registration form https://forms.gle/UXkSf9rUfx7PvooP7 by providing details of the completed bank transaction and include other required information on or before Oct. 20th 2023.

Total Number of Participants = 40

The course will be conducted in the offline mode at Malaviya National Institute of Technology Jaipur, Rajasthan, India.

You can contact Dr. Ram Dayal regarding any queries related to the course at ramdayal.mech@mnit.ac.in