Dr. Nelson Muthu

Associate Professor,
Mechanical Engineering Department
IIT Palakkad

nelsonm@iitpkd.ac.in
0491 209 1464

Research Interests

Fracture and Damage mechanics, Composites, Meshfree methods, Elasticity, and Medical device innovation

Professional Experience

12.2023 to Present	**Employer: Indian Institute of Technology Palakkad** Dec 2023 – Present: Associate Professor	**Palakkad, India**
05.2017 to 12.2023	**Employer: Indian Institute of Technology Guwahati** May 2017 – Dec 2023: Assistant Professor	**Guwahati, India**
01.2017 to 05.2017	**Employer: SPCE, Mumbai** Jan 2017 – May 2017: Visiting faculty Task: Taught Fracture Mechanics course to PG students	**Mumbai, India**
12.2015 to 05.2017	**Employer: BETiC, IIT Bombay** Dec 2015 – May 2017: Project Manager Task: Mentored projects at BETiC and in-charge of testing of medical devices, management representative for ISO 13485	**Mumbai, India**
07.2008 to 07.2010	**Employer: Global Analytics** July 2008 – April 2009: Junior Analyst April 2009 – July 2010: Analyst Task: Developed predictive tool using statistical modeling on human capital data and pay day lending	**Chennai, India**
05.2007 to 07.2007	**Employer: University of Karlsruhe.** May 2007 – July 2007: Intern Task: Studied LES of combustion induced vortex breakdown; meshed the geometry in Gambit and carried out the results in Fluent	**Karlsruhe, Germany**

Industry Collaborators and Supporters

DST, VSSC ISRO, TATA steels, SABIC, Robert Bosch Engineering and Business Solutions Private Limited

Courses Taught at IIT Guwahati

1. CE 101 - Engineering Drawing (July-2017, July-2018, July 2019 - Tutor)
2. ME 212 - Solid Mechanics-I (July-2017, July-2018, July-2019, Sep-2020, Sep-2021)
3. ME 101 - Engineering Mechanics (Jan-2018–Tutor, Jan-2019, Jan-2020, March 2021)
4. ME 607 - Introduction to Composite Materials (Jan-2018)
5. ME 223 - Solid Mechanics – II (Jan-2022, 23)
6. ME 501 - Advanced Engineering Mathematics (July-2022, July-2023)
7. ME 216 - Mechanical Engineering Lab-I: Strength of Materials lab (July-2021, 22, 23)
8. ME 326 - Mechanical Engineering Lab-IV: Tribology lab (Jan-2022, 23)
9. ME 663 - Mesh Reduction Methods and XFEM (Proposed and accepted)

Courses Taught at IIT Palakkad

1. ME 3522 - Introduction to Finite Element Methods (Jan-2024)

Labs established

- Established a full fledged composite manufacturing and testing lab at ME Department IIT Guwahati. The lab includes
    - Vaccum assisted resin transfer moulding set up
    - Resin dispenser
    - NDT Ultrasonic scanner
    - Mixed-mode bending (MMB), Double cantilever beam (DCB) and End-notch flexure (ENF) setup
- In-charge of the Shimadzu static UTM and axial-torsion dynamic UTM (R&D building) at IIT Guwahati

Sponsored Projects

S.No	PI and Co-PI Details	Title	Sponsoring Agency	Project Value (in lakhs)	Duration	Status
1.	Dr. Nelson Muthu (PI)	Manufacturing and testing of fibre reinforced composites	IIT-Guwahati	5.00	2017-2019	Completed
2.	Dr. S. Kanagaraj (PI) Dr. Nelson Muthu (co-PI)	An affordable lower limb prosthesis with polycentric knee joint, dynamic ankle joint and suction-suspension socket system having advanced features	DST-SERB (under IMPRINT)	73.37	2018-2021	Completed
3.	Dr. Nelson Muthu and Dr. S. Kanagaraj (Mentors)	Walking aid device for disabled patients	NewGen IEDC	2.50	2018-2019	Completed
4.	Dr. Nelson Muthu (PI)	Computational and Experimental study of damage and failure in carbon/glass fiber reinforced composite materials	DST-SERB	49.5935	2019-2022	Completed
5.	Dr. S.S. Gautam (PI), Dr. Arup Nandy, Dr. Nelson Muthu and Dr. B. Hazra (co-PI)	Functionality Enhancement through Design and Development of Advanced Finite Element Algorithms for STR TOOLS	DST-SERB and VSSC, ISRO	99	2019-2022	Ongoing
6.	Dr. Nelson Muthu (Mentors)	Versatile standing cum sitting device- VSD	NewGen IEDC	2.50	2021-2022	Completed
7.	Dr. Nelson Muthu & Dr. BS Reddy (Mentors)	Development of intelligent Vision System for Underwater Drones	NewGen IEDC	2.50	2021-2022	Completed

8.	Dr. Pankaj Tiwari and Dr. Nelson Muthu (Mentors)	Waste Disposal (Recycling) of Fiber (Carbon/Glass) reinforced Polymer Composites	TATA Steel (MaterialNEXT)	0.6	2022	Completed
9.	Dr. Pankaj Tiwari, Dr. Nelson Muthu and Mr. Sachin Kuriachan	Recycling of Fiber (Carbon & Glass) reinforced Polymer Composites	TATA Steel	24	2022-24	Ongoing
10.	Dr. B.S. Reddy and Dr. Nelson Muthu	Development of an Autonomous System for an Underwater Vehicle	Technology Innovation Hub, IITG TIDF	49.9	2022-24	Ongoing
11.	Dr. Nelson Muthu (PI)	Manpack Bridges	Technology Innovation Hub, IITG TIDF	6.4	2023-24	Ongoing

Consultancy Projects

S.No	PI and Co-PI Details	Title	Sponsoring Agency	Project Value (in lakhs)	Duration	Status
1.	Dr. Nelson Muthu (PI)	Training on Creep and Thermal Fatigue	FCA Engineering Pvt. India Ltd.	2.301	2018	Completed
2.	Dr. Nelson Muthu (PI)	Yield Strength, Coated Thickness & Base Metal Thickness of submitted Bhushan Steel PPGL Sheet Sample for NRL Project	M/s CADMETRIC Consulting	0.47	2021	Completed
3.	Dr. Nelson Muthu (PI)	Advanced Predictive Methodology for Fatigue Life Calculation	SABIC	11.49	2022-23	Completed
4.	Dr. Nelson Muthu (PI)	To develop an AI/ ML model which can assess the quality of wood logs.	TreeKisan	0.472	2023-23	Completed

Books

1. Uday Shanker Dixit, Nelson Muthu, S.M. Kamal "Strength of Materials" 2nd year Under Graduate level book as per AICTE curriculum, January 2023.

Publications

International Journals:

1. N. Muthu, S.K. Maiti, B.G. Falzon, I. Guiamatsia. "Computation of stress intensity factors in functionally graded materials using partition-of-unity meshfree method", *The Aeronautical Journal*, 116(1186):1253-1277; 2012.
2. N. Muthu, S.K. Maiti, B.G. Falzon, I. Guiamatsia. "A Comparison of Stress Intensity Factors Obtained Through Crack Closure Integral and Other Approaches using Extended Element-Free Galerkin Method", *Computational Mechanics*, 52:587-605 2013.
3. N. Muthu, B.G. Falzon, S.K. Maiti, S. Khoddam. "Modified Crack Closure Integral for

Extraction of SIFs in Meshfree Methods", *Finite Element in Analysis and Design*, 78: 25-39; 2014.

4. N. Muthu, S.K. Maiti, B.G. Falzon, Wenyi Yan. “Crack Propagation in Non-homogenous materials: Evaluation of Mixed-Mode SIFs, T-stress and Kinking angle using a variant of EFG Method”, *Engineering analysis with Boundary Elements,* 72: 11-26; 2016.
5. N. Muthu, S.K. Maiti, B.G. Falzon, Wenyi Yan. "Modelling interacting cracks through a level set using the element-free Galerkin method", *International Journal of Mechanical Sciences*, 134:203-215; 2017.
6. J. Ravi, S. Nidhan, N. Muthu, S.K. Maiti. “Analytical and Experimental studies on detection of longitudinal, L and T shaped cracks in Isotropic and Bi-material beams based on changes in natural frequency”, *Mechanical System and signal processing*, 101: 67-96; 2018.
7. P. Dinesh, M.R. Behera, P.G. Ranjith, N. Muthu "An element-free Galerkin method using vertically averaged multiphase flow model for carbon sequestration", *Computers and Geotechnics*, 105:195-210; 2018.
8. J. Tharion, S. Kapil, N. Muthu, J. G. Tharion & S. Kanagaraj "Rapid Manufacturable Ventilator for Respiratory Emergencies of COVID-19 Disease", *Transactions of the Indian National Academy of Engineering*, Jun 7:1-6; 2020.
9. P. Dinesh, P. G. Ranjith, M. R. Behera, N. Muthu “Experimental and numerical (EFG method) studies on sedimentary rock under varied salinity conditions”, *International Journal of Rock Mechanics and Mining Sciences*, 148:104909; 2021.
10. P. Rakesh, A. More, M. Kumar, N. Muthu “Probabilistic failure prediction in a double composite cantilever beam with single and double source uncertainty”, *Composite Structures*, 279:114870; 2021.
11. P. Dinesh, P. G. Ranjith, M. R. Behera, and M. Nelson “Mechanical properties of reservoir rock and caprock under varying brine saturation for application of geological carbon storage in deep saline aquifers” *AIP Conference Proceedings*, 2417: 020025; 2021.
12. Sasibhushan Yengala, Nelson Muthu and Subramani Kanagaraj “A Versatile Standing cum Sitting Device for Rehabilitation and Standing Aid for Paraplegic Patients”, *AIP Conference Proceedings*, 2653:020015; 2022.
13. P. J. Saikia and N. Muthu “Extrinsic cohesive zone modeling for interface crack growth: Numerical and Experimental studies”, *Engineering Fracture Mechanics*, 108353; 2022.
14. A. K. Kumar, N. Muthu, R. G. Narayanan, “Equivalent Orthotropic Properties of Periodic Honeycomb Structure: Strain-energy approach and homogenization”, *International Journal of Mechanics and Materials in Design*, 19:137-163; 2022.
15. Manash Jyoti Baishya, Bikram Jyoti Sahariah, Nelson Muthu, Prasenjit Khanikar “Composite strut-plate lattice: A high-stiffness design of cellular metamaterial having excellent strength and energy absorption ability”, *Materials Today Communications*, 33: 104939; 2022
16. P Vicky Kumar, Anil Kumar Birru, Nelson Muthu “Evaluation of Zr, Ni-Cr, and Au-Ag Applied Materials Using FEM on Prosthetic Crowns”, *Malaysian Journal of Science*, 42: 41-46; 2023.
17. Lalit Kumar, Dhrutiman Dey, Biranchi Panda, Nelson Muthu “Experimental and numerical evaluation of multi-directional compressive and flexure behaviour of extrusion-based 3D printed concrete”, *Frontiers of Structural and Civil Engineering*, 17:1643-1661; 2024.
18. P. J. Saikia, N. Muthu “Extrinsic/intrinsic cohesive zone modelling and experiments on interface failure of multi-walled carbon nanotube reinforced adhesively bonded joints under mode II loading”, *Theoretical and Applied Fracture Mechanics,* 126:103967; 2023.
19. L. Kumar, B. Panda, N. Muthu, “A simple potential energy formulation for 3D concrete printed structures considering the shear effects in the build direction”, *Progress in Additive Manufacturing*, 1-9; 2023.
20. S. S. Kumar, N. Muthu, “Generalized displacement control technique for mode I/II fracture problems using cohesive zone model within a modified element-free Galerkin framework”, *Fatigue and Fracture of Engineering Materials and Structures,* 46:4119-4141; 2023.
21. S. Sai Kumar, N. Muthu, “A thermodynamically consistent strain difference-based nonlocal damage mechanics approach for failure analysis of quasi-brittle materials”, *Theoretical and Applied Fracture Mechanics,* 131: 104351; 2024.

22. A. Kumar, R.Ganesh Narayanan, N. Muthu, “Manufacture of honeycomb core sandwich structures by hybrid approaches: Analysis using lab scale experiments and numerical simulation”, *Thin-Walled Structures,* 198:111739; 2024.
23. Manash Jyoti Baishya, Nelson Muthu, Prasenjit Khanikar,”In pursuit of a high-performance mechanical metamaterial: Simple-cubic-octahedral plate lattice”, *International Journal of Mechanical Sciences*, 272:109189; 2024.
24. P. J. Saikia, M. Kumar, A. Kumar, N. Muthu, “Experimental estimation and numerical validation of cohesive zone parameters in hydroxyl functionalized MWCNTs-reinforced CFRP under pure mode II loading”, *Polymer Composites*, 1-15; 2024.
25. A. Kumar, N. Muthu, R. Ganesh Narayanan, “Prediction of peel strength of sandwich sheets made of aluminium alloys fabricated by friction stir spot welding based hybrid process using cohesive zone modeling and finite element simulations”, *Engineering Failure Analysis*, 162:108381; 2024.
26. Eledathu Kuriachan Sachin, Nelson Muthu, Pankaj Tiwari, “Hybrid Recycling Methods for Fiber Reinforced Polymer Composites: A Review” *Journal of Reinforced Plastics and Composites*, 2024. (Accepted)

Book Chapter:

1. Brian G. Falzon, Nelson Muthu, "Micromechanical modelling of composite materials using the element-free Galerkin approach" Comprehensive Composite Materials II, 2016.
2. A. Kumar, P. J. Saikia, M. Kumar, S. Bag, N. Muthu, R. G. Narayanan, “Fractographic Analysis of Friction Stir Welded Aluminium alloy” Advances in Processing of Lightweight Metal Alloys and Composites, Materials Horizons: From Nature to Nanomaterials, 2022.

International Conferences:

1. N. Muthu, B.G. Falzon, S.K. Maiti, S. Khoddam. "Modelling Crack Propagation in Particle-Reinforced Composites using the Element-Free Galerkin Method" in *International Conference in Composite Materials*, Montreal, 2013.
2. Nelson M. Muthu, Surjya K. Maiti and Wenyi Yan. “Analysis of Cracks in Bimaterials/Composites with Variable Order Singularity using Meshless Method” in *World Congress on Computational Mechanics,* Barcelona, 2014.
3. N.M. Muthu, B.G. Falzon, S.K. Maiti, W. Yan “Micromechanical modelling of non-homogenous materials using meshless methods” in *International Conference in Composite Materials*, Copenhagen, 2015.
4. Jishnu Ravi, Nelson Muthu. “Detection of Longitudinal and L crack based on natural frequency data” in *International conference on vibration problems,* IIT Guwahati, 2015.
5. P. Dinesh, M.R. Behera, P.G. Ranjith, N. Muthu "Application of an efficient numerical model for CO2 sequestration in deep saline aquifers" in *4th International Conference in Ocean Engineering*, IIT Madras, Chennai, India, 2018.
6. P. Dinesh, M.R. Behera, P.G. Ranjith, N. Muthu "An Element-Free Galerkin (EFG) Meshfree Method Model for Carbon Sequestration" in the *3rd International Conference on Multiphase Flow and Heat Transfer*, Budapest, Hungary, 2018.
7. P. Dinesh, M.R. Behera, P.G. Ranjith, N. Muthu “Multiscale modelling of fracture in wet porous media” at the *1st International Symposium on In-situ Modification of Deposit Properties for Improving Mining 2018 (IMDPIM2018)*, Taiyuan, China, 2018.
8. S. Sai Kumar, N. Muthu, “Modeling of Delamination Behaviour in Composite Beam Using a Novel Continuum Damage Theory” in *International Conference and Exhibition on Reinforced Plastics*, Mumbai, 2019.
9. P. Dinesh, M.R. Behera, P.G. Ranjith, N. Muthu, “Application of Element Free Galerkin (EFG) method for CO2 Storage and Caprock Integrity” in *The UK Carbon Capture and Storage Research Centre (Online)*, 12th May 2020, Organized by University of Sheffield.
10. P.J. Saikia, N. Muthu, “Identification Of Cohesive Zone Parameters For A Bi-Material Interface Crack” in *1st Online International Conference on Recent Advances in Computational and Experimental Mechanics 2020 (ICRACEM 2020)*, Indian Institute of Technology Kharagpur, India, 4th–6th, September 2020. (http://icracem.org/docs/E-Proceedings%20ICRACEM%202020.pdf)
11. V. N. Naik, S. Sai Kumar, N. Muthu, “1D-Cohesive zone modelling of failure using eXtended

element-free Galerkin method" in *1st Online International Conference on Recent Advances in Computational and Experimental Mechanics 2020 (ICRACEM 2020)*, Indian Institute of Technology Kharagpur, India, 4th–6th, September 2020. (http://icracem.org/docs/E-Proceedings%20ICRACEM%202020.pdf)

12. P. J. Saikia and N. Muthu. Equivalency between Cohesive zone model and linear elastic fracture mechanics for an Isotropic Crack, *65th congress of the Indian Society of Theoretical and Applied Mechanics,* December 9-11,2020. (https://istam.iitkgp.ac.in/resources/2020/proceedings/Full_paper/SM/94fullpaper.pdf)
13. S. Sai Kumar and N. Muthu. Finite Element Implementation Of Elastic-Plastic Large Deformation Analysis For Small Strain Problems, *65th congress of the Indian Society of Theoretical and Applied Mechanics*, December 9-11,2020. (https://istam.iitkgp.ac.in/resources/2020/proceedings/Full_paper/SM/115fullpaper.pdf)
14. P. Dinesh, M.R. Behera, P.G. Ranjith, N. Muthu, "Mechanical properties of reservoir rock and caprock under varying brine saturation for application of geological carbon storage in deep saline aquifer" in *International Conference on Advanced Materials Behaviour & Characterization*, Organized by Mattest Research Academy, Chennai, Tamil Nadu, India, during 24-26 April 2021.
15. A. Kumar, N. Muthu, R. G. Narayanan "Equivalent In-plane Elastic Properties of Periodic Re-entrant Honeycombs – Strain-energy approach and FE modelling" *International Conference on Experimental and Computational Methods in Manufacturing (ICECMM 2021)*, NERIST, 28-29, Aug 2021.
16. Sasibhushan Yengala, Nelson Muthu and Subramani Kanagaraj "A Versatile Standing cum Sitting Device for Rehabilitation and Standing Aid for Paraplegic Patients" *Virtual International Conference on Product Design, Development, and Deployment (PDCUBE - 2021)*, Vellore Institute of Technology, Vellore, 11-12 Sep 2021.
17. P. Dinesh, M.R. Behera, P.G. Ranjith, W. A. M Wanniarachchi, N. Muthu, "Experimental validation of element-free Galerkin (EFG) model for SENB sedimentary rocks under varied salinity conditions" in *3rd International Conference in Geotechnical Engineering*, Colombo, Sri Lanka, during 06-07 Dec 2021.
18. S. Sai Kumar, N. Muthu, "Application of damage model based on nonlocal equivalent strain in the element-free Galerkin method" in *12th International Conference on Structural Integrity and Failure (SIF2021)*, Monash University, Melbourne, Australia, 06-07 Dec 2021.
19. Ankit Fule, N. Muthu, "Determination of the SIF in Generalized Finite Element Method using the Configurational Force approach" in *12th International Conference on Structural Integrity and Failure (SIF2021)*, Monash University, Melbourne, Australia, 06-07 Dec 2021.
20. G. Safiur Rahiman, N. Muthu, U.S. Dixit, Pavel A. Petrov "Determination of the flow stress of material based on a friction-independent test on a simple geometry" in All India Manufacturing Technology, Design and Research Conference (AIMTDR 2021), Departments of Mechanical Engineering, PSG Coimbatore, 09-11 Dec 2021.
21. Manash Baishya, Bikram Sahariah, Nelson Muthu, Prasenjit Khanikar "High-stiffness metamaterial composite structure with plate reinforced strut-microlattice" *TMS Annual Meeting & Exhibition*, Anaheim, California, USA, 27 Feb – 3 March 2022 (TMS 2022 151st Annual Meeting & Exhibition Supplemental Proceedings, 1551-1568).
22. Manash Jyoti Baishya, Manish Dalakoti, Nelson Muthu, Prasenjit Khanikar "A Crashworthy Lightweight Lattice Structure having a Composite Strut-Plate Lattice Topology Optimized using the Design of Experiments Technique" *The 13th International Symposium on Plasticity and Impact Mechanics (IMPLAST 2022)*, August 21-26, 2022, IIT Madras, Chennai, India.
23. Manash Jyoti Baishya, Nelson Muthu, Prasenjit Khanikar "A Multi-Phase Strut-Plate Lattice Design having Enhance Strength, Stiffness and Energy Absorption Ability" *8th Asian Conference on Mechanics of Functional Materials and Structures (ACMFMS-2022)*, 11th - 14th December, 2022, IIT Guwahati, Guwahati, India.
24. P. J. Saikia, S. Kakati, M. Kumar, N. Muthu "The effect of hydroxyl functionalized MWCNTs on the interlaminar fracture toughness of Basalt fiber reinforced epoxy composite" *4th Structural Integrity Conference and Exhibition (SICE)*, IIT Hyderabad, 14-16 December 2022, IIT Hyderabad, India.
25. P J Saikia, M Kumar and N Muthu "Enhancing the mode I interlaminar fracture toughness of carbon fiber-reinforced composite with hydroxyl functionalized MWCNTs; numerical and experimental study" *8th Asian Conference on Mechanics of Functional Materials and*

Structures (ACMFMS-2022), 11th -14th December, 2022, IIT Guwahati, Guwahati, India.

26. S.Raja, U.Melkani, R.Sarma, S. Kapil, N.Muthu "Effect of Fiber Holding Techniques in the Fabrication of Continuously Reinforced Metal Matrix Composites adopting Wire Arc Additive Manufacturing" *AM 3D Aero 2023 India Conference*, 13-14 December, December 2023, Ramaiah Institute of Technology, Bangalore, India.
27. K Murthy Pabbu, N. Muthu, "Phase-field modelling of fracture in Arruda-Boyce and Van der Waal hyperelastic material models using mixed(U-P) formulation," *9th International Conference on Computational Mechanics and Simulations (ICCMS)*, 20-22 December 2023, IIT Gandhinagar, Gandhinagar, India.
28. K Murthy Pabbu, N. Muthu, "Exploring the one-dimensional analysis of damage behaviour in Hyperelastic Materials via Generalized Displacement Control (GDC) technique," *9th International Conference on Computational Mechanics and Simulations (ICCMS)*, 20-22 December 2023, IIT Gandhinagar, Gandhinagar, India.
29. Lalit Kumar, Dhrutiman Dey, Biranchi Panda, Nelson Muthu, "Influence of the nozzle geometry on mechanical properties of 3D-printed concrete – Experiment and Finite element study" *International Conference on Additive Manufacturing (ICAM 2024),* 4-6th March 2024, NIT Warangal,Warangal, India.

National Conferences:

1. M. Nelson, B.Varun, S.K. Dwivedy "Dynamics and control of two link robot for minimum trajectory error" in *National Conference on robotics and industrial manufacturing process*, BHEL Hyderabad, 2009.
2. S. Narwal, P.S. Robi, N. Muthu, "Fluid Structure Modelling of Tri-Leaflet Aortic Valve" in 5th *Research Conclave 2018*, IIT Guwahati, 2018.
3. S. Sai Kumar, Nelson Muthu, "Modelling and testing of fiber reinforced composites under impact" in 5th *Research Conclave 2018*, IIT Guwahati, 2018.
4. Nelson Muthu, "Finite Element Analysis of Hyperelastic Material" in NAFED 2020, 09 Dec 2019, Organized by VSSC, ISRO, BARC Mumbai 2019.
5. Nelson Muthu "Finite Element Analysis of Hyperelastic Materials" in NAFED 2020, Organized by VSSC, ISRO,11-12 Dec 2020.
6. Nelson Muthu "Finite element modelling of hyper elastic rubber-like materials using popular constitutive models" in NAFED 2022, Organized by VSSC, ISRO,04-05 Feb 2022.
7. P Vicky Kumar, Anil Kumar Birru, Nelson Muthu "Design and Development of Dental Crown using 3D Printing for patient compatibility", Proceedings of National Conference cum Industry meet on Foundry 4.0 - Opportunities and Challenges, CSIR- Central Mechanical Engineering Research Institute (CSIR-CMERI), Durgapur, February 24-25, 2022.
8. A. Kumar, R. Ganesh Narayanan, N. Muthu "Friction Stir Spot Welding of Honeycomb Core Sandwich Structure" In: Joshi, S.N., Dixit, U.S., Mittal, R.K., Bag, S. (eds) Low Cost Manufacturing Technologies. NERC 2022. Springer, Singapore, 2023.
9. S. Sai Kumar, O. Ashok, N. Muthu "Hyperelastic Analysis of Adventitial Layer Using Isotropic Gent Model" In: Pandey, L.M., Gupta, R., Thummer, R.P., Kar, R.K. (eds) Healthcare Research and Related Technologies. NERC 2022. Springer, Singapore, 2023.
10. Sachin Kuriachan, Pankaj Tiwari, Nelson Muthu "Effect of Chemical Treatment on Decomposition Profiles of Carbon Fiber Reinforced Polymer Composites and Its Recycling" In: Deka, D., Majumder, S.K., Purkait, M.K. (eds) Sustainable Environment. NERC 2022. Springer, Singapore, 2023.

Patents

1. Chetan Pakhare, Tapas Pandey, Nelson Muthu, B. Ravi, Alaric Aroojis "A bipolar magnetic connector for establishing electric contacts between two modules with orientation capabilities and collapsible connection pins" (DoA: 04/08/2017, App No: 201721027799).
2. Tapas Pandey, Chetan Pakhare, Nelson Muthu, B. Ravi, Alaric Aroojis "A data logger which can interface several resistive transducer to the single port of analog to digital converter (ADC) which is the part of signal processing system such as microcontroller" (DoA: 04/08/2017, App No: 201721027804).
3. Sanchit Jhunjhunwala, Sajan Kapil, Joseph Tharion, Nelson Muthu "A Portable Mechanical Ventilator for Respiratory Emergencies" (DoA: 20-10-2020, App No: 202031045726).

4. Sasibhushan Yengala , Nikhil Kumar Singh , M. Muthupalaniappan , Nelson Muthu , Subramani Kanagaraj “A Modular Reciprocating Gait Orthosis For Rehabilitation And Walking Aid For Paraplegic patients” (DoA: 12-03-2021, App No: 202131010431).
5. Yengala Sasibhushan, Nelson Muthu, Subramani Kanagaraj “A Versatile Standing Cum Sitting Device For Rehabilitation And Standing Aid For Paraplegic Patients” (DoA: 25-06-2021, App No.: 202131028647).

Workshops and Conferences Organized

- TEQIP short term course on Mechanics of Composites for Engineering Applications from May 21st-25th, 2019 at IIT Guwahati.
- Organized Healthcare Hackathon from 5th – 7th September, 2019 at IIT Guwahati.
- TEQIP short term course on Fracture Mechanics and its applications to Laminated Composites from March 01st-05th, 2021 at IIT Guwahati.
- One-day workshop on Post-Buckling of Composite Shells on 9th May’24 at IIT Palakkad.

Awards and Talks

- One-day lecture on meshfree methods applied to fracture mechanics held at Mechanical Engg. Dept., SPCE, Mumbai in year 2013.
- Oskar winner of 3 minute talk presentation held at IIT Bombay in year 2014.
- DST Travel Grant for attending an international conference in Barcelona, 2014.
- Teaching Assistantship for UG and PG mechanical design courses by IIT-Bombay, 2011-2014.
- Best poster award for 12th International Conference on Vibration problems (ICOVP -2016) held at IIT Guwahati.
- Expert talk on Bio-medical Innovation at One day Induction Program for SSIP Coordinators of Universities/Institutes in Gujarat, 2017.
- Talk on ‘Mechanical Engineering: Then and Now’ in Ishan Vikas Programme – 2017, IITGi.
- An invited lecture on “Analytical and Experimental Studies on Detection of Longitudinal, L and Inverted T Cracks in Isotropic and Bi-material Beams Based on Changes in Natural Frequencies” in TEQIP short term course on “Vibration and Noise Analysis of Mechanical Systems” at IIT Guwahati in 2018.
- An invited talk on “Connecting Doctors, Researchers and Entrepreneurs for Indigenous Medical Device Innovation” in QIP - Short Term Course On “Current Status and Requirements of Biomedical Devices” 25th – 29th March, IIT Guwahati, 2019.
- Expert talk on “Connecting Doctors, Researchers and Entrepreneurs for Indigenous Medical Device Innovation” in TEQIP-III National workshop on Biomaterials: Design, Development and Biomedical applications, 11th – 15th September, NIT Manipur, 2019.
- Expert talk on “MEDICAL DEVICES Regulations” in TEQIP-III National workshop on Biomaterials: Design, Development and Biomedical applications, 11th – 15th September, NIT Manipur, 2019.
- An invited talk on “FE modelling of Composite Laminates” in TEQIP-III Short Term Course on Active/Passive Damping Composites for Structural Vibration Control, 6th – 10th January, IIT Guwahati, 2020.
- Invited talk on “FEM in Fracture Mechanics” in TEQIP-III short-term course on “Finite Element Method - Variational Methods to Computer Applications" on 2nd – 6th Nov 2020, IIT Guwahati, 2020.
- Expert talk on “Connecting Doctors, Researchers and Entrepreneurs for Indigenous Medical Device Innovation” in TEQIP-III Virtual National workshop on Avenues of Engineering in Biomedical research in present era 10th – 14th November, NIT Manipur, 2020.
- Online Lecture on “Connecting Doctors, Researchers and Entrepreneurs for Indigenous Medical Device Innovation”, Karunya Institute of Technology and Sciences, 26th Nov 2020.
- Online Lecture on “Irwin's Plastic Zone Correction, Dugdale Model and R-Curve” in AICTE ATAL Faculty Development Programme on Damage Tolerance: A new Design Strategy from 05-09 July 2021, VJTI Mumbai.
- Online Lecture on “Applications of Modern Manufacturing in Biomedical Engineering” in

Five Day Online Faculty Development Programme on Advanced Materials and Manufacturing Technology, Karunya Deemed University from 03rd - 07th Aug 2021.

- Online Lecture on "Applications of Modern Manufacturing in Biomedical Engineering" in Two weeks National Level Virtual Faculty Development Programme on Advanced Materials and Manufacturing Technology, Easwari Engineering College from 27th Sep – 08th Oct 2021.
- Online Lectures on "Engineering Drawing and 3D printing" and "Biomedical Innovation" in one week AICTE-ISTE Induction/Refresher Program on Issues and Challenges in Teaching Learning of Engineering Mechanics and Drawing, Nowgong Polytechnic, Nagaon from 21st – 28th Dec 2021.
- Talk on "Element-Free Galerkin method for Linear Elastic Fracture Mechanics" in 8th Asian Conference on Mechanics of Functional Materials and Structures (ACMFMS-2022), 11th - 14th December, 2022, IIT Guwahati, Guwahati, India
- Talk on " Layered composites – Manufacturing, Testing and Computational modelling" in *Indo-French Research Seminar on Innovation in Manufacturing and Machining of Advanced Aerospace materials*, 02-03 March 2023, PSG College of Technology, Coimbatore, India.
- 1st Runner-Up in Poster competition in *AM 3D Aero 2023 India Conference*, 13-14 December, December 2023, Ramaiah Institute of Technology, Bangalore, India.
- Best Teacher Award
  ME-101 (Engineering Mechanics) course: Jan-May 2019
  ME-212 (Solid Mechanics-1) course, July – Nov 2019, 2021

Journal Reviewer

1. Fatigue and Fracture Mechanics of Engineering Materials and Structures
2. Ceramics International
3. Springer Nature – Scientific Reports
4. Journal of The Institution of Engineers (India): Series C
5. Sadhana
6. International Journal of Mechanics and Materials in Design
7. Additive Manufacturing
8. International Journal of Computational Methods
9. Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science

Education Background

IIT Bombay-Monash Research Academy PhD, Mechanical and Aerospace Engineering,	Mumbai and Melbourne, 2015	Thesis title: Studies in the use of element-free Galerkin method for linear elastic fracture mechanics CGPA: 9.74/10
Indian Institute of Technology Guwahati B.Tech, Mechanical Engineering,	Guwahati, May 2008	CGPA: 8.59/10
Narayana Junior College Intermediate level, Andhra State Board	Nellore, March 2004	93.2%
Space Central School 10th, CBSE	Shriharikota, March 2002	92.8%

PhD Students Supervison

S.No	Research Scholar Name (Roll. No)	Topic	Status	Co-guide
1	S. Sai Kumar (176103019)	Studies on Strain Softening Materials using Nonlocal Finite Element and Element-Free Galerkin Methods	Thesis Submitted	-
2	Pran Jyoti Saikia (176103002)	Experimental and Computational Analysis of Interface Fracture using Extrinsic and Intrinsic Cohesive Zone Modelling	Completed	-
3	Avneesh Kumar (196103010)	Sandwich Honeycomb structures	Ongoing	Prof. R. Ganesh Narayanan
4	P. Krishna Murthy (196103114)	Damage in Hyperelastic materials	Ongoing	Prof. T.D. Pallicity
5	Lalit Kumar (196103111)	Failure in 3D printed concrete materials	Ongoing	Prof. B. Panda
6	M. Jyoti Baishya (196103016)	Auxetic Materials	Ongoing	Prof. P. Khanikar
7	V. Sathesh Raja (196103117)	Metal matric composites	Ongoing	Prof. S. Kapil
8	Dr. Joy Narayan Chakraborty (206103113)	Biomedical device for Prostate	Ongoing	Prof. S. Kanagaraj (Coordinating supervisor)
9	Sachin Kuriachan (216107023)	Recycling of FRP materials	Ongoing	Prof. P. Tiwari (CL Dept)
11	P. Rakesh (226103005)	Machine learning fracture models in composites	Ongoing	Prof. U.K. Komal
12	P. Vicky Kumar (NIT Manipur)	Design of 3D printed mouthguard	Ongoing	Dr. A. Birru (NIT Manipur) – Coordinating Supervisor

M.Tech Students Supervison

S.No	Student Name (Roll. No)	Topic	Status	Co-guide
1	Sahil Narwal (164103017)	Design and development of aortic heart valve	Completed - 2018	Prof. P.S. Robi
2	Supatra Shankhdhar (174103102)	Two Phase flow through Porous media using element-free Galerkin method	Completed - 2019	-
3	V. Vijay Aundhakar (174103112)	Stochastic modeling of failure in composite materials	Completed - 2019	-
4	Nikhil Kumar Singh (174103135)	Design and Development of a Modular Reciprocating Gait Orthosis for Rehabilitation and Walking aid for paraplegic patients	Completed - 2019	Prof. S. Kanagaraj
5	Aditya More (184103113)	Probabilistic modeling of failure in composite materials	Completed - 2020	-
6	Amit Kumar Singh	Modeling delamination due to fatigue in composite material	Completed - 2020	-

	(184103102)			
7	Vishnu Naik (184103430)	1D-Cohesive zone modelling of failure in Friction stir welds using eXtended element-free Galerkin method	Completed - 2020	-
8	Orepalli Ashok (184103413)	Finite Element Analysis of Hyperelastic Materials	Completed - 2020	-
9	Paladugu Rakesh (194103230)	Polymer composites - Manufacturing, Testing & Probabilistic failure using FEM	Completed - 2021	-
10	Amit Maurya (194103403)	Fracture analysis of the robotic arm under impact loading	Completed - 2021	Prof. B. Sandeep Reddy
11	V. Jaya Prakash (194103440)	Global-local crack modelling using Element-free Galerkin method	Completed - 2021	-
12	Y. Sasibhushan (194103443)	Design and Development of a Modular Reciprocating Gait Orthosis (RGO) and a Versatile Standing cum Sitting Device (VSD) for Rehabilitation of Paraplegic Patients	Completed - 2021	Prof. S. Kanagaraj
13	Mano Prakyath Havalgi (204103104)	FEM Formulation to Alleviate Different Types of Locking in Non - Linear Analysis with Hyper Elastic Materials	Completed – 2022	Prof. A. Nandy
14	Fule Ankit Ashok Rao (204103111)	Global-local crack modelling using numerical methods	Completed – 2022	-
15	Aman Rathore (204103301)	Testing of composites and development of Versatile Standing cum Sitting Device (VSD)	Completed – 2022	-
16	Md Afzal Amanullah (214103111)	Finite Element Modelling of Thin Rubber-like Materials using different Hyper-Elastic Material Models	Completed – 2023	-
17	Albert Shaji (214103403)	Alleviating Volumetric Locking in Hyperelastic Materials using Finite Element and Element Free Galerkin Methods	Completed – 2023	-
18	Ujwal Joy (214103434)	Fatigue Analysis of Thermoplastics (Polypropylene) – Experimental and Numerical Analysis	Completed – 2023	-
19	Nikhil Kumar (214103315)	Ocular Disease Detection using CNN	Completed – 2023	

B.Tech Students Supervison

S.No	Students Name (Roll. No)	Topic	Status	Co-guide
1	Ujwal Gajbe (150103031) & Jitender Prakash (150103039)	Atomistic Scale Simulation Of Crack Propagation In Non-Homogenous Materials	Completed - 2019	-
2	Devansh Gupta (150103027) & UttamkumarSingh (150103074)	Comparative Study Of Un-Textured And Micro Textured Tools On Shaping Of Aluminium Metal Through Computational Modelling Using Abaqus Cae 2017	Completed - 2019	Prof. M. Ravi Sankar
3	Abhishek Mishra (150103003) & Sanjay Soren (150103061)	Assistive Electrode Based Electric Discharge Micromachining Of Silicon Carbide	Completed - 2019	Prof. M. Ravi Sankar
4	Anmol Deep	Failure of laminated composite	Completed	-

	(160103011), Dhiraj Mittal (160103025) & Nitul Deori (160103054)	materials - probabilistic analysis and machine learning	- 2020	
5	Tripan Dipta Roy (170103075) & Ajit Kumar Singh (170103089)	Crack Modelling and SIF Extraction in Python	Completed - 2021	-
6	Akshay Shah (180103006) & Amit Rai (180103008)	Autonomous and Electric Vehicles – Simulation and Machine Learning	Completed - 2022	Dr. Caleb Ronald Munigety
7	Md. Adnan Ansari (180103044) & Nimma Mohan Krishna (180103050)	Design and Development of a Manpack bridge	Completed - 2022	Prof. P. Khanikar
8	Bharat Bhushan Rai (190103025) & B. Kiran Kumar (190103026)	Synthetic Enriched Function for Modelling Cracked Geometries Using FEM	Completed - 2023	-
9	Garvit Kaushik (190103107) & Snigdh Chandra (190103096)	Digital twin assets in CARLA simulator	Completed - 2023	-
10	Nikhil Upadhyay (190103116) & Yash Joshi (190103105)	Interface fatigue crack growth modelling in composite materials	Completed - 2023	-

Administrative services

- ME Department bilingual name plate in-charge in 2017.
- ME Department faculty meeting secretary from August'17 – Sep'19.
- ME Department website in-charge from September 2018.
- ME Departmental Postgraduate Programme Committee (DPPC) member from 2018-21.
- 1st year UG ME Department Faculty advisor for 2018, 2019 and 2020 students.
- Institute Engineering Mechanics (ME 101) course coordinator for 2019, 2020, 2021.
- Institute JEE representative in 2018,19,20,21, 24
- Institute GATE representative in 2019, 22, 23
- Faculty advisor for Research Conclave'18.
- Faculty co-convener for Research Conclave'19.
- Faculty convener for Research Conclave'20 and Research & Industry Conclave 2022.
- Associate warden for Dihing Hostel in 2018,19.
- ME Department faculty recruitment coordinator for 2019.
- ME Department – Design stream, PhD admission convener, 2020.
- Member of the Standing committee for Alumni awards 2020.
- ME Department Faculty In-Charge of Strength of Materials laboratory 2021-2023
- ME Department Internship In-Charge 2022, 23
- ME Department Undergraduate Programme Committee (DUPC) member from 2022
- Honorary member of IITG alumni association (IITGAA)
- Faculty recruitment convener for Machine Design Specialization 2023
- Convener of the Credit Waiver Written Comprehensive Exam at IITG
- Convener of the BTP modification committee at IITG.