GLOBAL INITIATIVE OF ACADEMIC NETWORKS

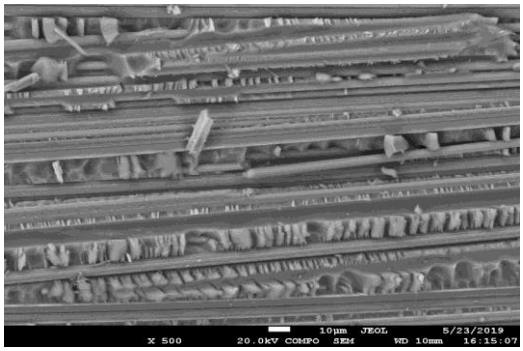
शिक्षा मंत्रालय
MINISTRY OF EDUCATION
सत्यमेव जयते

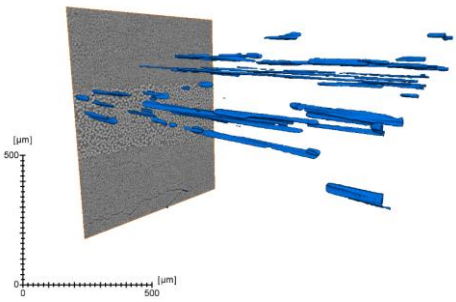
GLOBAL INITIATIVE OF ACADEMIC NETWORKS MINISTRY OF EDUCATION, GOVT. OF INDIA, SPONSORED COURSE ON

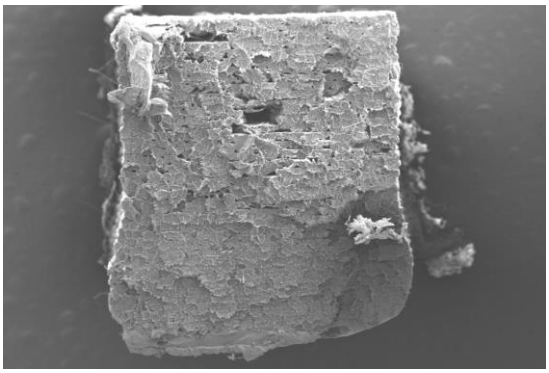
Mechanics, processing and performance prediction of composite materials

Dates: 13-02-23 to 24-02-23

Mode: Online







Organized by:

Mechanical Engineering Department,
Indian Institute of Technology Kharagpur
Kharagpur, West Bengal
www.iitkgp.ac.in

Keep an eye on website
https://sites.google.com/view/atuljain/gian-course for updates!

About Course

Overview

The future of fiber reinforced composites in general, and textile composites in particular, seems bright. Four industrial branches – aeronautic, automotive, sporting goods and wind energy – are now major users of composites, and their demands will shape composites material science for decades ahead. For the development of novel materials with tailored performance, and analysis of existing high performance composite systems, engineers and researchers need a thorough understanding of the structure-defined mechanical behavior of the composite materials, that cover the structural/hierarchical levels from the nanometer to meter scales. The composites industry has reached the point where it is transitioning from 'manual processes' to 'automation', an evolution similar to what took place in the metals industry in the beginning of the 20th century. The advent of industry 4.0 with a demand for customization and for product design as manufactured creates a need for understanding of the material behavior in manufacturing as well as in its performance. Over the coming decades, the composites world will undergo a major metamorphosis, as automation and robotics will be increasingly implemented; this transition is currently underway in the automotive and the aerospace sector. The course provides a student – a future composites engineer, technologist or a researcher – with a fundamental knowledge of basic phenomena and modelling concepts of the mechanical behavior of composite materials, with the emphasis on multiaxial composite laminates and textile composites. For the textile composites the mechanics of the reinforcing fabrics in the composite production is presented.

Objectives

The course pursues the following objectives:

1. Expose the students to the fundamentals of mechanics of fibre reinforced composites.
2. Provide the students with fundamental knowledge, allowing them estimations of the composite materials performance for the material design.
3. Create in the students understanding of principles and methods, implemented in modern software products for composites design.
4. Convey to the students the as manufactured design paradigm, interrelation between composites manufacturing and performance.
5. Expose the student to the practical problems and their solutions, through problem solving and case studies.

Apart from the course, the participants will get an opportunity to participate in Q&A session where they can discuss and ask questions on "*any*" topic related to composites to a world renowned expert.
This event will be organized outside of the two weeks in which the course will be run.

Course Schedule

Day No.	Date*	Topic
Day 1#	13-Feb-23	Introduction to composites materials/ case studies Different types of fibres and matrices, rules and criteria for choosing appropriate constituents
Day 2##	14-Feb-23	Different methods of fabricating composites Introduction to textile composites, including description of different fibre architecture
Day 3##	15-Feb-23	Modelling: manufacturing and mechanical properties- draping of textiles, including modelling of draping
Day 4##	16-Feb-23	Modelling: manufacturing and mechanical properties- permeability of textiles and modelling of impregnation and dependence on mechanical properties Anisotropic Elasticity- Different types of materials based on material symmetry and Hooke's law for isotropic, transversely isotropic, orthotropic and anisotropic material
Day 5##	17-Feb-23	Micromechanics of long fibre composites: stiffness- modified rule of mixtures, other methods Micromechanics of long fibre composites: strength-different modes and modelling
Day 6##	20-Feb-23	Micromechanics of long fibre composites: strength2– different modes of failure for long fibre composites and their dependence on ply orientation Fatigue of composites -Modelling of fatigue behaviour of different types of composites including textile, unidirectional composites and short fibre composites.
Day 7#	21-Feb-23	Classical Laminate theory- Introduction to laminate, ABD matrix, Laminate design, different types of laminates – balanced, symmetric, specially-orthotropic etc.
Day 8##	22-Feb-23	Laminate failure – Modelling of failure in laminate, first ply failure and failure envelopes
Day 9#	23-Feb-23	Joining of composites- Different challenges and methods of joining composites. Composites 4.0- Introduction to Composites 4.0
Day 10#	24-Feb-23	Introduction to nano-reinforced composites Evaluation

*Dates are tentative, subject to change

- Lecture delivered by Host faculty

- Lecture delivered by International Expert

Teaching faculty

Prof. Stepan V. LOMOV is emeritus professor at Department of Materials Engineering, KU Leuven, Belgium. He received PhD in St-Petersburg in 1989, and Doctor Habille in Textiles Material Science at St-Petersburg State University of Technology and Design in 1995.

He has been associated with KU Leuven since 1999 and pursues wide range of interests including: composites, material science and manufacturing, nano-composites, textiles, modelling, software development and experimental mechanics.

Prof. Lomov has published 350+ papers in peer-reviewed WoS listed publications which have been cited 10,000+ times leading to h-index >50. **Prof. Lomov** sits on the editorial board of leading journals like Composite Science and Technology, Textile Research Journal and Journal of Engineering Fibres and Fabrics. He has been instrumental in the development and commercialization of software: WiseTex and VoxTex. He has supervised 30+ PhDs who are placed in academia and industry in all corners of the globe.

He is reachable at stepan.lomov@kuleuven.be. A peer-reviewed review paper highlighting contribution of **Prof. Stepan V. Lomov** can be read here - https://doi.org/10.1177/0021998320937066

Dr. Atul JAIN is an assistant Professor at the Indian Institute of Technology, Kharagpur since 2017. He received PhD from the KU Leuven in 2015, where he was the recipient of the IWT Baekeland Mandate for the period of his PhD. Previously, **Dr. Jain** has held academic positions in University of Southern California, USA and University of Edinburgh, Scotland.

His research interests include: Mean-field homogenization, micromechanics of composites, joining of composites and architectured materials.

Dr. Jain was the inaugural winner of the DRDO Dare of Dream Innovation contest and was recently awarded the ASEM_Duo Fellowship by the Academy of Research and Higher Education (ARES), Belgium

He is reachable at atuljain@mech.iitkgp.ac.in and to know more
Kindly visit: https://sites.google.com/view/atuljain/

Dr. Nilanjan DAS CHAKLADAR is an assistant Professor at the Indian Institute of Technology, Kharagpur. He received PhD from the University of Manchester, UK in 2014, after completing Masters from IIT Kharagpur and BE from Jadavpur University, India. Nilanjan has previously worked in the areas of manufacturing and simulation in the Universities of Nottingham, Leeds and New South Wales, Sydney.

His research interests include defect-free composite manufacturing via autoclave and out-of-autoclave processes, filament winding and hybrid composites.

He is reachable at ndaschakladar@mech.iitkgp.ac.in and to know more
Kindly visit: https://www.linkedin.com/in/ndchakladar/

Logistics

- ## Who can attend ?

-Executives, engineers and researchers from manufacturing, service and government organizations, including R&D laboratories.
-Student students at all levels (BTech/MSc/MTech/PhD) or Faculty from academic and technical institutions.

- ## Course Fee Structure

Participation fees is as follows (Excluding onetime GIAN Portal Registration fee of Rs 500/-):

	Participation fee			
Participants	India & SAARC Nations, incl. GST	Outside India, SAARC	From host institute (IIT Kharagpur), incl. GST	From institute of invited guest speaker (KU Leven)
Students	₹ 1,298	$59	Free	$37
Faculties	₹ 2,596	$118	₹ 1,298	$77
Industry	₹ 5,192	$177	#N/A	

- ## How to register?

Step-1: Web Portal Registration: Visit http://www.gian.iitkgp.ac.in/GREGN/index and create login User ID and Password. Fill up the registration form and complete one time web registration by online payment of Rs. 500/-. This provides the user with lifetime registration to enroll in any number of GIAN courses offered.

Step-2: Course Registration: Login to the GIAN portal with the user ID and Password already created in Step 1. Click on Course Registration option at the top of Registration form. Select the Course titled "**Mechanics, processing and performance prediction of composite materials**" from the list and click on save option. Confirm your registration by clicking on "Confirm Course".

Step-3: Initiate the payment (as per table above) for the course using details below

Details for NEFT

Name of Bank Account: CEP-STC
Bank Account Number: 9556-220-000-2955
Name of Bank: Canara Bank
IFSC Code: CNRB0019556
SWIFT Code: CNRB-IN-BB-BFD

Step-4: Once the payment is made, please fill up the form https://forms.gle/N54ZejWSSNEjfbiz5 to secure your seat and receive confirmation of participation.

For any queries regarding registration of the course, please contact the course coordinator through email (atuljain@mech.iitkgp.ac.in)

*SAARC countries include: Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka