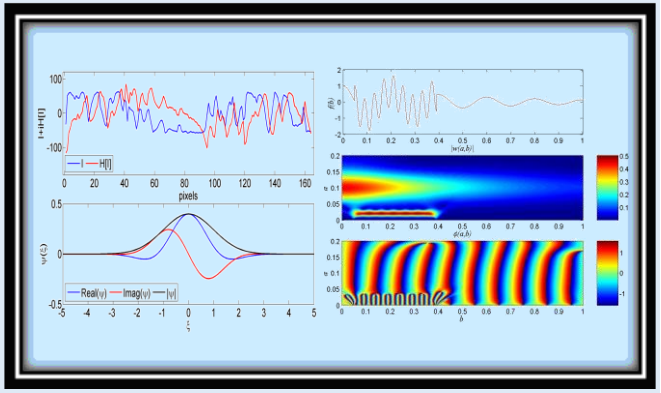
A short-term course
on

Wavelets and their Application in Signal and Image Processing



December 21-25, 2017

Under

Global Initiative for Academic Networks
Ministry of Human Resource Development
Government of India

सत्यमेव जयते

Organized by

Department of Mathematical Sciences
Indian Institute of Technology (BHU)
Varanasi-221005, Uttar Pradesh
India

An Overview of the Course:

The subject area of wavelet theory, developed since the middle of the 1980's and being a hot worldwide research topic now, lies at the intersection of pure mathematics, computational mathematics, signal processing, and many applications in natural sciences and engineering. At the present time, wavelet analysis is considered as a powerful alternative of the Fourier analysis since a good localization of wavelet functions provides an opportunity to reveal signals features in the both time and frequency domains simultaneously.

The principal goal of this course is to present a variety of practical approaches to a calculation of the wavelet expansions of data samples simultaneously supplied with the strict mathematical background, which assures their applicability and provides a roadmap for further developments. One of the special highlights is aimed to consider advantages, which the continuous wavelet transform provides for characterizing non-linear dynamical differential equations and analyzing their solutions with a special attention to the applications in modern biophysics, in particular, theoretical neuroscience.

Main Topics:

- Global and local spectral analysis paradigm, basic ideas and approaches of the wavelet expansions, classification of the wavelet transform's types, numerical methods for the computing direct and inverse wavelet transform
- Dynamical systems and biophysical models related to the non-stationary oscillations and the wavelet-based bifurcation analysis of such systems
- Multiresolution analysis and extension principles, time-frequency localization of stationary and periodic wavelets, uncertainty products it application to classical discrete wavelet systems.
- Convergence and error analysis of different numerical schemes based on wavelets for integral equations
- Wavelet-based approaches to multiresolution image processing: compression, denoising and segmentation, edge detection
- Wavelets in biomedical applications: wireless capsule endoscopy images, retina fundus images, computer-assisted tomography, magnetic resonance imaging

All topics will be supplied with the practical trainings.

Who can Attend?

- M.Sc./B.Tech./M.Tech./Ph.D. students from various institutes, universities and research organizations across the country.
- Faculty/Researchers/Scientist from academic/technical institutions and R&D Centre across the country.

Registration Process:

Step 1: One-time Registration on GIAN portal (if already registered, go to step 2 for details regarding institute registration for this course)

Web link: http://www.gian.iitkgp.ac.in/GREGN/index

Note that registration to the portal is one-time affair and will be valid for lifetime of GIAN. Once registered in the portal, an applicant will be able to apply for any number of GIAN courses as and when necessary.

Step 2: Institute Registration: All participants are required to pay the appropriate registration fee as given below.

M.Sc./B.Tech./M.Tech./Ph.D. students	**Rs. 1000**
Faculty/Scientist/Researchers from academic/technical institutions	**Rs. 2000**
Participants from industries	**Rs. 2500**
Participants from abroad	**USD 100**

Participants are requested to email the scanned copy of duly filled registration form given at the end, along with the receipt of prescribed fee submitted through State Bank Collect, on or before December 01, 2017, with the subject '**GIAN STC 2017 Participant**' to vksingh.mat@iitbhu.ac.in
The procedure for making the fee payment is as follows.

Payment Instructions: Access **https://www.onlinesbi.com** Click on **SB Collect**. Click Checkbox to accept 'Terms & conditions'. Then click on **'Proceed'.** Select state as **'Uttar Pradesh'.** Select type of category as **'Educational Institutions'.** Click on **'Go'.** Select the name of institutions as **'Indian Institute of Technology (B.H.U.), Varanasi'.** Select payment category as **'GIAN-short term course participation fee'.** Fill up the form and pay the fee according to your participation category. Save the receipt for record and get SB collect reference number; you need to fill it on registration form.

About the City:

The holy city of Varanasi is known as the city of temples and learning. It is a place of great historical and cultural importance. This religious capital of India is situated on the bank of the holy river Ganges and is famous for temples of Lord Shiva, Buddha (at Sarnath) and Sankat Mochan etc. Varanasi is the premiere most place of oriental learning also. Simultaneously it is keeping pace with modern advanced knowledge. The city is reputed for silk fabrics, perfumes, artistic brass and copper wares and a variety of handicrafts. This vibrant city with multiple dimensions of knowledge and liberation has a magnetic attraction for people all over the world.

How to Reach?

The city of Varanasi is well connected by road, rail and air with all the important places of India. Regular flights are there from Varanasi to Delhi, Mumbai, Chennai, Bangalore, Kolkata, Khajuraho and Lucknow. The Banaras Hindu University campus is only 10 Kms from Varanasi railway station, 20 Kms from Mughal Sarai railway station and 35 Kms from the airport.

About the Department:

The Department of Mathematical Sciences, IIT (BHU) earlier known as Mathematics / Applied Mathematics has been functioning since 1968. Its importance lies in the fact that it caters to the needs of the undergraduate as well as post-graduate students of the Institute. In addition, the Department runs its own 5-year Dual Degree (B Tech & M Tech) programme in Mathematics & Computing. Computing is the glamour of the Department. It annexes several dimensions in terms of new and growing areas of research and further facilitates simulation of mathematical models constructed for interdisciplinary areas.

Accommodation:

The participants may be provided with accommodation at the Institute Guest House/ Hostels on nominal payment basis subject to availability. Request for accommodation has to be sent in advance. Otherwise, participants will have to make their own stay arrangement.

About the Faculty:

Prof. Eugene B. Postnikov
Head of Theor. Physics Dept.
Research Center for Condensed Matter Physics,
Kursk State University
Kursk, Russia
PhD (2000), D.Sc. (2011)

Research interests in wavelet transform relate to new methods of its evaluation and applications closely connected to differential equations and time series analysis.

Dr. Vineet K. Singh
Associate Professor
Department of Mathematical Sciences, Indian Institute of Technology (BHU), Varanasi
Uttar Pradesh-221005, India

Research interests in wavelet approaches based on operational matrix methods applied to numerical solutions of integral and differential equations

Dr. Anastasia Lavrova
Senior Researcher
St. Petersburg University and
St. Petersburg State Research Institute of Phthisiopulmonology
Saint-Petersburg, Russia
PhD (2005)

Research interests concern nonlinear processes in the living systems including the wavelet analysis of experimental and simulated data especially in neuroscience.

Dr. Elena Levedeva
Associate Professor
St. Petersburg State Polytechnic University and
St. Petersburg University
Saint-Petersburg, Russia
PhD (2008)

Research interests in functional analysis related primarily to the discrete wavelet transform (wavelet bases and frames).

Dr. Sunil Kumar
Assistant Professor
Department of mathematical Sciences, Indian Institute of Technology (BHU), Varanasi
Uttar Pradesh-221005, India

Research interests are in numerical analysis of PDE, domain decomposition methods and singular perturbation Problems, mathematical image processing

Important Dates:

Course duration	**December 21-25, 2017**
Registration starts on	**October 01, 2017**
Last date of registration	**December 01, 2017**

Address for all Correspondence:

Course Coordinator

Dr. Vineet Kumar Singh,
Associate Professor,
Department of Mathematical Sciences, IIT (BHU)
Varanasi, Uttar Pradesh-221005, India
Email: vksingh.mat@iitbhu.ac.in
Phone.: +91 7376716701

For more details and regular updates, please visit the following webpage:

https://waveletgian.wordpress.com/

Further Information:

- Number of participants for the course will be limited to forty.
- List of participants will be available on the above webpage on December 03, 2017.
- Accommodation will be provided on first come first serve basis.
- Bring your fee receipt, registration form, and selection confirmation to attend the course.
- Participants will be provided registration kit and course material covering the entire course. The registration fee includes all instructional materials, computer use for tutorials and assignments, and free internet facility.
- There will be continuous evaluation of each participant during the course on understanding of the concepts and skills. Based on the performance, winners will be announced and some prizes may be given.
- After successful completion of the course, all participants will get participation certificate.
- Last but not least, do not hesitate to contact the course coordinator if you have any questions or require any information about the course.

Indian Institute of Technology (BHU), Varanasi

Department of Mathematical Sciences

Registration Form

Wavelets and their Application in Signal and Image Processing

December 21-25, 2017

Under

Global Initiative of Academic Networks (GIAN), MHRD

1. Name ……
2. a) Age …… b) Sex: M/F ……
3. Designation ……
4. Organization ……
5. Address for correspondence

……

……

E-mail…… Phone/Mobile……

6. Highest Academic Qualification……
7. Specialization ……
8. Category of Participant
   - Faculty/Research Scholar/Student of IIT (BHU) ☐
   - Faculty/Research Scholar/Student of other institutions ☐
   - Industry Participant ☐
   - Foreign Participant ☐
9. IIT (BHU) Accommodation Required Yes ☐ No ☐
10. Payment Details
    - Amount (Rs.) ……
    - SB Collect Reference Number ……

Payment mode: Through SB collect (see brochure for details regarding payment procedure)

Please register me for the course on **Wavelet and their application in signal and image processing** to be held at IIT (BHU) Varanasi.

Date……

Place …… Signature of the Participant