

Anupam SAXENA

RESEARCH INTERESTS

Compliant and Robotic Systems: Structural/Topology Design of Large Deformation Systems with Nonlinearities in Geometry, Material and those involving Contact; Design and Realization of Orthotic/Exoskeleton and Prosthetic Devices for Assistance and Rehabilitation; Structural Inference; Biomimetics; Bio-inspired Designs; Terrestrial (multi-agent) & Aerial Robots; Multi-body Dynamics of Flexible Systems; Optimal and Minimal Assembly Design for Sustainability;

BROAD APPLICATION AREAS

Soft and Medical Robotics; Biomedical/Healthcare; Micro-Electro-Mechanical Systems; Automotive and Aerospace; Sustainable Engineering — those requiring Sensing, Actuation, Grasp, Manipulation, Bistability and Static-Balancing, prescribed (e.g., Constant) Input/Output Force Relations

CURRENT EMPLOYMENT

July 2016 - present | *Full Professor*, INDIAN INSTITUTE OF TECHNOLOGY KANPUR

ADDRESS: | (Office) Faculty Building, #361
| (Lab) Compliant and Robotic Systems, Faculty Building, #369
| Indian Institute of Technology Kanpur 208016
PHONE: | +91 512 259 7205(O), 7397 (L)
EMAIL: | anupams@iitk.ac.in
URL: | home.iitk.ac.in/~anupams

EDUCATION

1997-2000 Ph.D. in Mechanical Engineering, **University of Pennsylvania**, PA, USA
1995-1997 M.S. in Mechanical Engineering, **The University of Toledo**, OH, USA
1991-1995 B.Tech in Mechanical Engineering, **Indian Institute of Technology**, Bombay

WORK EXPERIENCE

May 2017 - present | *Visiting Professor*, RWTH AACHEN UNIVERSITY, GERMANY
| Summer and Winter Sessions
May, 2022 | GDAŃSK UNIVERSITY OF TECHNOLOGY
August 2021 - June 2022 | RWTH AACHEN UNIVERSITY, GERMANY. **RRS, AvH Foundation**
May 2017 - July 2017 | RWTH AACHEN UNIVERSITY, GERMANY. **RRS, AvH Foundation**
June 2014- July 2014 | *Visiting Assoc. Professor*, RWTH AACHEN UNIVERSITY, GERMANY
May 2010- Dec 2012 | *Visiting Assoc. Professor*, RWTH AACHEN UNIVERSITY, GERMANY,
AvH Fellow, Experienced Researcher
Dec 2014- May 2015 | *Visiting Assoc. Professor*, INDIAN INSTITUTE OF TECHNOLOGY,
GUWAHATI
May 2009 - July 2016 | *Associate Professor*, INDIAN INSTITUTE OF TECHNOLOGY KANPUR
July 2006 - June 2007 | *Visiting Assistant Professor*, CORNELL UNIVERSITY
Mar 2001 - May 2009 | *Assistant Professor*, INDIAN INSTITUTE OF TECHNOLOGY, KANPUR
*AvH: Alexander von Humboldt; *RRS: Renewed Research Stay

RESEARCH OUTPUT (SUMMARY)

<i>Publications</i>	<i>Journals– Published/in press/arXiv:</i> 54 (Page 12 for complete list) <i>Peer Reviewed Conferences:</i> 66 (Page 15 for complete list) <i>Books and Book Chapters:</i> 1+5 (Page 19 for complete list)
<i>Methods,</i>	<ul style="list-style-type: none">• Biomimetic and Parametric Design of Human Hand Exoskeleton for Coarse Grasping Applications• Analysis of a Tendon Pulley System (TPS) of human finger flexors using the Pseudo-Rigid-Body Model approach. Most aspects including finger-joint locking considered.• Functional Inference of complex, human anatomical tendinous networks using Estimation-Exploration Algorithm (Co-evolution).• Three-finger hand exoskeletons for fine, cooperative manipulation (translation/rotation) of slender objects.• A Compact Differential Mechanism for a Wearable Hand Exoskeleton.• Synthesis Methodology for Constant input/output force mechanisms• A displacement delimited contact-aided large displacement compliant (CCM) gripper to arrest and manipulate very fragile objects.
<i>Software & Tools</i>	<ul style="list-style-type: none">• Topology Synthesis of path generating contact-aided large displacement compliant mechanisms (CCMs) with hexagonal cells and material masks, and with initially curved frames. All (self and mutual) contact modes considered.• 3D MMOS: Material Mask Overlay Strategy (MMOS) for topology optimization with tetrakaidecahedra (truncated octahedra) and spheroidal negative masks.• Material Mask Overlay Strategy (MMOS) for topology optimization with hexagonal tessellation and circular/elliptical/rectangular positive/negative masks.• Unified synthesis of planar, path generating mechanisms involving rigid and compliant members undergoing large deformation.• Educational Codes on Topology Optimization with hexagonal and frame finite elements• Design/Realization of a large deformation, 3-kink CCM Switch.• Realtime, Projective Path Planning for multi-agents for arrest and guidance of a moving object under a dynamic environment.
<i>Patents & Inventions</i>	<p>Shyam Sunder Nishad. Anirban Choudhury. Ashish Dutta. Anupam Saxena. <i>Hand exoskeleton for assisting stroke patients in full extension exercise of three fingers and grasping/ball-squeezing exercises.</i> Indian Patent Office. 304112. Grant Date: 08.01.2020.</p> <p>Vitthal Khatik. Anupam Saxena. 2024. <i>A Device for Providing Assistance and Rehabilitation During Flexion and Extension Movement of Fingers.</i> Indian Patent Office. 508011. Grant Date: 07.02.2024.</p> <p>Vitthal Khatik. Anupam Saxena. 2023. <i>System for Providing Flexion and Extension Movement to Articulated Finger Units of an Artificial Hand.</i> Indian Patent Office. 509038. Grant Date: 09.02.2024.</p>

SELECTED PUBLICATIONS

- SRIVATSA DESHMUKH. VITTHAL KHATIK. ANUPAM SAXENA. 2023. *Robust Fusion Model for Handling EMG and Computer Vision Data in Prosthetic Hand Control*. IEEE Sensors Letters. in IEEE Sensors Letters, vol. 7, no. 9, pp. 1-4, Sept. 2023, Art no. 6004804, doi: 10.1109/LSENS.2023.3301837.
- KHATIK V. M. NISHAD S. S. ANUPAM SAXENA. 2021. *Comprehending finger flexor tendon pulley system using systematic computational analysis*. ASME Journal of Biomedical Engineering. 143. 111009-1-10.
- SAXENA A. VALERO-CUEVAS F J. LIPSON H. 2012. Functional inference of complex anatomical tendinous networks at a macroscopic scale via sparse experimentation. *PLOS Computational Biology*. 8(11): p.1-17 (e1002751)
- VALERO-CUEVAS F J. ANAND V. SAXENA A. LIPSON H. 2007. Beyond parameter estimation: Extending biomechanical modeling by the explicit exploration of model topology. *IEEE Transactions of Biomedical Engineering*. Nov;54(11):1951-64.
- Vitthal Manohar Khatik. Anupam Saxena. 2023. A Novel Slack Tolerant, Sliding Pulley Differential Mechanism for Adaptive Grasping. *ASME 2023 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC / CIE2023)*. Boston Park Plaza, Boston MA. August 20-23. IDETC2023-115115.
- ORLANDO, M. F., BEHERA L., DUTTA, A., AND SAXENA A. 2020. Optimal Design and Redundancy Resolution of a Novel Robotic Two-Fingered Exoskeleton. *IEEE Transactions on Medical Robotics and Bionics*, Vol 2(1). pp. 59-75.
- Felix Orlando Maria Joseph. Laxmidhar Behera. Tomoya Tamei. Tomohiro Shibata. Ashish Dutta. Anupam Saxena. 2016. On Redundancy Resolution of the Human Thumb, Index and Middle Fingers in Cooperative Object Translation. *Robotica*. 35 (10), pp. 1992-2017
- ORLANDO M F. DUTTA A. SAXENA A. BEHERA L. SHIBATA T. 2013. Manipulability Analysis of Human Thumb. Index and Middle fingers in Cooperative 3D Rotational Movements. *Robotica*. 31 (5), pp. 797-809. Available on CJO.doi: 10.1017/S0263574713000064.
- JIMSON N GEO. TOMOYA TAMEI. TOMOHIRO SHIBATA. M F FELIX ORLANDO. LAXMIDHAR BEHERA. ANUPAM SAXENA. ASHISH DUTTA. 2013. Control of an optimal finger exoskeleton based on continuous joint angle estimation from EMG signals. *Annu Int Conf IEEE Eng Med Biol Soc*.338-341. doi: 10.1109/EMBC.2013.6609506.
- Shyam Sunder Nishad, Ashish Dutta, Anupam Saxena. 2014. Design and Control of a Three Finger Hand Exoskeleton for Translation of a slender object. *The 11th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI 2014)*. Nov. 12 – 15, 2014 at Double Tree Hotel by Hilton, Kuala Lumpur, Malaysia.
- SAXENA. A. ANANTHASURESH. G. K. 2001. Topology Synthesis of Compliant Mechanisms for Nonlinear Force-Deflection and Curved Output Path. *ASME Journal of Mechanical Design*. March 2001. Vol. 123. pp 33-42.
- RAI A K. SAXENA A. MANKAME N D. 2010. Unified synthesis of compact planar path-generating linkages with rigid and deformable members. *Structural and Multidisciplinary Optimization*. 41:863–879.
- SAXENA A. KRAMER S N. 1998. A Simple and Accurate Method for Determining Large Deflections in Compliant Mechanisms subjected to End Forces and Moments. *ASME Journal of Mechanical Design*. 120(3). pp. 392-400.
- KUMAR. P. SAXENA. A. SAUER R. A. 2018. Computational optimization of large deformation compliant mechanisms undergoing self and mutual contact, *Journal of Mechanical Design*, 141(1): 012302 (13 pages).

KEY MERITS (ACADEMIC, ADMINISTRATIVE AND OUTREACH)

<i>May 2013 - Nov 2014</i>	<i>Faculty Advisor and Associate Dean</i> , INTERNATIONAL RELATIONS, IIT KANPUR Salient Accomplishments: IITK-NUS Joint Degree Programme, MIPP programme with the University of Melbourne (Joint Ph.D. programme), Academic MoUs with strategically chosen overseas universities including three each from Finland and Norway, e.g., Aalto University and The University of Oslo, envisioned and initiated internationalization strategy for IIT Kanpur and established its presence via print and media amongst other responsibilities, streamlined the activities of the Office of International Relations (OIR) which was then with the Dean, Resources and Alumni (DoRA), and initiated for OIR to be a standalone unit.
<i>2021 - present</i>	<i>Associate Editor</i> JOURNAL OF MECHANISMS AND ROBOTICS reappointed
<i>2011 - 2015</i>	<i>Associate Editor</i> JOURNAL OF MECHANISMS AND ROBOTICS
<i>Dec, 2015</i>	<i>Organizing Chair: 2nd INTERNATIONAL AND 17th NATIONAL CONFERENCE ON MACHINES AND MECHANISMS</i> , DEC 16-19, INDIAN INSTITUTE OF TECHNOLOGY KANPUR. CO-CHAIRS: DR. SHIKHA PRASAD AND DR. NEERAJ SINHA.
<i>2020-present</i>	<i>Advisor</i> , CMDE (COMPLIANT MECHANISMS DESIGN AND ENGINEERING) LABS https://www.cmdelabs.com
<i>2009-present</i>	<i>Mentor Advisor</i> , TAS (TRIDENT ANALYTICAL SOLUTIONS) Prominent Products from TAS: Shabdnagari, Sociota, Market Reckon, Caller Pay. http://www.tas.co.in/
<i>2020-21</i>	<i>Mentor Advisor</i> , PLUS ROBOTICS Focuses on educating students about Robotics and provides services through online courses and school programs
<i>2006, 2016</i>	<i>Symposium Coordinator, Compliant Mechanisms ASME IDETC 2006, 2014, 2016</i> Coordinated review of many submissions
<i>2006, 2009</i>	<i>Session Chair</i> ASME IDETC 2006, 2009, 2023
<i>2011-12, 2002-03</i>	<i>Faculty Advisor</i> , ASSOCIATION OF MECHANICAL ENGINEERS, IIT KANPUR
<i>Sep 2008 - Apr 2009</i>	<i>Games Counselor</i> , STUDENT GYMKHANA, IIT KANPUR Was instrumental in forming SPEC, Sports and Physical Education Committee, on the proposal by Prof. CS Upadhyay to the then Dean, Student Affairs, Prof. Partha Chakraborty.
<i>2002 - 2003</i>	<i>Chairperson</i> , STAFF GYMKHANA, IIT KANPUR Helped draft the new constitution for Staff Gymkhana years later.
<i>2014-present</i>	<i>Peer Review of Funding applications</i> for Technology Foundation STW, Dutch Research Council, Department of Science and Technology, India and others.

2012	Co-Convenor, <i>International Conference on Microactuators and Micromechanisms</i> MAMM-2012, CSIR-CMERI INDIA
2001-present	<i>Reviewer</i> ASME Journal of Mechanical Design, ASME Journal of Mechanisms and Robotics, Structural and Multidisciplinary Optimization, Computer Aided Design, International Journal for Numerical Methods in Engineering, Finite Elements in Analysis and Design, Computational Methods in Applied Mechanics and Engineering.
2016-present	<i>Examiner for Doctoral Theses/Viva voce</i> Indian Institute of Science, Bangalore, IIT Madras, IIT Guwahati
2001-present	STUDENT INTERNSHIPS AT CARS LAB Please refer to page 7
2001-present	Counselled many students on career and mental health related issues.

INVITED TALKS

ON HAND EXOSKELETONS

RWTH Aachen University (July, 2017), Indian Institute of Technology, Madras (2024)

COMPLIANT MECHANISMS, DESIGN PRINCIPLES AND TOPOLOGY OPTIMIZATION – VARIOUS ASPECTS

Cornell University (Aug, 2006), University of Milwaukee (Sep, 2007), IIT Kanpur (Oct, 2009), RWTH Aachen University (Nov, 2010), TU Delft (Feb, 2011), IIT Bombay (Oct, 2011), NAIST, Ikoma, Japan (Apr, 2013), IIT Hyderabad (Mar, 2016), NIT, Suratkal (Mar, 2017), SICE, IIT Hyderabad (Dec, 2022)

ON FUNCTIONAL INFERENCE USING THE ESTIMATION-EXPLORATION ALGORITHM

University of SUNY Buffalo (Mar, 2007), Gdansk University of Technology (May, 2022)

EU REGIONAL SCHOOL, RWTH AACHEN UNIVERSITY (July, 2016)

A 3 hr lecture on [Systematic Synthesis of Large Displacement Compliant Mechanisms: A Structural Optimization Approach](#)

NERIST, NIRJULI INDIA (Aug, 2014)

A three day short term TEQIP course on CAD

ON CAPTURING UNSTEADY FLOW CHARACTERISTICS AROUND A FLAPPING WING-CHORD USING POTENTIAL FLOW THEORY

IIT Guwahati (April, 2015), IISc Bangalore (Mar, 2014), RWTH Aachen University (Jul, 2014), RWTH Aachen University (June, 2018)

ON KEMPE'S LINKAGES

RWTH Aachen University (Nov, 2012), Microactuators, Microsensors and Micromechanisms (MAMM) Conference (December, 2022)

RESEARCH SUPERVISION

Ongoing Doctoral Students

- D9. Estefania Andrea Hermoza Llanos (RWTH Aachen University), On Design of Large Deformation Compliant End-Effector System for Applications in Medical Robotics and Micromechanisms. Principal Supervisor: Burkhard Corves, Co-Supervisors: Anupam Saxena and Mathias Hüsing.
- D8. Vitthal Khatik, On design of Hand Exoskeletons, Principal Supervisor: Anupam Saxena
- D7. Shyam Sunder Nishad, On Systematic Design of Robotic Dragonflies, Principal Supervisor: Anupam Saxena
- D6. Nikhil Singh, Some Advancements in Topology Optimization Strategies: From Singularity-Free, Close-to-Binary Solutions to Reduced Variables and Minimum Length Scale Imposition. Principal Supervisor: Anupam Saxena

Graduated Doctoral Students

- D5. BVS Nagendra Reddy, On Design of Large Deformation Compliant Topologies for Special Deformation Characteristics, Principal Supervisor: Anupam Saxena
- D4. Kumar, Prabhat, 2017, Synthesis of Large Deformable Contact-aided Compliant Mechanisms using Hexagonal Cells and Negative Circular Masks. Principal Supervisor: Anupam Saxena, Co-supervisor: Roger Sauer, RWTH-Aachen
- D3. Mayank Goswami, 2014, On Tomography Reconstruction Techniques. Principal supervisor: Prabhat Munshi, IIT Kanpur, Co-supervisor: Anupam Saxena
- D2. Orlando, Felix, 2013, Cooperative Human Finger Motion Analysis and Optimal Design of a Three Finger Exoskeleton: Principal supervisor: Laxmidhar Behera, IIT Kanpur, Co-supervisors: Anupam Saxena and Ashish Dutta, IIT Kanpur
- D1. Khan, A, 2010, Numerical Study of Thermo-Elastohydrodynamic Lubrication of Infinite Line Contact Rough Surfaces. Principal supervisor: Prawal Sinha, IIT Kanpur, Co-supervisor: Anupam Saxena

Graduated Masters Students

- M24. Abhishek Sharma, 2017, On Design of Knee, Foot and Ankle Orthotic Exoskeleton. Principal Supervisor: Anupam Saxena
- M23. Ajay Bajaj, 2017, Soft hand exoskeleton. Principal Supervisor: Anupam Saxena
- M22. Amul Agarwal, 2017, Structural/Functional Inference of a Nonlinear 2D Continua Using Predator Prey Estimation Exploration. Principal Supervisor: Anupam Saxena
- M21. Anuj Agarwal, 2016, A Novel Mechanism for Flapping Wing Flight. Principal Supervisor: Anupam Saxena
- M20. Hrishikesh Raste, 2014, Optimal Design for a Flapping Wing Mechanism and Wing Profile Capturing Unsteady Flow Characteristics. Principal Supervisor: Anupam Saxena
- M19. Shyam Sundar, 2014, On design and control of a three finger exoskeleton. Principal Supervisor: Anupam Saxena, Co-supervisor: Ashish Dutta.
- M18. Sharad Singhania, 2011, Design and Control of Multi-Agents for Transportation of Object in Extended 2D Terrain. Principal Supervisor: Anupam Saxena, Co-supervisor: Ashish Dutta
- M17. Ved Prakash Chowdhary, 2011, Optimal Design and Control of Leg Exoskeleton. Principal Supervisor: Anupam Saxena, Co-supervisor: Ashish Dutta
- M16. Pranay Sharma, 2011, Topology optimization of Electrothermally Compliant MEMS using a hybrid approach. Principal Supervisor: Anupam Saxena
- M15. Sujit Kumar V. Naik, 2010, How to Choose from a Synthesized set of Mechanisms, Principal Supervisor: Anupam Saxena
- M14. BVS Nagendra Reddy, 2010, Synthesis of Non-smooth path generating Fully Compliant Mechanisms using Self Contact, Principal Supervisor: Anupam Saxena

- M13. Amit Srivastava, 2010, Electric Pulse Aided Single Point Incremental Forming, Principal Supervisor: N. V. Reddy, Co-supervisors: Anupam Saxena
- M12. Mayank Goswami, 2009, On Tomography using Finite Element like field approximations and Optimization, Principal Supervisor: P. Munshi, Co-supervisors: M. S. Kalra, Anupam Saxena
- M11. Vijaysingh R. Shinde., 2009, Experimental Validation of Form Closure Capture and Transportation of Moving Objects using Projective Path Planning, Principal Supervisor: Anupam Saxena, Co-supervisor: Ashish Dutta
- M10. Pavan Kumar, 2009, Singularity-free Binary Designs in Topology Optimization, Principal Supervisor: Anupam Saxena
- M9. Ashok Rai, 2006, Topology, Shape and Size Optimization of Compliant Mechanisms Using Curved Frame Elements and Genetic Algorithm, Principal Supervisor: Anupam Saxena
- M8. Pankaj Sharma, 2006, Arrest and Guidance of a Moving Object using Multi-Agents, Principal Supervisor: Anupam Saxena, Co-supervisor: Ashish Dutta
- M7. CP Mishra, 2006, Nonlinear, Transient, Thermo-Elastic Analysis for Continua under High Temperature Environment, Principal Supervisor: Anupam Saxena
- M6. Mukul Tuli, 2006, Local Shape Modification of B-Spline Curves, Principal Supervisor: N. Venkat Reddy, Co-supervisor: Anupam Saxena
- M5. Anjul Beohar, 2005, A Hybrid Approach to Reconstruct 3d Solids From 2d Near Isometric Sketches, Principal Supervisor: Anupam Saxena, Co-supervisor: Ashish Dutta
- M4. Maitray Srivastava, 2005, Mathematical Analysis, Design, Development and Experimentation of an 8 DOF Biped Robot, Principal Supervisor: Ashish Dutta, Co-Supervisor: Anupam Saxena
- M3. Prince Malik, 2004, Automated Design of Modular Fixtures to minimize Tolerances, Principal Supervisor: N. Venkat Reddy, Co-Supervisor: Anupam Saxena
- M2. Rajat Saxena, 2003 , A Novel Parameterization for Topology Design of ETC MEMS for Strength, Principal Supervisor: Anupam Saxena
- M1. Gaurav Seth, 2002, Splines based Assessment of Pre and Post Treatments of Dental Fixtures, Co-Supervisor: Anupam Saxena

Senior Design Projects

- SDP5. Anuj Agarwal, Shaurya Shriyam, 2014, Design, Modeling and Control of a Robotic Fish. Principal Supervisor: Anupam Saxena, Co-Supervisor: Laxmidhar Behera
- SDP4. Sandeep Urankar, Pranjal Jain, Anurag Singh, 2003, Design, Fabrication and Control of a Robo-sloth, a rope climbing Robot, Principal Supervisor: Anupam Saxena
- SDP3. Manish Dwivedi, Ashish Sethi, Amit Pahwa, A. P. Singh, 2002, Design and Fabrication of a Customized Above Knee Prosthesis, Principal Supervisor: Anupam Saxena
- SDP2. Ashish Asthana, Nandeesh Shukla, Bharat Panjwani, 2002, Design, Fabrication and Control of a Four dof Redundant Planar Manipulator, Principal Supervisor: Anupam Saxena, Co-supervisor: Susmit Sen
- SDP1. Abhudyai Singh, Apratim Rajendra, Bipin Kumar, 2002, Adonis: Walking Machine and Biped (**Adjudged the best B. Tech project**), Principal Supervisor: Anupam Saxena, Co-supervisor: Susmit Sen

Interns

- | | |
|-------------------|---|
| Amitesh Mishra | On Reconstruction of 3-D Solids from 2-D Multiple and Primary Auxiliary Views |
| Chandini Jain | On Topology Design using improved Material Mask Overlay Method |
| Autumn Allen | On Kinematic Design of a Flapping Mechanism |
| Vishal Jain | On Design of a Compact Differential Mechanism for Soft Hand Exoskeleton, and on Flapping Mechanism emulating fruitfly |
| Shelley Goel | On Electro-Thermo-Mechanical Modeling of Compliant Mechanisms. |
| Rubin Jacob | On a TMD based Hand Exoskeleton to suppress hand tremors. |
| Srivatsa Deshmukh | On Fusion Model for Combining EMG and Computer Vision Data in Prosthetic Hand Control |

ONGOING RESEARCH

- Design & Realization of a Finger-to-Elbow Hand Exoskeleton for Coarse Grasping:
First part established that with the Flexor Digitorum Profundus (FDP) tendon, annular A and cruciate C pulleys need to be positioned and sized optimally for maximum range of motion, minimum tendon tension, bowstringing and pulley stresses. This finding was in concurrence with the anatomy of human hand, when two annular and two cruciate pulleys are in use. Second part was to design a Finger-to-Elbow hand Exoskeleton (F-EL-EX) for Coarse Grasping for individuals with hand muscle weakness based on the above finding. Four strings, one for each finger, are routed (optimally) from finger-tip to wrist, and connected via a (an underactuated) novel, sliding pulley based differential mechanism which permits string slacking and uses a single motor to actuate the fingers *differentially*. Flexion-extension of the thumb is controlled by the second motor. F-EL-EX is designed for lateral pinch, spherical/power and parallel extension type grasps. Third part pertains to clinical trials with F-EL-EX on individual(s) with hand muscle weakness. Voice control based grasp is planned. Performance of F-EL-EX is to be adjudicated based on many grasping criteria. Final task is to extend the F-EL-EX design for the four fingers, and possibly thumb, to have independent flexion-extension capabilities, using Machine Learning.
- Design of multi-finger compliant (monolithic) gripper for adaptive grasping:
Each planar unit of the gripper is designed using large deformation topology optimization, modelling contact with objects of various, but smooth, curvatures. Notion is to cater to a variety of object shapes when grasping and securing. Tethered actuation is planned through the gripper's base. The fingertip approximately follows a specified trajectory, and grasp-contact forces (or number of grasp points) are maximised. Initial finger positions/configurations can be adjusted to facilitate minimal invasion. Relative orientations of finger bases can also be modified, e.g., two fingers could be placed relatively closer, or farther apart. A prototype demonstrating the end-effector is planned. A similar approach is being pursued to design a spatial constant/minimum force monolithic gripper for applications in minimal invasive surgery.
- Design Realization of a Robotic Dragonfly
Following research questions and a task are proposed: Q1: How does one evaluate a rigid-link flapping mechanism, i.e., what are the criteria, and how to suggest if one such mechanism is better than another? Subsequently, how does one optimize a flapping mechanism? Q2: How to manipulate the flapping mechanisms on the Biomimetic-MAV for yaw and roll (left/right) turns, and pitch (up and down)? How to hover? Introducing differential amplitudes in mechanism-pair may be one way for rolling and turning. The Task is then to build a flapping Biomimetic MAV and control the flapping flight for possible motions.
- Advances in Spatial Topology Optimization
Three primary problems are (to be) solved. The first is topology optimization with tetra-kai-decahedron (TKD) finite elements (cells) using spheroidal masks to control material within each cell. TKD, analogous to hexagonal cells (honeycomb tessellation) is employed ensuring *proper connectivity*, that without point or edge, but only face connections at the cell level. Geometrical singularities are avoided when computing the structural stiffness. The second problem is to implement *normalized Field Product* method – a topology optimization scheme capable of yielding *close to 0-1* solutions without use of any parameters, maintaining minimum length scale on the solid phase. The third problem is to perform spatial topology optimization maintaining specified length scales on both, solid and void phases, irrespective and independent of the size and type of mesh used. Extensions to such methods are possible to large deformation topology optimization problems that could be catered to designing spatial compliant mechanisms or soft robots.

RESEARCH FUNDING AND GRANTS

- 11/2001–03/2002 Development of Topology Design Software for Compliant Mechanisms, Initiation Bridge Grant, IIT Kanpur (**Project Investigator**)
- 09/2002–03/2005 Design for Optimal Failure-free MEMS Topologies, Min. Human. Res and Dev., Govt. of India (**Project Investigator**)
- 09/2003–09/2006 Topology Design of Compliant Mechanisms with Nonlinear Deformation, Dept. Sci. Tech. (Fast Track Scheme), Govt. of India (**Project Investigator**)
- 01/2006-01/2009 Reconstruction of 3D Solids from Single near Parallel Projections, All Ind. Council. Tech. Edu., (**Project Investigator**)
- 04/2006–04/2009 Topology Design of Compliant MEMS for Path Generation, Dept. Sci. Tech., India, (**Project Investigator**)
- 05/2006–05/2009 Automated Modular Fixture Planning for Minimum Tolerances, Dept. Sci. Tech. India, (**Co Project Investigator**)
- 04/2012-03/2015 An Innovation in Distraction Osteogenesis for Mandibular Regeneration using a Refined Transport Distractor, Dept. Sci. Tech. India, (**Co Project Investigator**)
- 07/2014–07/2016 Seed Funding To Host The International Conference On Machines And Mechanisms (under the aegis of IFFToM and AMM), December 16-19, 2015, IIT Kanpur, (**Conference Chair**)
- 02/2014–08/2016 A BCI Operated Hand Exoskeleton based Neurohabilitation System for Movement Restoration in Paralysis, Dept. Sci. Tech. India and UK-India Edu. Res. Initiative (**Co Project Investigator**)
- 01/2017– On Design of Robotic Dragonflies, Visvesvaraya PhD Scheme, GoI (**Project Investigator**)

RECOGNITION AND MEMBERSHIPS

- 2024 | *Reviewers With Distinction Award*. ASME Journal of Mechanisms and Robotics (JMR)
- 2020 | *In top 2% (Design Practice & Management)*— IOANNIDIS J. P. A, BOYACK KEVIN W, BAAS JEROEN, 2020, UPDATED SCIENCE-WIDE AUTHOR DATABASES OF STANDARDIZED CITATION INDICATORS, PLOS BIOLOGY, OCTOBER 16, 2020
<https://doi.org/10.1371/journal.pbio.3000918>
- 2010- | *Alexander von Humboldt Fellowship for Experienced Professors*
- 2006 | *AICTE Career Award*
- 1997 | *Procter and Gamble Best Professional Paper Award*
- 1991 | *Silver Medal. Mathematics Talent Search Examination. Govt of INDIA*
- 1992 | *VivekVir Award. Govt of Madhya Pradesh. INDIA*
- 2014, 2018 | *Recipient of Appreciation for Teaching, ME 851A, Compliant Mechanisms*
- 2013, 2014 | *Recipient of Appreciation for Teaching, TA 101A, Technical Arts*
- 2012, 2017 | *Recipient of Appreciation for Teaching, ME 751A, CAD*
- 2015- | *Association of Machines and Mechanisms*
Life Member
- 2021 | *The American Society of Mechanical Engineers, ASME*
Member

TEACHING MERITS

Pedagogical training/expertise

23 years of experience in teaching graduate and undergraduate courses in and related to computer aided engineering design, compliant mechanisms, large deformation analysis, structural (topology) optimization, kinematic and geometric modeling, assistive/ orthotic/ exoskeletal devices, bio-inspired design, and multi-body dynamics of flexible systems.

Open access teaching

Computer Aided Engineering Design (NPTEL/Online)
<https://www.youtube.com/watch?v=dp0vGTUAVPs>

Technical Arts (NPTEL/Online)
<https://www.youtube.com/watch?v=ZIZyQbCX30E>

Research based teaching

Topology Optimization
IGMR, RWTH Aachen University, Jan 10-Feb 21, 2022

Topology Optimization
Gdańsk University of Technology, May, 2022

ME851A Compliant Mechanisms
2013(II), 2017(II), 2024(I)

Genesis; glimpse of applications; continuum and discrete perspectives: nonlinear finite element analysis and pseudo rigid-body analysis; design of compliant mechanisms based on linkage synthesis and structural optimization methods; function and path generation; Medical, Soft and Rehabilitative Robotics; static balancing; applications in microsystems, precision engineering, automotive, product design, etc.

(Received Appreciation for Teaching both times)

Other teaching experience

ME751A Computer Aided Engineering Design — 2001(II), 2002(I), 2003(I), 2004(I), 2005(I), 2006(I), 2007(II), 2009(I), 2010(I), 2012 (I), 2014 (I), 2015 (I, IITG), 2017 (I), 2018 (I), 2019 (I), 2020 (II), 2022 (II), 2023 (II)

Transformations and Projections, Design and Representation of Curves and Surfaces (Ferguson, Bezier and B-Spline), Derivation and comprehension of B-spline basis functions, Solid Modeling (Wire frame, B-rep, CSG and Voxel approaches), Basics of FEM and Optimization.

(Received Appreciation for Teaching multiple times)

ME676A Nonlinear Finite Element Methods — 2019 (II), 2021 (I), 2023 (I)

Introduction with Newton-Raphson's and Arc-Length Methods using truss elements, Snap through and Bifurcations, Co-rotational Beams, Statically balanced configurations, Tensors, Stress and Strain measures, Work Conjugates, Constitutive Relations, Weak form of Governing Equation, Generic Finite Element Modeling with/out contact, Multibody dynamics with flexible members, coding projects/exams with many examples with MATLAB code templates.

ME321A Advance Mechanics of Solids — 2008(I), 2009(II), 2016 (II)

Classical Elasticity Equilibrium equations, strain-displacement relations, compatibility and stress-strain relations, Stress function, Solutions with stress functions, Tensors, Analysis of Stress and Strain Tensors, Constitutive Elasticity Tensor, Stress-Strain energy conjugate measures, introduction to FEM.

Other teaching experience
(contd.)

TA101A Engineering Drawing and Graphics — 2013 (I), 2014 (I)
Orthographic (Third and first angle), Isometric, Sectional, Assembly, Oblique, Perspective and Auxiliary views, Lines and lanes, Intersection and Development.
(Received Appreciation for Teaching both times)

ME 352A Kinematics of Machines and Mechanisms — 2015 (II)
Overview and basics on mobility, degrees of freedom (Grübler's criterion); displacement, velocity and acceleration analysis (analytical and graphical using the instant center method); overview on type, number and dimensional synthesis; linkages; Grashof's criterion; function, path and motion generation using analytical and graphical approaches; Overview on Kempe's linkages and Compliant mechanisms; Gears; Cams and methods for profile design; Balancing of rotors; belt-pulley drives, etc.

ME 251A Engineering Design and Graphics — 2018 (II)
Section and Assembly drawings using examples of Belt Roller Assembly, Non-return valve, Feed check valve, Screw Jack Assembly, Couplings, Fuel Injector Assembly, representations of Fasteners, Springs, Gears, Bearings, Fits and Tolerances, and overview of Design Principles.

ME 681A Mathematical Methods in Engineering — 2005(II)
Vector and Matrix Algebra, Vector Spaces, Ordinary and Partial Differential Equations, Analysis with Complex Numbers

ESO204A Mechanics of Solids — Summer, 2003
Stresses, strains, material properties, shear force and bending moment diagrams, deflections of beams, torsion, columns, springs and failure theories

ME 351A Design of Machine Elements — 2003 (II)
Review of Mechanics of Solids, Failure theories, Fatigue failure, Design of fasteners, springs, shafts, spur and helical gears, clutches, brakes and flywheels

ME 685A Programming and Numerical Methods — 2002(II), 2004(II), 2007 (I)
Curve interpolation and approximation, Numerical integration and differentiation, Single and Multiple Root determination, Solution of Linear and Nonlinear system of equations, Matrices, and ODE and PDEs

ME 399A Communication Skills — 2014 (II)
Various aspects of communication skills including group discussions, public speaking, planning and making presentations, technical writing, non-verbal, verbal and written modes, role of body language etc. covered and emphasized through a number of interactive sessions. *text editing* sessions (using the green board) to demonstrate minimization of verbosity and proper choice of words so that evolving the first draft in a few iterations yields a well composed document.

Pedagogical publications

SAXENA A. 2011. Kempe's Linkages and the Universality Theorem. *Resonance*. 16 (3). pp. 220-237. DOI:10.1007/s12045-011-0028-x.

SAXENA A. 2011. Topology Optimization with Negative Masks using Gradient Search. *Structural and Multidisciplinary Optimization*. 44 (5). pp. 629-649

COMPREHENSIVE LIST OF PUBLICATIONS

Journals (published/in press/arXiv; reverse chronological order)

- J54. VITTHAL KHATIK AND ANUPAM SAXENA. 2024. *On Optimal Tendon Routing Based Design of Biologically Inspired Underactuated Hand Exoskeleton for Gross Grasping*. IEEE Transactions on Medical Robotics and Bionics. accepted.
- J53. NIKHIL SINGH. PRABHAR KUMAR. ANUPAM SAXENA. 2024. *Three-Dimensional Material Mask Overlay Topology Optimization Approach With Truncated Octahedron Elements*. ASME Journal of Mechanical Design. Jan 2024, 146(1): 011701-1
- J52. SRIVATSA DESHMUKH. VITTHAL KHATIK. ANUPAM SAXENA. 2023. *Robust Fusion Model for Handling EMG and Computer Vision Data in Prosthetic Hand Control*. IEEE Sensors Letters. in IEEE Sensors Letters, vol. 7, no. 9, pp. 1-4, Sept. 2023, Art no. 6004804, doi: 10.1109/LSENS.2023.3301837.
- J51. BVS NAGENDRA REDDY, VITTHAL KHATIK, BURKHARD CORVES AND ANUPAM SAXENA. 2023. *Compliant Constant Output/Input Force Mechanisms — Topology Optimization with Contact*. Mechanisms and Machine Theory. Volume 190, December 2023, 105449.
- J50. PRABHAT KUMAR AND ANUPAM SAXENA. 2022. *A Material Mask Overlay Strategy for Close to Binary Design-dependent Pressure-loaded Optimized Topologies*. Structural and Multidisciplinary Optimization. 65 (10), 304.
- J49. KHATIK V. M. NISHAD S. S. ANUPAM SAXENA. 2021. *Comprehending finger flexor tendon pulley system using systematic computational analysis*. ASME Journal of Biomedical Engineering. 143. 111009-1-10.
- J48. BVS NAGENDRA REDDY. ANUPAM SAXENA. 2021. *Topology synthesis of a 3-kink Contact-aided compliant switch*. ASME Journal of Mechanical Design. 143. 081704-1-15.
- J47. PRABHAT KUMAR. ROGER A. SAUER. ANUPAM SAXENA. 2020. *On topology optimization of large deformation contact-aided shape morphing compliant mechanisms*. Mechanism and Machine Theory. Vol 156, Feb 2021, 104135.
- J46. ORLANDO, M. F., BEHERA L., DUTTA, A., AND SAXENA A. 2020. *Optimal Design and Redundancy Resolution of a Novel Robotic Two-Fingered Exoskeleton*. IEEE Transactions on Medical Robotics and Bionics, Vol 2(1). pp. 59-75.
- J45. SINGH NIKHIL. KUMAR PRABHAT. AND SAXENA ANUPAM. 2020. *On Topology Optimization with Elliptical Masks and Honeycomb Tessellation with Explicit Length Scale Constraints*. Structural and Multidisciplinary Optimization, 62(3), 1227-1251.
- J44. SAXENA. A. 2018. *On Upper Bounds with $ABC = 2^m p^n$ and $ABC = 2^m p^n q^r$ with p and q as Mersenne or Fermat Primes*. arXiv:1809.03328v1 [math.NT] 6 September, 2018.
- J43. KUMAR. P. SAXENA. A. SAUER R. A. 2018. *Computational optimization of large deformation compliant mechanisms undergoing self and mutual contact*, <http://arxiv.org/abs/1802.06049>, Journal of Mechanical Design, 141(1): 012302 (13 pages).
- J42. S SHAKYA, A SAXENA, P MUNSHI, M GOSWAMI. 2017. *Adaptive Discretization for Computerized Tomography*. Research in Nondestructive Evaluation. Research in Nondestructive Evaluation. 1-17
- J41. Felix Orlando Maria Joseph. Laxmidhar Behera. Tomoya Tamei. Tomohiro Shibata. Ashish Dutta. Anupam Saxena. 2016. *On Redundancy Resolution of the Human Thumb, Index and Middle Fingers in Cooperative Object Translation*. Robotica. 35 (10), pp. 1992-2017
- J40. Kumar P. Sauer R. Saxena A. 2016. *On Synthesis of C^0 Path Generating Compliant Mechanisms with Mutual Contact using the Material Mask Overlay Method*. ASME Journal of Mechanical Design. Vol. 138. pp. 062301-1-9.
- J39. MAYANK GOSWAMI. M. SHAKYA S. SAXENA A. MUNSHI M. 2015. *Optimal Spatial filtering schemes and compact tomography setups*. ASNT Journal of Research in Nondestructive Evaluation. 27 (2), pp. 69-85.

- J38. KUMAR. P AND SAXENA A. 2015. On topology optimization with embedded boundary resolution and smoothing. *Structural and Multidisciplinary Optimization*. 52 (6). pp 1135–1159.
- J37. GOSWAMI M. SHAKYA S. SAXENA A. MUNSHI P. 2015. Reliable reconstruction strategy with higher grid resolution for limited data tomography. *NDT & E International*. 72. pp. 17–24.
- J36. GOSWAMI M. MUNSHI P. KHANNA A. SAXENA A. 2015. Non-uniform Arrangement of Emitter-Receiver Pairs Arrangement and Compact Ultrasonic Tomography Setup. *IEEE Sensors*. Sensors Journal. 15(2). pp. 1198-1207.
- J35. GOSWAMI M. MUNSHI P. SAXENA A. GUPTA M.K. KUMAR A. 2014. Plasma Diagnostics at Aditya Tokamak by Two Views Visible Light Tomography. *Fusion Engineering and Design*. 89(11). Nov 2014, pp. 2659-2665. ISSN 0920-3796.
- J34. MERGEL. J. C. SAUER. R. A. AND SAXENA A. 2014. Computational optimization of adhesive microstructures based on a nonlinear beam formulation. *Structural and Multidisciplinary Optimization*. 50(6). 1001-1017.
- J33. GOSWAMI. M. SAXENA A. AND MUNSHI. P. 2014. A new grid based tomographic method for two-phase flow measurements. *Nuclear Science and Engineering*. 176 (2), pp. 240-253.
- J32. GOSWAMI M. MUNSHI P. SAXENA A. 2011. Void fraction measurement using entropy maximization approach, experimental and computational two phase flow. *Transaction of American Nuclear Society*. 104 (1094-1095). ISSN: 0003-018X.
- J31. SAXENA A. 2013. Contact-Aided Compliant Displacement-Delimited Gripper Manipulators. *ASME Journal of Mechanisms and Robotics*. 5(4).041005.1-041005.12.
- J30. ORLANDO M F. DUTTA A. SAXENA A. BEHERA L. SHIBATA T. 2013. Manipulability Analysis of Human Thumb. Index and Middle fingers in Cooperative 3D Rotational Movements. *Robotica*. 31 (5), pp. 797-809. Available on CJO.doi: 10.1017/S0263574713000064.
- J29. SHINDE V R. DUTTA A. SAXENA A. 2013. Experiments on multi-agent capture of a moving object using projective path planning. *Robotica*. 31(2).pp. 267-284
- J28. SAXENA A. VALERO-CUEVAS F J. LIPSON H. 2012. Functional inference of complex anatomical tendinous networks at a macroscopic scale via sparse experimentation. *PLOS Computational Biology*. 8(11): p.1-17 (e1002751)
- J27. SAXENA A. AND SAUER. R.A. 2012. Combined gradient-stochastic optimization with negative circular masks for large deformation topologies. *International Journal for Numerical Methods in Engineering*. 93 (6), pp. 635-663
- J26. REDDY BVS NAGENDRA. NAIK SUJITKUMAR V. SAXENA A. 2012. Systematic Synthesis of Large Displacement Contact Aided Monolithic Compliant Mechanisms. *ASME Journal of Mechanical Design*. 134(1). pp.011007-1-12
- J25. SAXENA A. 2011. Topology Optimization with Negative Masks using Gradient Search. *Structural and Multidisciplinary Optimization*. 44 (5). pp. 629-649
- J24. SUJIT KVN. SAXENA A. RAI A K. REDDY BVS NAGENDRA. 2011. How to Choose from a Synthesized Set of Path- Generating Mechanisms. *ASME Journal of Mechanical Design*. 133 (9), 91009.
- J23. SAXENA A. 2011. Kempe’s Linkages and the Universality Theorem. *Resonance*. 16 (3). pp. 220-237. DOI:10.1007/s12045-011-0028-x.
- J22. SAXENA A. 2011. An Adaptive Material Mask Overlay Method: Modifications and Investigations on Binary. Well Connected Robust Compliant Continua. *ASME Journal of Mechanical Design*. 133 (4). pp. 041004-1-11
- J21. SAXENA A. 2011. Are Circular Shaped masks Adequate in Adaptive Mask Overlay Topology Synthesis Method. *ASME Journal of Mechanical Design*. 133(1). pp. 011001-1-11.
- J20. MANNEPALLI S. DUTTA A. SAXENA A. 2010. A multi-objective GA based algorithm for 2D form and force closure grasp of prismatic objects. *International Journal of Robotics and Automation*. 25 (2).pp. 142 - 154

- J19. KHAN H. SINHA P. SAXENA A. 2009. A Simple Algorithm for ThermoElastohydrodynamic Lubrication Problems. *International Journal of Research and Reviews in Applied Sciences*. Volume 1. Issue 3 (December. 2009). 265-279.
- J18. RAI A K. SAXENA A. MANKAME N D. 2010. Unified synthesis of compact planar path-generating linkages with rigid and deformable members. *Structural and Multidisciplinary Optimization*. 41:863-879.
- J17. JAIN C. SAXENA A. 2010. An Improved Material-mask overlay strategy for Topology Optimization of Structures and Compliant Mechanisms. *ASME Journal of Mechanical Design*. 132 (6). 061006-1-10.
- J16. SAXENA R. SAXENA A. 2009. Design of Electro-Thermally Compliant MEMS with Hexagonal Cells using Local Temperature and Stress Constraints. *ASME Journal of Mechanical Design*. Volume 131 (5). pp. 510061-5100610
- J15. SAXENA A. 2008. A Material-Mask Overlay Strategy for Continuum Topology Optimization of Compliant Mechanisms using Honeycomb Discretization. *ASME Journal of Mechanical Design*. Volume 130 (8). pp. 823041-823049
- J14. SHARMA P. SAXENA A. DUTTA A. 2008. Optimal Arrest and Guidance of a Moving Prismatic Object using Multi-Agents; *Robotica*. Volume 26. Issue 1. pp - 41-53
- J13. BANSAL S K. MALIK P. SAXENA A. AND REDDY N V. 2008. Modular Fixture Planning for Minimum Three-dimensional Tolerances. *International Journal of Production Research*. Volume 46. Issue 6 March 2008. pages 1455 - 1476
- J12. SAXENA R. SAXENA A. 2007. On Honeycomb Representation and SIGMOID Material Assignment in Optimal Topology Synthesis of Compliant Mechanisms. *Finite Elements in Analysis and Design*. Volume 43. Issue 14. Pages: 1082-1098
- J11. VALERO-CUEVAS F J. ANAND V. SAXENA A. LIPSON H. 2007. Beyond parameter estimation: Extending biomechanical modeling by the explicit exploration of model topology. *IEEE Transactions of Biomedical Engineering*. Nov;54(11):1951-64.
- J10. SRIVASTAVA M. DUTTA A. SAXENA A. 2007. Trajectory generation using GA for an 8 DOF biped robot with deformation at the sole of the foot. *Journal of Intelligent and Robotic Systems*. 49. pp 67-84
- J9. RAI A K. SAXENA A. MANKAME N D. 2007. Synthesis of Path Generating Compliant Mechanisms using Initially Curved Frame Elements. *ASME Journal of Mechanical Design*. Vol. 129. pp. 1056-1063
- J8. TULI M. REDDY N.V. SAXENA A. 2006. Constrained Shape Modification of B-Spline curves. *Computer-Aided Design and Applications*. Vol. 3. N (1-4). pp 437-446.
- J7. SAXENA A. 2005. Topology Design of Large Displacement Compliant Mechanisms with Multiple Materials and Multiple Output Ports. *Structural and Multidisciplinary Optimization*. Vol. 30 (6). pp. 477-490.
- J6. SAXENA A. 2005. Synthesis of Compliant Mechanisms for Path Generation using Genetic Algorithm. *ASME Journal of Mechanical Design*. Vol. 127 (4). pp 745-752.
- J5. SAXENA A. AND ANANTHASURESH. G. K. 2003. A Computational Approach to the Number Synthesis of Linkages. *ASME Journal of Mechanical Design*. Vol. 125. pp 110-118.
- J4. SAXENA A. AND ANANTHASURESH G K. 2001. Topology Design of Compliant Mechanisms with Strength Considerations. *Mechanics of Structures and Machines*. 29(2). pp. 199-221
- J3. SAXENA. A. AND ANANTHASURESH. G. K. 2001. Topology Synthesis of Compliant Mechanisms for Nonlinear Force-Deflection and Curved Output Path. *ASME Journal of Mechanical Design*. March 2001. Vol. 123. pp 33-42.
- J2. SAXENA A. ANANTHASURESH G K. 2000. On an Optimality Property of Compliant Topologies. *Structural and Multidisciplinary Optimization*. 19 (1). pp. 36-49.
- J1. SAXENA A. KRAMER S N. 1998. A Simple and Accurate Method for Determining Large Deflections in Compliant Mechanisms subjected to End Forces and Moments. *ASME Journal of Mechanical Design*. 120(3). pp. 392-400.

Refereed/Peer reviewed Conferences

- C66. Aditi Agarwal. Anupam Saxena. Prabhat Kumar. 2023. PyHexTop: a Compact Python Code for Topology Optimization using Hexagonal Elements. 6th National Conference on Multidisciplinary Design, Analysis and Optimization. NCMDAO 2023. Dec 6-8. IIT Guwahati. paper #: 103. Chosen for Springer Conference Proceedings: Advances in Multidisciplinary Design, Analysis and Optimization.
- C65. Vitthal Manohar Khatik. Anupam Saxena. 2023. A Novel Slack Tolerant, Sliding Pulley Differential Mechanism for Adaptive Grasping. *ASME 2023 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC / CIE2023)*. Boston Park Plaza, Boston MA. August 20-23. IDETC2023-115115.
- C64. Nikhil Singh. Anupam Saxena. 2023. *A Volume conserving Boundary Smoothing Method for 2D Topology Optimization Solutions*. 15th ECCOMAS Thematic Conference on Evolutionary and Deterministic Methods for Design. Optimization and Control 2023. 1-3 June 2023, Chania, Crete, Greece. Paper ID: E1892.
- C63. Vitthal Manohar Khatik. Shyam Sunder Nishad. Anupam Saxena. 2023. *Understanding Importance of Various Pulleys in Finger Flexor Tendon Biomechanics Using a Computational Model*. 15th ECCOMAS Thematic Conference on Evolutionary and Deterministic Methods for Design. Optimization and Control 2023. 1-3 June 2023, Chania, Crete, Greece. *accepted*.
- C62. Estefania Hermoza Llanos. Mathias Hüsing. Burkhard Corves. Anupam Saxena. 2022. Compliant finger gripper based on topology optimization. *Microactuators, Microsensors and Micromechanisms (MAMM 2022)*. Indian Institute of Technology, Hyderabad. Dec. 2-5, 2022.
- C61. Ajay Bajaj. Vishal Jain. Prabhat Kumar. Aynur Unal. Anupam Saxena. 2018. On a Soft Hand Exoskeleton for Adaptive Grasping using a Novel Differential Mechanism. *Asian MMS 2018 Conference*. Bengaluru. Dec. 17-19. 2018. Asian MMS-2018-123.
- C60. Anirban Chowdhury. Haider Raza. Ashish Dutta. Shyam Sunder Nishad. Anupam Saxena. Girijesh Prasad. 2015. A Study on Cortico-muscular Coupling in Finger Motions for Exoskeleton Assisted Neuro-Rehabilitation. *37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*. Milano, Italy, August 25-29. #2527.
- C59. Shyam Sundar. Ashish Dutta. Anupam Saxena. 2015. Design and Control of a Three Finger Hand Exoskeleton for Translation and Rotation of a Slender Object. *ASME Design Engineering and Technical Conference*. Boston, USA. iDETC, 2015, # 47058.
- C58. Prabhat Kumar. Roger Sauer. Anupam Saxena. 2015. On Synthesis of Contact Aided Compliant Mechanisms using the Material Mask Overlay Method. *ASME Design Engineering and Technical Conference*. Boston, USA. iDETC, 2015, # 47064. **Honorable mention fast forward presentation paper award.**
- C57. Shyam Sunder Nishad, Ashish Dutta, Anupam Saxena. 2014. Design and Control of a Three Finger Hand Exoskeleton for Translation of a slender object. *The 11th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI 2014)*. Nov. 12 – 15, 2014 at Double Tree Hotel by Hilton, Kuala Lumpur, Malaysia.
- C56. Shaurya Shriyam. Anuj Agrawal. Laxmidhar Behera. Anupam Saxena. 2014. Robotic Fish Design and Control based on Biomechanics. *Advances in Control and Optimization of Dynamical systems*. Indian Institute of Technology Kanpur. Mar 13-15.
- C55. Goswami M. Saxena A. Munshi P. 2014. Mollifiers schemes in limited data computerized tomography. *Proceedings of ASNT 23rd Research symposium*. Minneapolis. USA.
- C54. Goswami M. Munshi P. Khanna A. Saxena A. 2014. Void fraction estimations for bubble column with small diameter. *Proceedings of ASNT 23rd Research symposium*. Minneapolis. USA.

- C53. Jimson Ngeo. Tomoya Tamei. Tomohiro Shibata. M F Felix Orlando. Laxmidhar Behera. Anupam Saxena. Ashish Dutta. 2013. Control of an optimal finger exoskeleton based on continuous joint angle estimation from EMG signals. *Annu Int Conf IEEE Eng Med Biol Soc.*338-341. doi: 10.1109/EMBC.2013.6609506.
- C52. Kumar Prabhat and Saxena. A. 2013. On Embedded Recursive Boundary Smoothing in Topology Optimization with Polygonal Mesh and Negative Masks. 2013. *1st International and 16th National Conference on Machines and Mechanisms*. December. 18-20. Indian Institute of Technology Roorkee.
- C51. Goswami M. Munshi P. Saxena A. Kumar M. and Kumar A. 2013. Plasma Diagnostics at Aditya Tokamak by Two Views Visible Light Tomography. *Proc.Of 28th National symposium on plasma Science and Technology. Plasma*. Bhubaneswar. pp 247-248.
- C50. Goswami M. Munshi P. Saxena A. 2011 Void fraction measurement using entropy maximization approach. Vol. 104. pp 1094-1095. *Experimental and computational two phase flow. Transaction of American Nuclear Society*. Florida. Vol. 104. 1094-1095.
- C49. Goswami M. Saxena A. Munshi P. 2013 Application of a grid based tomographic method for two-phase flows. *Proceedings of 7th World Congress on Industrial Process Tomography*. WCIPT7Krakow. Poland P-05. 305-311.
- C48. Goswami M. Saxena A. Munshi P. 2013 Adaptive grids and spatial filtering for limited view tomography. *Proceedings of 52nd Annual Conference of BINDT*. NDT 2013. Telford. U.K. 98.
- C47. Goswami M. Bhadouria V. Agrawal N. Khanna A. Munshi P. Kishore N.N.Saxena A. 2013. Optimal sensor locations and ultrasound tomography set-up design for limited data problems. *Proceedings of 52nd Annual Conference of BINDT*. NDT 2013. Telford. U.K. 128.
- C46. Orlando. F. M. Dutta. M. Saxena. A. Behera. L.Shibata. T. and Tamei. T. 2011. Design and development of a three finger hand exoskeleton. *The 29th Annual Conference of the Robotics Society of Japan. Shibaura*. September 7-9.
- C45. Goswami. M. Saxena. A. Munshi. P. 2011. Void Fraction Measurement Using Entropy Maximization Approach. *Transactions of the American Nuclear Society*. Vol. 104. Hollywood. Florida. June 26–30. 2011. pp. 1094-1095.
- C44. Sharma. P and Saxena. A. 2010. On Binary Topology Design for Electro-Thermally-Compliant MEMS. *Mechanisms and Machine Science*. Springer. ISSN: 2211-0984. *Workshop on Machines and Micromechanisms. MAMM 2010*. May 26-28. Aachen. Germany.
- C43. Orlando. F. M. Dutta. A. Behera. L. Saxena. A. 2010. Optimal design and control of a thumb exoskeleton. *IEEE. TENCON*. Nov. 21-24. Fukuoka. Japan. #5627.
- C42. Reddy. BVS Nagendra. Saxena. A. 2010. Automated Design Of Contact-aided Compliant Mechanisms Using Initially Curved Frame Elements. *ASME Design Engineering and Technical Conferences*. Montre'al. Canada. Aug 15th – 18th. 2009. #DETC-29172.
- C41. Naik.S. Saxena. A. Rai. A. K. 2010. On criteria for choice of the best solution from a generated set of partially compliant linkages. *ASME Design Engineering and Technical Conferences*. Montre'al. Canada. Aug 15th – 18th. 2009. #DETC-29137.
- C40. Saxena. A. 2010. On an Adaptive Mask Overlay Topology Synthesis Method. *ASME Design Engineering and Technical Conferences*. Montre'al. Canada. Aug 15th – 18th. 2009. #DETC-29113.
- C39. Sharma. P. Saxena. A. 2010. On Evaluation of Adaptive Mask Overlay Topology Synthesis Method using Different Mask Shapes. *ASME Design Engineering and Technical Conferences*. Montre'al. Canada. Aug 15th – 18th. 2009. #DETC-29019.
- C38. Akolkar. A. Orlando. M. F. Dutta. A. Saxena. A. Behera. L. 2009. Optimal design and control of a hand exoskeleton for rehabilitation of stroke patients. *ICROS-SICE International Joint Conference*. Fukuoka International Congress Center. Fukuoka. JAPAN. August 18(Tue.)-21(Fri.). 2009 (submitted)

- C37. Shinde. V. S. Saxena. A. Dutta. A. Panda. B. Maji. T. 2009. Experimental evaluation of multi agent based optimal arrest and guidance of a prismatic 2D object avoiding obstacles. *ICROS-SICE International Joint Conference*. Fukuoka International Congress Center. Fukuoka. JAPAN. August 18(Tue.)-21(Fri.). 2009 (submitted)
- C36. Mankame. N. D. Browne. A. L. Saxena. A. 2009. Shape memory polymer based reconfigurable compliant mechanisms: an exploration. *ASME Design Engineering and Technical Conferences*. San Diego. CA Aug 30th – Sep 2nd. 2009. #DETC- 87331.
- C35. Jain. C. and Saxena. A. 2009. On an adaptive Material-mask overlay strategy for Topology Optimization of Structures and Compliant Mechanisms. *ASME Design Engineering and Technical Conferences*. San Diego. CA Aug 30th – Sep 2nd. 2009. #DETC- 86712.
- C34. Singh. S. P. Dutta. A. Saxena. A. 2009. Design of a biped robot with torsion springs at the joints for reduced energy consumption during walk. *ASME Design Engineering and Technical Conferences*. San Diego. CA Aug 30th – Sep 2nd. 2009. #DETC-86595.
- C33. Rai. A. Saxena. A. Mankame. N. D. 2009. Unified synthesis of compact planar path-generating linkages with rigid and deformable members. *ASME Design Engineering and Technical Conferences*. San Diego. CA Aug 30th – Sep 2nd. 2009. #DETC-86850.
- C32. Khan. H. Sinha. P. Saxena. A. 2008. "A Simple Numerical Method for the Solution of Thermal Elastohydrodynamic Lubrication Problem of Infinite Line Contacts. *International Conference on Recent Trends in Computational Partial Differential Equations*. ICCPDE-2008. Dec. 10-13. IIT Bombay.
- C31. Singh. S. P. Dutta. A. Saxena. A. 2008. "Multi agent based optimal arrest and guidance of a prismatic 2D object avoiding obstacles". *INDICON: IEEE Conference & Exhibition on Control, Communication and Automation*. #172
- C30. Stephen L. Canfield. Daniel L. Chlarson. Alexander Shibakov. Joseph D. Richardson. Anupam Saxena. 2008. Towards Uniformly Distributed Compliance In Compliant Mechanisms: A Multi-Objective Approach. *ASME Design Engineering Technical Conferences*. Las Vegas. Sep. 2007. paper #. DETC2008-49939.
- C29. Rai. A. and Saxena. A. 2007. Optimal Continuum Synthesis of Partially Compliant Mechanisms for Prescribed Non-smooth Paths. *National Conference on Machines and Mechanisms*. IISc. Bengaluru (Bangalore). 12-14th December. NaComm- #69.
- C28. Dutta. A. Saxena. A. and Sharma. P. 2007. Obstacle Avoidance. Arrest And Guidance Of A Prismatic 2D Object Using Multi Agents. *International Conference on Instrumentation, Control and Information Technology (SICE2007)*. Kagawa University. Takamatsu. Japan. September 17-20.2007. paper #657.
- C27. Saxena. A. Lipson. H. and Valero-Cuevas. F. 2007. Blind Inference of Tendon Networks Through Minimal Testing. *American Society of Bio-Mechanics Meeting*. Stanford University. August 22-25. 2007.
- C26. Saxena. A. and Mankame. N. 2007. Design for Manufacture of Optimal Compliant Topologies with Honeycomb Continuum Representation. *IEEE Congress on Evolutionary Computation* September-25-28. Swissotel The Stamford. Singapore. submitted
- C25. Canfield. S. Chlarson. D. Shibakov. A. Richardson. J. and Saxena. A. 2007. Multi-Objective Optimization Of Compliant Mechanisms Including Failure Theories. *ASME Design Engineering Technical Conferences*. Las Vegas. Sep. 2007. paper #. DETC2007-35618
- C24. Mankame. N. and Saxena. A. 2007. Analysis of the Hex-cell parameterization for Topology synthesis of Compliant Mechanisms. *ASME Design Engineering Technical Conferences*. Las Vegas. Sep. 2007. paper #. DETC2007-35244.
- C23. Saxena. A. 2007. A Material-Mask Overlay Strategy for Continuum Topology Optimization of Compliant Mechanisms using Honeycomb Discretization. *ASME Design Engineering Technical Conferences*. Las Vegas. Sep. 2007. paper #. DETC2007-34341.

- C22. Sharma. P. Dutta. A. Saxena. A. 2006. Determination of Optimal Contact Points for Constraining a Prismatic Object by a Group of Mobile Robots. *IEEE Conferences on Cybernetics & Intelligent Systems (CIS) and Robotics. Automation & Mechatronics (RAM)*. Bangkok, Thailand. 7-9 June 2006. Paper # P0474
- C21. Sharma. P. Saxena. A. Dutta. A. 2006. Multi-Agent Form Closure Capture of a Generic 2d Polygonal Object. *ASME Design Engineering Technical Conferences*. Philadelphia. PA. Sep. 10-13. 2006. paper #. DETC2006-99335.
- C20. Rai. A. Saxena. A. Mankame. N. Upadhyay. CS. 2006. On Optimal Design Of Compliant Mechanisms For Specified Nonlinear Path Using Curved Frame Elements And Genetic Algorithm. *ASME Design Engineering Technical Conferences*. Philadelphia. PA. Sep. 10-13. 2006. paper #. DETC2006-99298.
- C19. Mishra. A. and Saxena. A. 2005. On Preliminaries of 3d Solid Reconstruction Using Auxiliary Views. *ASME Design Engineering Technical Conferences. Design Automation Conference*. Long Beach. CA. Sept. 24-Sept 28. 2005. paper # DETC2005-84230.
- C18. Bansal S. Reddy N. V. Saxena A. 2005. Automated Modular Fixture Planning. Keynote Paper. *Computer-Aided Production Engineering*. University of Monash. Melbourne. Australia - 21-24 November
- C17. Saxena. R. and Saxena. A. 2003. On Design of Electro-Thermally Compliant MEMS for Strength. *ASME Design Engineering Technical Conferences. Design Automation Conference*. Chicago. IL. Sep. 2-Sept. 6. 2003. paper #. DETC2002/DAC-48807.
- C16. Saxena. R. and Saxena. A. 2003. On Honeycomb Parameterization for Topology Optimization of Compliant Mechanisms. *ASME Design Engineering Technical Conferences. Design Automation Conference*. Chicago. IL. Sep. 2-Sept. 6. 2003. paper #. DETC2002/DAC-48806.
- C15. Urankar. S. Singh. A. Jain. P. Saxena. A. and Dasgupta. B. 2003. Robosloth-A rope climbing robot. *NaCOMM. National Conference on Machines and Mechanisms*. IIT. Delhi. Dec. 2003.
- C14. Saxena. A. Luzhong. Yin and Ananthasuresh. G. K. 2002. PennSyn 2.0 Enhancements to a Synthesis Software for Compliant Mechanisms. *ASME Design Engineering Technical Conferences. Design Automation Conference*. Montreal. CA. Sep. 29-Oct. 2. 2002. paper #. DETC2002/MECH-34210.
- C13. Saxena. A. 2002. On Multiple-Material Optimal Compliant Topologies: Discrete Variable Parameterization using Genetic Algorithm. *ASME Design Engineering Technical Conferences. Design Automation Conference*. Montreal. CA. Sep. 29-Oct. 2. 2002. paper #. DETC2002/MECH-34209.
- C12. Saxena. A. Yin. L. Mankame. N. Zhonyang. Q. and Ananthasuresh. G. K. 2002. Alternate Modeling and Design Parameterization for the Topology Design of Compliant Mechanisms. *39th Annual Technical Meeting. Society of Engineering Science*. October 13-16th. 2002. University Park. PA
- C11. Saxena. A. and Ananthasuresh. G.K. 2001. On the Extraction of Kinematic Behavior from Optimal Compliant Topologies with Application to Number Synthesis of Linkages. *ASME Design Engineering Technical Conferences. Design Automation Conference*. Pittsburgh. PA. Sep. 9-11. 2001. paper #. DETC2001/DAC-21017.
- C10. Saxena. A. and Ananthasuresh. G.K. 2001. On Strength Issues in Topology Design of Compliant Mechanisms. *ASME Design Engineering Technical Conferences. Design Automation Conference*. Pittsburgh. PA. Sep. 9-11. 2001. paper #. DETC2001/DAC-21016.
- C9. Saxena. A. 2001. Topology Synthesis of Compliant Mechanisms with Discrete Design Parameterization. *NaCOMM. National Conference on Machines and Mechanisms*. IIT. Kharagpur. Dec. 21-23. 2001.

- C8. Saxena. A. 2001. In Pursuit of Global Optimal Compliant Topologies. *NaCOMM. National Conference on Machines and Mechanisms. IIT. Kharagpur.* Dec. 21-23. 2001
- C7. Saxena. A. Wang. X. and G. K. Ananthasuresh. 2000. PennSyn – A Topology Synthesis Software for Compliant Mechanisms. *ASME Design Engineering and Technical Conference.* Sept. 2000. Baltimore. MD. DETC/MECH-14139.
- C6. Saxena. A. and Ananthasuresh. G. K. 1999. Towards the Design of Compliant Continuum Topologies with Geometric Nonlinearity. *ASME Design Engineering Technical Conferences.* Sept. 12-15. Las Vegas. NV. DETC/DAC-8578.
- C5. Saxena. A. and G. K. Ananthasuresh. 1999. Path Generation with Compliant Mechanisms using Geometrically Nonlinear Continuum Models. *The Sixth National Applied Mechanical and Robotics (AMR) Conference.* October. Cincinnati. OH.
- C4. Saxena. A. and Kramer. S. N. 1998. A Simple and Accurate Method for Determining Large Deflections in Compliant Mechanisms subjected to End Forces and Moments. . 25 *Biennial Mechanisms ASME Conf.* June 13-16. Atlanta. GA. DETC98/MECH-5883
- C3. Saxena. A. and Ananthasuresh. G. K. 1998. Topology Synthesis of Compliant Mechanisms using the Optimality Criteria Method. *AIAA98-4953. 7th AIAA/USAF/NASA/ISSMO Symposium on Multidisciplinary Analysis & Optimization.* Sept. 2-4. 1998/ St. Louis. MO.
- C2. Saxena. A. and Ananthasuresh. G. K. 1998. Towards an Optimality Criteria Method for Topology Synthesis of Compliant Mechanisms. *25 Biennial Mechanisms ASME Conf.* June 13-16. Atlanta. GA. DETC98/MECH-5937.
- C1. Saxena. A. and Kramer. S. N. 1997. Determination of Large Deflections in Compliant Mechanisms subjected to Combined End Loads. *The Fifth National Applied Mechanical and Robotics Conference. AMR-23. (Recipient of the Procter and Gamble Best Professional Paper Award).*

Books and Book Chapters

- B1. Saxena A. Sahay B. 2005. *Computer Aided Engineering Design.* Anamaya Publishers (INDIA) and Springer, PO BOX 322, 3300 AH Dordrecht, The Netherlands.
- BC6. Estefania Hermoza Llanos. Mathias Hüsing. Burkhard Corves. Anupam Saxena. 2022. *Compliant finger gripper based on topology optimization..* in Ashok Kumar Pandey, Prem Pal, Nagahanumaiyah, L. Zentner (Eds.), *Microactuators, Microsensors and Micromechanisms, MAMM 2022,* pp. 31-45, Springer.
- BC5. Ajay Bajaj, Vishal Jain, Prabhat Kumar, Aynur Unal, and Anupam Saxena. 2020. *Soft Hand Exoskeleton for Adaptive Grasping Using a Compact Differential Mechanism.* *Mechanism and Machine Science.* Chapter DOI.: 10.1007/978-981-15-4477-4_52.
- BC4. Prabhat Kumar. Anupam Saxena. Roger A. Sauer. 2016. *Implementation of Self-Contact in Path Generating Compliant Mechanisms.* in L. Zentner, B. Corves, B. Jensen and E.-C. Lovasz (Eds.), *Microactuators and Micromechanisms,* pp. 251-261, Springer. *First Author is the recipient of the Young Delegates Programme Award in the 4th Conference on Microactuators and Micromechanisms, MAMM-2016 held in Ilmenau, Germany. October 05-07.*
- BC3. Hrishikesh Raste. Anupam Saxena. Roger Sauer. Burkhard Corves. 2015. *Bioinspired mechanism synthesis for flapping flight with unsteady flow effects.* in Corves Burkhard. Lovasz Erwin-Christian. Husing Mathias (Eds.) *Mechanisms, Transmissions and Applications.* pp. 251-260. Springer
- BC2. Sharma P. Saxena A. 2010. *On Binary Topology Design of Electro-Thermally-Compliant MEMS.* in Ananthasuresh G. K., Corves Burkhard, Petuya Victor (Eds.). *Micromechanisms and Microactuators.* pp. 125-138. Springer
- BC1. Saxena A. Ananthasuresh G. K. 2003. *Chapter 2: Synthesis for Mechanical Behavior.* in *Optimal Synthesis Methods for MEMS,* Kluwer Academic Publishers, Boston, MA, USA, 2003, pp. 13-42.

Theses

- D5. BVS Nagendra Reddy, On Design of Large Deformation Compliant Topologies for special deformation characteristics, Principal Supervisor: Anupam Saxena
- D4. Kumar, Prabhat, 2017, Synthesis of Large Deformable Contact-aided Compliant Mechanisms using Hexagonal cells and Negative Circular Masks. Doctoral Dissertation, Indian Institute of Technology, Kanpur, India.
- D3. Mayank Goswami, 2014, On Tomography reconstruction techniques. Doctoral Dissertation, Indian Institute of Technology, Kanpur, India.
- D2. Orlando, Felix, 2013, Cooperative Human Finger motion analysis and Optimal design of a three finger exoskeleton. Doctoral Dissertation, Indian Institute of Technology, Kanpur, India.
- D1. Khan, A, 2010, Numerical Study of Thermo-Elastohydrodynamic Lubrication of Infinite Line Contact Rough Surfaces. Doctoral Dissertation, Indian Institute of Technology, Kanpur, India.
- M24. Abhishek Sharma, 2017, On Design of Knee, Foot and Ankle Exoskeleton. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M23. Ajay Bajaj, 2017, Soft hand exoskeleton. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M22. Amul Agarwal, 2017, Structural/Functional Inference of a Nonlinear 2D Continua Using Predator Prey Estimation Exploration. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M21. Anuj Agarwal, 2016, A Novel Mechanism for Flapping Wing Flight. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M20. Hrishikesh Raste, 2014, Optimal Design for a Flapping Wing Mechanism and Wing Profile Capturing Unsteady Flow Characteristics. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M19. Shyam Sundar, 2014, On design and control of a three finger exoskeleton. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M18. Sharad Singhania, 2011, Design and Control of Multi-Agents for Transportation of Object in Extended 2D Terrain. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M17. Ved Prakash Chowdhary, 2011, Optimal Design and Control of Leg Exoskeleton. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M16. Pranay Sharma, 2011, Topology optimization of Electrothermally Compliant MEMS using a hybrid approach. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M15. Sujit Kumar V. Naik, 2010, How to Choose from a Synthesized set of Mechanisms. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M14. BVS Nagendra Reddy, 2010, Synthesis of Non-smooth path generating Fully Compliant Mechanisms using Self Contact. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M13. Amit Srivastava, 2010, Electric Pulse Aided Single Point Incremental Forming, Principal Supervisor. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M12. Mayank Goswami, 2009, On Tomography using Finite Element like field approximations and Optimization. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M11. Vijaysingh R. Shinde., 2009, Experimental Validation of Form Closure Capture and Transportation of Moving Objects using Projective Path Planning. Master's thesis, Indian Institute of Technology, Kanpur, India.

- M10. Pavan Kumar, 2009, Singularity-free Binary Designs in Topology Optimization. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M9. Ashok Rai, 2006, Topology, Shape and Size Optimization of Compliant Mechanisms Using Curved Frame Elements and Genetic Algorithm. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M8. Pankaj Sharma, 2006, Arrest and Guidance of a Moving Object using Multi-Agents. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M7. CP Mishra, 2006, Nonlinear, Transient, Thermo-Elastic Analysis for Continua under High Temperature Environment. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M6. Mukul Tuli, 2006, Local Shape Modification of B-Spline Curves. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M5. Anjul Beohar, 2005, A Hybrid Approach to Reconstruct 3d Solids From 2d Near Isometric Sketches. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M4. Maitray Srivastava, 2005, Mathematical Analysis, Design, Development and Experimentation of an 8 DOF Biped Robot. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M3. Prince Malik, 2004, Automated Design of Modular Fixtures to minimize Tolerances. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M2. Rajat Saxena, 2003, A Novel Parameterization for Topology Design of ETC MEMS for Strength. Master's thesis, Indian Institute of Technology, Kanpur, India.
- M1. Gaurav Seth, 2002, Splines based Assessment of Pre and Post Treatments of Dental Fixtures. Master's thesis, King George's Medical University, Lucknow, India.

Internal Reports

- I1. Mishra, A., 2009, Reconstruction of 3-D Solids from 2-D Multiple and Primary Auxiliary Views. *CARS-1*.
- I2. Kumar P. On order $n+1$ (even) Closed Interpolating Splines. *CARS-2*.