



KNOWLEDGE INCUBATION FOR TEQIP, IIT KANPUR

Pravartana 2016: TEQIP Symposium on Mechanics

February 12-14, 2016

Knowledge incubation for TEQIP, IIT Kanpur along with the Mechanics and Applied Mathematics Group at IIT Kanpur organized a 3 day symposium (**Pravartana 2016**) from **12th to 14th February, 2016** on **Mechanics**. The symposium aimed to make the participants aware of the recent trends in applied areas of mechanics with special focus on vibrations, plasticity and non-destructive testing. The symposium was planned in honor of four stalwarts of Mechanics (Profs. C. Venkatesan, D.Yadav, P. M. Dixit and N. N. Kishore) all of whom have contributed significantly to the development of Mechanics Research at IIT Kanpur. The symposium comprised of advanced lectures on topics based on the work of these stalwarts by the experts from various academic institutions and research labs within the country.

Topics Discussed

- Overview of Helicopter Dynamics and Aeroelasticity, and Autonomous Mini Helicopter Development
- Modelling of material behaviour and analysis of structure with multi-functional capabilities
- Future design requirements and trends to overcome challenges of helicopter operations
- Stall, flutter and thrust generation of an oscillating airfoil
- Aeromechanical instabilities in helicopters.
- Structure-mechanics relationship in fibrous biomaterials.
- Flexible forming processes (with emphasis on incremental forming)
- Recent Trends in Ultrasonic NDT
- Ultrasonic Tomography of Perspex- Polystyrene Specimen
- Strength reliability of fibre bundles-attempts to extract statistics from deceitful simulation data.
- Linear elastic model for generating wavy structure in lipid membrane by peripheral protein.
- Two applications of statistics from an engineering perspective.
- Improved harmonicity due to mode locking in string vibrating against obstacle
- Structural Integrity Assessment on solid propellant rocket motors.
- Ductile – fracture using continuum damage mechanics

- Contact mechanics of beams
- Modelling fatigue crack propagation in adhesively bonded composites
- Challenges in the modelling of metal forming processes
- Effect of crack closure parameter and cut off on negative triaxiality on damage growth
- Non-metric material connection and inhomogeneities in materially uniform elastic solids.
- Finite element studies on indentation and modelling using a strain gradient theory.

List of Speakers

- Prof. C Venkatesan, IIT Kanpur
- Prof. V L Sateesh, NAL , Bangalore
- Prof. N. S Krishna, HATSOFF Helicopter Training Pvt. Ltd, Bangalore
- Prof. VaitalaLaxman, Amrita University, Coimbatore
- Prof. Ranjith M, IIT Madras
- Mohd. Suhail Rizvi, IIT Kanpur
- Prof. N.V Reddy, IIT Kanpur
- Prof. N.N Kishore, IIT Kanpur
- Prof. P Munshi, IIT Kanpur
- Prof. S Mahesh, IIT Madras
- Prof. Anindya Chatterjee, IIT Kanpur
- Prof. B.N Rao, KL University
- Prof. PM Dixit, IIT Kanpur
- Azhar Jamil, AMU, Aligarh
- Prof. U.S. Dixit, IIT Guwahati
- Manoj Kumar, IIT Kanpur
- AyanRoychowdhury, IIT Kanpur
- Prof. S. Basu, IIT Kanpur
- Mr. Venugopala Swami Punati, IIT Kanpur
- ParitoshMahata, NIT Jalandhar
- Ashok Mandal, NIT Jamshedpur

Participating Institutes

Institute	Number of Participants
Andhra University College of Engineering	1

Siddaganga Institute of Technology, Karnataka	1
Rajarambapu Institute of Technology,	1
Vasavi College of Engineering Ibrahimbagh, Hyderabad	1
MANIT Bhopal	2
College of Engineering, Pune	2
MMMUT, Gorakhpur	2
Dr. B A Technological University, Lonere	1
Sreenidhi Institute of Science and Technology Hyderabad	3
AMU Aligarh	2
AITAM Engineering College	1
Rotavio labs, Hyderabad	2
Total	19

Workshop Schedule

February 12, 2016

Time	Event
8:30 – 9:00 AM	Registration
9:00 – 10:00 AM	Overview of Helicopter Dynamics and Aeroelasticity, and Autonomous Mini Helicopter Development <i>Prof. C Venkatesan, IIT Kanpur</i>
10:00 – 10:50 AM	Modeling of material behaviour and analysis of structure with multi-functional capabilities <i>Prof. V L Sateesh, NAL , Banglore</i>
10:50 – 11:10 AM	Manufacture and development of a RCSRERVOMOTOR Challenges from the prespective of a start up <i>Mr. B B Swaroop, Rotavio labs</i>
11:00 – 11:30 AM	Coffee Break
11:30 – 12:30 PM	Future design requirements and trends to overcome challenges of helicopter operations <i>Prof. N. S Krishna, HATSOFF Helicopter Training Pvt. Ltd, Banglore</i>
12:30 – 1:00 PM	Stall, flutter and thrust generation of an oscillating airfoil <i>Prof. VaitalaLaxman, Amrita University, Coimbatore</i>
1:00 – 2:30 PM	Lunch Break
2:30 – 3:30 PM	Aeromechanical instabilities in helicopters <i>Prof. Ranjith M, IIT Madras</i>
3:30 – 4:00 PM	Structure-mechanics relationship in fibrous biomaterials. <i>Mohd. Suhail Rizvi, IIT Kanpur</i>
4:00 – 4:30 PM	Coffee Break
4:30 – 5:30 PM	Flexible forming processes (with emphasis on incremental

	forming) <i>Prof. N.V Reddy, IIT Kanpur</i>
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February 13, 2016

Time	Event
9:00 – 10:00 AM	Recent Trends in Ultrasonic NDT <i>Prof. N.N Kishore, IIT Kanpur</i>
10:00 – 11:00 AM	Ultrasonic Tomography of Perspex- Polystyrene Specimen <i>Prof. P Munshi, IIT Kanpur</i>
11:00 – 11:30 AM	<i>Coffee Break</i>
11:30 – 12:30 PM	Strength reliability of fiber bundles-attempts to extract statistics from deceitful simulation data. <i>Prof. S Mahesh, IIT Madras</i>
12:30 – 1:00 PM	Linear elastic model for generating wavy structure in lipid membrane by peripheral protein. <i>Paritosh Mahata, NIT Jalandhar</i>
1:00 – 2:30 PM	<i>Lunch Break</i>
2:30 – 3:30 PM	Two applications of statistics from an engineering perspective <i>Prof. Anindya Chatterjee, IIT Kanpur</i>
3:30 – 4:00 PM	Improved harmonicity due to mode locking in string vibrating against obstacle <i>Ashok Mandal, NIT Jamshedpur</i>
4:00 – 4:30 PM	<i>Coffee Break</i>
4:30 – 5:30 PM	Structural Integrity Assessment on solid propellant rocket motors. <i>Prof. B.N Rao, KL University</i>

February 14, 2016

Time	Event
9:00 – 10:00 AM	Ductile Fracture using Continuum Damage Mechanics <i>Prof. P M Dixit, IIT Kanpur</i>
10:00 – 10:30 AM	Contact Mechanics of Beams <i>Mr. Venugopala Swami Punati, IIT Kanpur</i>
10:30 – 11:00 AM	Modeling fatigue Crack Propagation in Adhesively Bonded Composites <i>Mr. Azhar Jamil, AMU Aligarh</i>
11:00 – 11:30 AM	<i>Coffee Break</i>
11:30 – 12:30 PM	Challenges in the modelling of metal forming processes <i>Prof. U S Dixit, IIT Guwahati</i>
12:30 – 1:00 PM	Effect of crack closure parameter and cut off on negative triaxiality on damage growth <i>Mr. Manoj Kumar, IIT Kanpur</i>
1:00 – 2:30 PM	<i>Lunch Break</i>

2:30 – 3:00 PM	Non-metric Materials Connection and Inhomogeneities in Materially Uniform Elastic Solids <i>Mr. Ayan Roy chawdhary, IIT Kanpur</i>
3:00 – 4:00 PM	Finite element studies on indentation and molding using a strain gradients theory <i>Prof. S Basu, IIT Kanpur</i>
4:00 PM	Coffee & Closure

Faculty Feedback

Workshop

<i>Questions</i>	<i>Excellent</i>	<i>Good</i>	<i>Ordinary</i>
Clarity of communication about workshop	04	04	00
Organization of the sessions	03	05	00
Quality of lectures	04	03	00
Effectiveness of discussions	03	05	00
Effectiveness of learning experience	01	06	01
	<i>Appropriate</i>	<i>Short</i>	<i>long</i>
Duration of workshop	05	02	00
	<i>Definitely</i>	<i>Maybe</i>	<i>No</i>
Would you like to have more such sessions?	04	02	01
Would you like e-lectures by experts on special	06	01	00
Suggest specific topic that you would like additional expert lectures on	<ul style="list-style-type: none"> ➤ Fracture mechanics ➤ Fluid Mechanics-Non Linear Analysis. ➤ Advances in fracture Mechanics, Damage Modelling, Experimental Methods. ➤ Composite laminates. ➤ Computational Solid Mechanics. ➤ Fracture, Vibration Isolation. ➤ FEM Modelling ➤ Composite Material ➤ Machine Design 		

Additional Suggestions	<ul style="list-style-type: none"> ➤ Kindly inform along with brochure some more details of the focus of symposium ➤ Prior information about the topics to be covered. ➤ No focussed attention in the symposium ➤ No theme in symposium ➤ No value addition from symposium ➤ Advances in Fracture Mechanics, Damage Modelling, Experimental Methods. ➤ More interested in some experimental activity. ➤ Workshop participants may be encouraged for active involvement. ➤ Give hardcopy of projection or topic.
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Teaching

Which subjects do you teach?	<ul style="list-style-type: none"> ➤ Engg. Mechanics, Advanced Fluid Mechanics, Free Surface Flows ➤ Maths I, II ,III, IV, Mathematical Modelling, Probability. ➤ Fracture Mechanics, Solid Mechanics, CAD. ➤ Finite Element Method, Mechanics of Composite Material, Mechanics of Materials. ➤ Solid Mechanics, Finite Element Method ➤ Fracture, FEM, Dynamics. ➤ Mechanics, Fluid Mechanics ➤ Machine Design 	
What is average student to teacher ratio in your institute?	<ul style="list-style-type: none"> ➤ 15:01 ➤ 12:01 ➤ 09:04 (approx) ➤ 20:01 ➤ 12:01 ➤ 12:01 ➤ 20:01 	
Questions	YES	NO
Do you have additional support for teaching (tutors, graders, teaching Assistants, etc)?	06	01

Do you give class projects for UG classes?	08	00		
Do you give class projects for PG classes?	07	01		
Do you have sufficient resources for laboratory courses?	04	04		
	<i>Sufficient</i>	<i>Inadequate</i>		
Is the library/journal/e-connection support adequate?	03	05		
	<i>Definitely</i>	<i>May be</i>	<i>No</i>	
Would you like to have common (TEQIP) repository of course material?	08	00	00	
Would you like to visit IITK to participate in and develop course material (existing or new)	08	00	00	
Would you like to participate in creation of the repository material (course files/lab.	07	01	00	
	<i>e-courses</i>	<i>Workshops</i>	<i>Content</i>	<i>none</i>
How can IITK effectively help you prepare for teaching?	05	06	01	00
How can TEQIP help improve your teaching?	<ul style="list-style-type: none"> ➤ Improvement in lab facilities for research ➤ Exposure to different technique for teaching ➤ Financial support for content upgradation. 			

Research

<i>Questions</i>	<i>Definitely</i>	<i>Maybe</i>	<i>No</i>
Would you like to visit an IIT for a visiting-faculty/ post-doctoral fellow, if offered (via-TEQIP)?	07	01	00
Would you like to share/use research infrastructure at IITK, if made available?	08	00	00
Would you like to conduct collaborativeresearch with IITK?	08	00	00

Would you like lectures by experts (Indian and international) on niche research areas/topics?	08	00	00
Do you want special-topic conferences?	08	00	00
How can TEQIP help improve your research?	<ul style="list-style-type: none"> ➤ By providing a platform like knowledge exchange ➤ Developing laboratory ➤ By providing opportunity to do research using facilities available at IITs ➤ Organize workshops with active testing (Lab) or simulation activities on assignment. ➤ Support to visit national labs. ➤ Support to discuss with people of higher institutes/organizations. 		

Additional Questions for TEQIP 3rd Phase:

1. Would you want in the 3 rd phase of TEQIP paid access to high end experimental facilities in specific institution?	<ul style="list-style-type: none"> ➤ 8 of 8 says Yes. ➤ Unlike phase-I and phase-II phase-III should have a focused attention on a narrowed field of research which is of national importance. Hence it is essential to identify the are to be supported. ➤ Yes, but specific institute allow all institute research student work in this institute.
2. Would you be interested in having end state art of activity TEM, SHRTM etc at specific institution (in the TEQIP fold so that all TEQIP institution can access) ?	<ul style="list-style-type: none"> ➤ 8 of 8 says Yes

OUTCOME

This year's Pravartanā was the sixth instance of the symposium and it was a great success towards expanding the scope IIT Kanpur's engagement with TEQIP institutes in research. Further, the topics of the symposium were Vibrations, Nondestructive Testing, Plasticity and Computational Mechanics. These topics were chosen to honour our esteemed colleagues Professors C. Venkatesan, D. Yadav, N. N. Kishore and P. M. Dixit who have made significant contributions to their respective areas of research. The symposium brought together the best researchers in these areas from academia and industry within India to present their research work. Specific problems that were discussed range from large scale engineering applications to small scale biomechanics. Some examples include, challenges in designing helicopters, how to non-destructively evaluate damage in a composite materials, how to model damage growth and plasticity in metals using continuum and statistical analysis, mathematically model the fibrous scaffolds for tissue engineering, how proteins deform cell membrane. This was an excellent platform where researchers from TEQIP institutes, IIT Kanpur and elsewhere learn about rigorous theoretical and mathematical modelling of physical phenomena, as well as industrial applications. The participants could also interact with some of the experts in these fields and present their own work.