HYDRO - GEO 2022

STRIDE
SCHEME FOR TRANS-DISCIPLINARY RESEARCH FOR INDIA'S DEVELOPING ECONOMY

ज्ञान-विज्ञान विमुक्तये
UGC
University Grants Commission

KNU UGC-STRIDE Sponsored

One Week Capacity Building Training Workshop

on

Applications of Modern Techniques in Hydrogeomorphology

(Hydro-Geo 2022)

(As a part of UGCs Scheme - STRIDE Component - I)

November 23 - 29, 2022

Department of Geography

KAZI NAZRUL UNIVERSITY

(A State University under the West Bengal Act XIX of 2012)

Nazrul Road, Kalla Bypass More, Post Office: Kalla C.H., Police Station: Asansol (North), District: Paschim Bardhaman, Pin 713 340, West Bengal

About Hydro-Geo 2022

Introduction

Hydrogeomorphology implies the geomorphological study of water and its effects (Scheidegger, 1973). It operates in an interdisciplinary framework focussing on the interaction and linkage of hydrologic processes with landforms or earth materials and the interaction of geomorphic processes with surface and subsurface water at various spatio-temporal scales. The hydrogeomorphic studies recognize that the presence of water in earth materials weakens them and renders them susceptible to collapse or erosion, and the pore-pressure fields within them at critical times affect their collapse and their mobility. For instance, the channel initiation and network development in the context of landform evolution are driven by a set of runoff generation processes with flow magnitudes and stress-inducing characteristics. Therefore, the introduction and adoption of hydrogeomorphology as an interdisciplinary science link several fields related to geosciences, hydrology, and physical geography, such as hydrogeology, geomorphology, remote sensing, applied geophysics, soil and rock geotechnics, climatology and natural hazards.

From the ongoing research developments, it is evident that the studies combining hydrology and geomorphology are becoming increasingly profound and useful for identifying hazards and understanding the impacts of land use and climatic change. A number of outstanding published works examining the role of surface and subsurface flow regimes and flow paths on fluvial erosion and mass wasting, and the ecologists have also found the concept of hydrogeomorphology useful to describe the linked water and geomorphic conditions that define habitats in wetlands, rivers, and other environments. Groundwater hydrologists are integrating the geological, structural and hydrogeological data with hydrogeomorphological data to determine the groundwater potential zones. The societal relevance of this research field links to understanding, forecasting, and mitigating natural hazards to reduce the risks for society. The current trend in hydrogeomorphic studies is to discuss the quantification of the processes and feedbacks with significant input from basic sciences to develop a quantitative understanding of processes and forcings. Hence, the research approach is now becoming often highly reckonable and integrative, ranging from pore-scale fundamentals to remotely sensed data-driven analysis.

Within this frame of reference, the Geography Department of the Kazi Nazrul University, Asansol, will pursue a programme of organizing a capacity building training workshop on 'Applications of Modern Techniques in Hydrogeomorphology' (**Hydro-Geo 2022**) that focuses upon a wider application of state-of-art quantitative techniques in hydrogeomorphic scientific studies. The

workshop will be generously funded and supported by the Scheme for Trans-disciplinary Research for India's Developing Economy (STRIDE) of the University Grants Commission (UGC). The main objective of this workshop will be to give exposure to young researchers across India with an acute sense of specific problems and opportunities that can arise from applying these modern quantitative approaches and methods to their research problems related to hydrogeomorphology.

♦ Rationale/ Need of Hydro-Geo 2022

Hydrogeomorphological investigations are fundamental for assessing water resources and understanding the hydrological processes involved in landscape evolution - because the hydrogeomorphological processes are so diverse, the measurement methods are rooted across disciplines: including Geology, Geophysics, Physical Geography, and so on. Apart from conventional techniques, many new and advanced techniques and instruments are being used for hydrogeomorphological investigations worldwide. It is high time that young researchers working in the field of hydrogeomorphology are made conversant with these techniques to improve their capabilities. Among the latest techniques, the application of geomorphometric analyses, geophysical, geospatial, and sedimentological techniques have increased dramatically. Geophysical techniques can be used both in surface water as well as in groundwater hydrology. Especially, electrical resistivity is an important technique for groundwater exploration and mapping and reconstructing the sub-surface geometry of buried sand bodies, in particular, buried fluvial channels that are potential aquifers. Geospatial techniques have become the backbone of all the hydrogeomorphological investigations in the last few decades. These techniques are being widely used for mapping earth features from spaceborne sensors. Many new fully automatic instruments have also been developed during the past few years. The knowledge for comprehending these aspects and laboratory instruments is a must for hydrogeomorphological measurements. Therefore, monitoring and assessment of hydrological and geomorphological processes is essential to manage properly of the valuable natural resources.

The planned Capacity Building Training Workshop on 'Applications of Modern Techniques in Hydrogeomorphology (**Hydro-Geo 2022**)' from **November 23 - 29**, **2022**, aims to create awareness of multiple perspectives and research across domains in the discipline of hydrogeomorphology. The societal relevance of this field essentially links to the cognizance and reliable guidance for mitigating natural hazards with certainty. During the training workshop, we will discuss the current research findings in the domain of flood geomorphology, groundwater hydrology, and the application of geospatial technology in hydrogeomorphology. The workshop will be a platform where we will get to hear voices from all the domains involved in hydrogeomorphology *i.e.* practitioners, scientists and the younger generation entering this field. Sessions are designed to highlight that there is a need for

wider collaboration to learn modern techniques. **Hydro-Geo 2022** will also focuses on developing new skills for early career researchers through hands-on training, which will bring a fresh perspective to the research domain and hence fulfill the objective of the **UGC-STRIDE Scheme**.

Objectives of Hydro-Geo 2022

The objectives of the training workshop are as follows:

- To develop intend and practices for research among early-career researchers and students to pursue careers and undertake high-quality research in the areas of hydrogeomorphology that augment and expand their research capacity.

- To motivate early-career researchers and students to undertake short-term projects analyzing local, regional, and national problems pertaining to hydrogeomorphology.

- To give participants an overview of the flood geomorphology, ideal for those seeking a catchment-wide perspective for flood management. Essentially, the knowledge of river hydromorphology and geomorphological dynamics is fundamental for sustainable river design and management.

By the end, the participants will have a better apprehension of (i) flood geomorphology used in relation to sustainable river management, (ii) hydrogeomorphic and geophysical studies used in groundwater exploration research, and (iii) the application of geospatial technology in hydrogeomorphic studies.

Scope as per the STRIDE Component - I Guideline

Scheme for Trans-disciplinary Research for India's Developing Economy (STRIDE) aims to promote innovative culture for trans-disciplinary research, especially in Universities and Colleges. The main objectives of STRIDE are to identify young talent, strengthen research culture, build capacity, promote innovation and support trans-disciplinary research relevant to national development. Keeping these in mind, **Hydro-Geo 2022** involves young talent through developing new skills and promoting quality trans-disciplinary research in the area of hydrogeomorphology that is socially pertinent, need-based at the local level, and nationally important with global significance.

Target group of participants

Early-career researchers (PhD students, postdoc or other young researchers within 8 years from the PhD), and Postgraduate students in the fields of Physical Geography, Geology, and Environmental Science are eligible to apply. Some familiarity with computer programing and basic mathematics is

desirable, along with a basic understanding of Geomorphology and Hydrology. There will be no registration fees for the proposed training workshop. Selected candidates shall attend the program physically at Kazi Nazrul University, Asansol.

Course structure

The course will mainly consist of plenary talks, keynote talks, research talks, and some hands-on training. The plenary and keynote talks will be given by renowned experts on the emerging trends in hydrogeomorphology. The hands-on training session will introduce participants to the software (LSDTopoTools, TopoToolbox in MATLAB, HEC-RAS, *etc*.) and instrument (Resistivity Meter) for hydrogeomorphological research. Participants must bring their laptops for the hands-on training session. The course will be organized at **Seminar Hall**, **Administrative Building**, **Kazi Nazrul University**, **Asansol**. The medium of the training workshop will be English.

How to reach the venue

The distance between Asansol railway station and Kazi Nazrul University is ten (10) minutes by car. Participants can book cab or take an e-rickshaw from Asansol Railway Station to reach the university campus. Bus service is also available for reaching Kazi Nazrul University from the Asansol Bus Stand. Participants can also take buses to Kalla Road; it will take fifteen (15) minutes to reach Kazi Nazrul University.

Application process

To apply for participation in the **Hydro-Geo 2022**, send (i) a motivation letter, (ii) a CV, (iii) an abstract of ongoing research, and (iv) a support letter from the advisor/supervisor as a single pdf-file to: **knustride1@knu.ac.in** with a copy to (CC) **sujay.bandyopadhyay@knu.ac.in** within ~~13th November 2022~~ **15th November 2022 (Tuesday)**. Applications will be evaluated by the organizers. Only selected candidates will be informed by email.

Costs

There will be no registration fees for the training workshop. However, the students must make their own travel and accommodation arrangements. The organizers may help to search for suitable accommodation. During the workshop, lunch and tea will be served to all the participants. Each participant will be provided detailed lecture notes, relevant literature, and other materials. A certificate will be given to all participants. Attendance (100%) is mandatory to receive a course completion certificate.

Thematics

Module-1: Flood Geomorphology

- Introduction to flood geomorphology
- Long-term flood records for flood risk management
- Paleoflood hydrology and its scientific and societal value
- Field observations and data collection for paleoflood records
- Managing instrumental, historical, and paleoflood data

Module-2: Groundwater Hydrology

- Basics of Groundwater hydrology
- Managing aquifer recharge for attaining sustainability in groundwater
- Application of geophysical methods in groundwater investigation
- Field training and demonstration of electrical resistivity techniques
- Electrical resistivity field data acquisition and interpretations

Module-3: Geospatial Technology for Hydrogeomorphology

- Applications of Geospatial technology for surface and subsurface water resource management
- Type of hydrological models and spatial, non-spatial data inputs for hydrological modeling
- Digital Elevation Model and its derivatives for hydrological modeling
- River Flow Modeling using 1D Hydrodynamic (1D HEC-RAS Hydrodynamic Modeling)

Field Trip Program

There will be a Field Trip for one full day on **November 26, 2022** in and around **Barakar River**. The field training will focus on the geological mapping of rock exposures, and the studies of Quaternary fluvial archives. The visit will bring the group in some key locations for understanding the hydrogeomorphological evolution of the area.

About the Kazi Nazrul University

Kazi Nazrul University was established as a teaching and affiliating university in 2012. The University inaugurated its teaching programmes by commencing post-graduation classes in four core disciplines - Bengali, English, History, and Mathematics. Beginning with four postgraduate programmes, the University has now expanded to accommodate 47 programmes in 21 departments, 9 research centres, and more than 20 affiliated colleges. Named after the rebel poet Kazi Nazrul Islam (1899-1976) of India - who is also the national poet of Bangladesh - this university aims at achieving an ideal of creative freedom that marks the life of the mind and the intellectual traffic of ideas. The

revolutionary poet, Kazi Nazrul, has been immortalized in Bengali cultural memory because of his acute thirst for a spirit of independence and his attentiveness to the syncretism that characterizes knowledge traditions as well as transactions. This university has been established with the explicit aim of achieving this same syncretism of purpose and its allied commitment to the dream of a transformed future. The founding vision of Kazi Nazrul University is to function effectively as an institutional space encouraging and providing instruction, teaching, training, and research in various branches of learning and courses of study - with a view to promote the advancement and dissemination of knowledge and extending higher education to meet the immediate needs of society. While teaching activities are the mainstay of any higher educational institution, KNU has been modelled after the Humboldtian fashion of a research university - with specific emphasis on the need for knowledge production alongside processes of dissemination. There have been notable endeavors within the university to set up centers for advanced interdisciplinary exchange and intensive research collaboration, apart from rigorous daily routines of classroom instruction.

About the Department of Geography

The Department of Geography was established in the year 2015 and offers two Master's Degree programmes, *viz*. M.Sc. in Geography and M.Sc. in Geoinformatics, and also a Ph.D. programme in Geography. The department envisioned to strive in integrate the natural and social sciences to understand and solve the problems of people and the environment. In doing so, it endeavours to function efficiently to encourage and provide instruction, teaching, training, and research in varied aspects of geographical importance. The focus of the department would be to let the students learn their courses proficiently, which can further make them progressive and empowered in advancement, dissemination of knowledge, achieving higher education and to meet the growing needs of society.

Resource Persons

Prof. Robert J. Wasson
Australian National University, and
James Cook University, Australia

Prof. Venkatesh Merwade
Lyles School of Civil Engineering,
Purdue University, USA

Dr. Kalyan Rudra
West Bengal Pollution Control Board
Kolkata, West Bengal, India

Dr. Pradeep Srivastava
Department of Earth Sciences,
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Prof. Lakshminarayan Satpati
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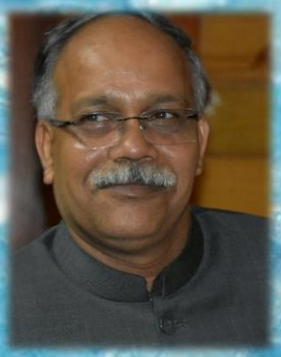

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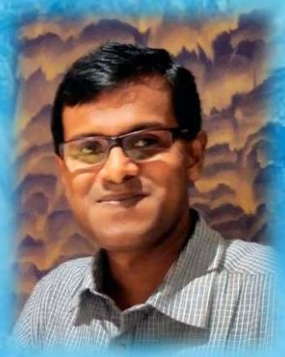

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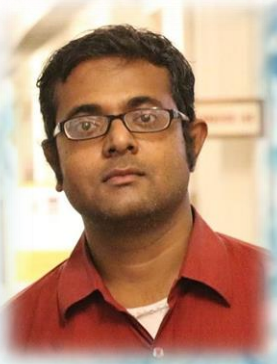

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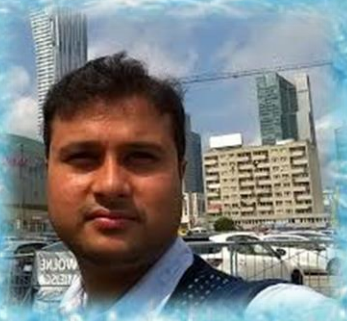

Dr. Tirthankar Ghosh
Department of History, Kazi Nazrul University, Asansol, West Bengal, India

Organizing Committee

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Contact

Please contact (i) **Arup Kumar Roy** (9732173670), (ii) **Sukumar Maji** (8145144219), and (iii) **Prabir Bhattacharya** (8927121535) for accommodation - and transportation - related queries if anyone needs help. For all other matters concerning the training workshop, please check the university website (https://www.knu.ac.in/) or contact **Dr. Sujay Bandyopadhyay** (Department of Geography, Kazi Nazrul University, Asansol, West Bengal) sujay.bandyopadhyay@knu.ac.in.