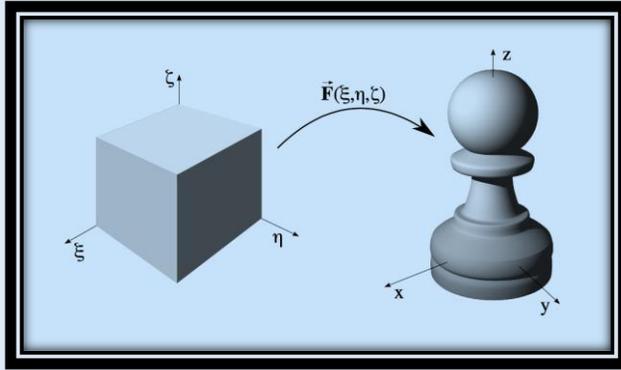


A short-term course
on
**Isogeometric Methods using B-Splines
and NURBS**



December 16-20, 2017

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



Organized by

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

An Overview of the Course:

Isogeometric analysis (IGA) has been introduced by Prof. Thomas J. R. Hughes in 2005 as an innovative numerical methodology for the discretization of Partial Differential Equations (PDEs). The main idea was to improve the interoperability between CAD and PDE solvers. To achieve this, it was proposed to use CAD mathematical primitives, i.e., splines and Non-Uniform Rational B-splines (NURBS), also to represent PDE unknowns. The smoothness of splines is useful in improving the accuracy per degree of freedom and solving higher order PDEs via direct approximations. Isogeometric methods have been used and tested on a variety of problems of engineering interests.

The principal goal of this course is to present a variety of numerical methods (using Galerkin and Collocation formulations) which have been derived in isogeometric analysis framework to solve different types of boundary value problems in PDEs. Further, the mathematical approximation properties of B-splines and NURBS spaces will be discussed. Along with the theory, the development of robust implementations of isogeometric methods using widespread conventional languages of scientific programming will be presented, leading to a deeper understanding of practical aspects of these methods, and providing a framework for developing an intuitive understanding of them. To conclude, some open problems will be outlined, and challenges involved in solving them will be discussed, motivating M.Sc., B.Tech, M.Tech., and Ph.D. students to engage in research in this rapidly developing area of mathematical and engineering research.

Main Topics:

- ✚ Introduction to Isogeometric methods, Geometric Design and Mesh generation, Generating a NURBS mesh
- ✚ Finite Element Methods, Isogeometric Finite Element Methods, Isogeometric FEM-PDE solver.
- ✚ Quadrature rules for Isogeometric analysis, Assembly procedure for Isogeometric analysis, Making an effective and fast IGA-PDE solver.
- ✚ Isogeometric Collocation Methods, Implementation of Isogeometric Collocation Methods.
- ✚ Stabilized Finite Element Methods, Stabilization in Isogeometric Finite Element Methods, Implementation of Stabilization Methods.

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. 2500
Participants from industries	Rs. 3500
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 skumar.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:



Dr. Mukesh Kumar
Assistant Professor
Department of Mathematics
College of Charleston
South Carolina,
USA 29429

Dr. Mukesh Kumar is an Assistant Professor in Department of Mathematics, College of Charleston, Charleston, USA. He earned his masters (2004) from IIT Roorkee and Ph.D. (2009) from IIT Delhi. He carried out his postdoctoral research at Institute of Applied Mathematics and Technology-CNR, Pavia, Italy (2009-2010) and NTNU, Norway (2011-2014). He was then a research scientist at SINTEF ICT, Norway (2015). He is author of more than 25 publications in international journals of repute. His current research interests are in Finite Element Methods, Isogeometric methods using NURBS, T-spline, and LR B-splines, A Posteriori Error Estimations and Adaptivity, and Computational Mechanics.



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

Dr. Sunil Kumar is an Assistant Professor in Department of Mathematical Sciences, IIT (BHU), Varanasi, India. He earned his masters degree from IIT Roorkee and doctorate degree from IIT Delhi. He carried out his postdoctoral research at IISc Bangalore (2012) and University of Coimbra, Portugal (2012-2014). He was then a research scientist at Max Planck Institute for Solar System Research, Germany (2014-2015). He also served as Assistant Professor at NIT Delhi (2015-2016). His research interests are in Numerical Analysis of Partial Differential Equations, Domain Decomposition Methods, Singular Perturbation Problems, and Mathematical Image Processing.

Important Dates:

Course duration	December 16-20, 2017
Registration starts on	October 01, 2017
Last date of registration	December 01, 2017

Address for all Correspondence:

Course Coordinator

Dr. Sunil Kumar,
Assistant Professor,
Department of mathematical Sciences, IIT (BHU)
Varanasi, Uttar Pradesh-221005, India
Email: skumar.mat@iitbhu.ac.in
Mobile No.: +91 7835014019

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

<https://skumarmath.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

Isogeometric Methods using B-Splines and NURBS

December 16-20, 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

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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 **Isogeometric Methods using B-Splines and NURBS** to be held at IIT (BHU) Varanasi.

Date.....

Place

Signature of the Participant