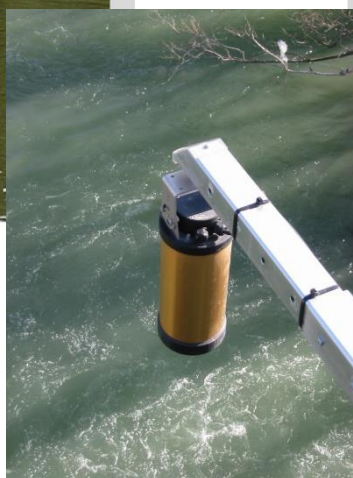


Emerging Hydrometric Techniques for Discharge Estimation and Rating Curve Development

April 3 – 8, 2017



**DEPARTMENT OF HYDROLOGY
INDIAN INSTITUTE OF TECHNOLOGY
ROORKEE**

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Overview

River flow measurements at the desired site is of utmost importance for river engineers and hydrologists for water resources planning and management, and for various operational purposes such as flood forecasting, reservoir operation and flood inundation studies. To circumvent the continuous river flow measurements, which are costly, tedious and frequently dangerous during flood events, river engineers develop normal stage-discharge relationships, also known as rating curves, using few flow measurements. Subsequently this rating curve is used to estimate discharges corresponding to the observed stages. As a part of hydrological observation activities, Central Water Commission (CWC), Government of India operates a vast network of more than 900 hydrological observation stations on various state and inter-state rivers for collection of stage, discharge and water quality data. With the implementation of the National Hydrology Project from 1995 onwards, CWC embarked on modernization of hydrometry of Indian river system by using some modern tools such as ADCP, radar type water level recorders for collection of data at very few sites. But majority of the sites operated by CWC are still using traditional current meter based area-velocity method for discharge measurement. However, more advanced and non-contact methods are available now which have potential for adoption in the field practices of hydrometry.

Despite advancements in hydrometry, streamflow measurements in India and many other countries are still performed using traditional current meter technique which is time consuming, costly and unsafe during floods. The introduction of entropy theory in hydraulics by Chiu (1987) gives the opportunity to develop an uncomplicated process for average flow velocity estimation and subsequent discharge estimation at a river section. This approach needs to be applied for discharge estimation in Indian rivers. Further at many locations, establishment of stage-discharge relationships may not be possible using the presently used conventional measurement methods for discharge estimation during low flows as well. In this context there is scope for the application of approximate flood stage routing methods with sporadic velocity measurements using modern non-contact devices for developing stage-discharge relationships at such sites. *The present course is aimed at imparting training to river engineers, academicians, students and researcher scholars with a focus towards development of next generation river-gauging network systems. This could potentially revolutionize discharge measurement techniques currently employed in Indian rivers, resulting in saving of both time and resources.*

The key objectives of the course are to impart training to the participants for enabling to:

- A. Understand the theoretical background of entropy theory, wave types and routing methods, and the use of satellite and radar products for hydrometric monitoring.
- B. Use of entropy theory for average velocity estimation at a river site based on the measurement of surface flow velocity. Development of simplified stage-hydrograph channel routing methods for discharge estimation and rating curve development. Application of remote sensing techniques for discharge estimation.
- C. Practical application of above techniques using field and satellite data (through lectures and hands-on experiments).

Modules	Current field practices of hydrometry, rating curve characteristics and its development, advanced hydrometric techniques of discharge estimation and rating curve development such as entropy theory, flood wave types and channel routing techniques, simplified routing methods, remote sensing, modern tools available for velocity, discharge estimation and water level measurements, such as ADCP, Acoustic instruments, portable radars, satellite remote sensing and altimetry.
You Should Attend If...	<ul style="list-style-type: none"> ▪ you are a River Engineer, a hydrologist, a water manager, and a field professional from a government/government-undertaking organisations. ▪ you are a student of all levels (enrolled in a Master or PhD program) or a faculty from any academic institution interested in learning how to use modern hydrometric techniques for discharge estimation. ▪ You are Field expert from Central Water Commission.
Fees	<p>The registration fees for participation in the course is as follows:</p> <p>Participants from abroad: US\$ 500</p> <p>Industry/Govt. Dept.: ₹. 7500</p> <p>Academic/Research Organisations: ₹. 5000</p> <p>Students/Research Scholars: ₹. 3000</p> <p>The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility and tea/coffee during the session. The participants will be provided with accommodation on payment basis.</p>
Course Duration	April 3 – 8, 2017

Course Coordinators

Prof. Muthiah Perumal
Phone: 01332-285817
Email: p_erumal@yahoo.com

Dr. Manoj K. Jain
Phone: 01332-285845
Email: jain.mkj@gmail.com

Register at:

<http://www.gian.iitkgp.ac.in/GREGN>

The Faculty

Prof. Tommaso Moramarco is a Researcher with many years of experience serving at the Research Institute for Geo-Hydrological Protection (IRPI), National Research Council (CNR), Italy. His research interests include flood monitoring, forecasting and hydraulic risk mitigation, hydro-meteorological monitoring, synthesis of the effects of spatial variability in hydraulic quantities and scaling, entropy theory applied to natural channels and hydrometry etc. He is coordinating projects on hydro-meteorological monitoring, flood forecasting, and hydraulic risk in the frame of Italian, European and International programs. He is a Referee of leading hydrologic and hydraulic journals, an Associate Editor of Journal of Hydrologic Engineer (ASCE). He was the recipient of the Norman Medal from ASCE for his two works on flood routing in natural channels. The American Academy of Water Resource Research has conferred on him the Diplome, Water Resource Engineer.



Prof. Muthiah Perumal is a Professor at the Department of Hydrology, IIT Roorkee. He has carried out extensive research in the area of flood modelling focusing on simplified river flood wave studies. He has introduced a new flood wave type known as the Approximate Convection-Diffusion equations which enabled the development of simplified hydraulic flood routing methods using discharge as well as stage as the operating variables known as the Variable Parameter McCarthy-Muskingum (VPMM) method and Variable Parameter Muskingum Stage-Hydrograph (VPMS) routing methods, respectively.



Dr. Manoj Kumar Jain is an Associate Professor at the Department of Hydrology, IIT Roorkee. He has carried out extensive research on hydrological and hydraulic modelling, experimental hydrology, watershed management, monitoring and modeling. Significant contributions have been made to understand processes of rainfall-runoff, soil erosion from watersheds in spatial and temporal domains by developing process oriented spatially-distributed hydrological modeling framework. He is a referee of leading hydrologic and hydraulic journals, Editor of Hydrology Journal of IAH.



Dr. Sumit Sen obtained MS from University of Arkansas, USA and Ph.D. from Department of Civil Engineering, Auburn University, USA. Presently he is working as faculty in the Department of Hydrology, IIT Roorkee. He is working on problems related to experimental hydrology, watershed management, monitoring and modeling; rainfall-runoff modeling.





REGISTRATION AND ACCOMMODATION REQUEST FORM
Emerging Hydrometric Techniques for Discharge Estimation and Rating Curve Development
TRAINING WORKSHOP

April 3 – 8, 2017

Department of Hydrology, Indian Institute of Technology Roorkee
Roorkee, Uttarakhand

Affix passport
size photo

1. Name of applicant (in block letters): Ms./Mr.
2. Designation
3. Residential address with pin code:

Mobile:

4. Institute where employed with address:

Phone (Off.):

Email:

5. Highest Academic Qualification:..... Specialization:
6. Do you need accommodation for your stay during course: Yes / No. (on payment basis)
7. Details of accompanying DD for registration fee:

Amount: Rs..... DD No. Issuing Bank:

Date:

Signature of Applicant

Note:

- (i) Application should reach DOH Office at the address given below latest by November 15, 2016. Scanned copy may be sent by e-mail.
- (ii) Participation in the workshop, only if you have received confirmation of admission.
- (iii) Registration fee for participation should be paid through Demand Draft in favour of "DEAN (SRIC), IIT Roorkee" payable at Roorkee.

After Completion, please mail to:

Dr. Manoj K. Jain,
Department of Hydrology, IIT Roorkee
Roorkee – 247 667 (Uttarakhand) INDIA
Phone: (01332)285845, Fax: (01332) 2273560