Anilkumar P M

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Pre-Doctoral Research Scholar
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PRINCIPAL INTERESTS

Long term career goals include the pursuit of research in the field of Civil Engineering and teaching in an academic environment. Areas of interests include Finite Element Analysis, Structural Analysis, Modelling of Composites and Structural Dynamics.

ACADEMIC BACKGROUND

Doctor of Philosophy (Ph.D.) in Civil Engineering 2022
Indian Institute of Technology Madras, Tamil Nadu, India

- Advisors: Prof. B. N. Rao and Prof. Raimund Rolfes
- Dissertation: Investigations on active multistable variable stiffness composites for morphing applications
- CGPA: 9.75/10, Major: Structural Engineering

Master of Technology (M.Tech.) in Civil Engineering 2016
Indian Institute of Technology Madras, Tamil Nadu, India

- Advisors: Prof. B. N. Rao and Dr.ir. Eelco L. Jansen
- Dissertation: Finite element analysis of bistable structures actuated using piezoelectric MFC patches
- CGPA: 9.77/10, Major: Structural Engineering

Bachelor of Technology (B.Tech.) in Civil Engineering 2015
National Institute of Technology Calicut, Kerala, India

- Advisors: Prof. A. P. Shashikala
- Dissertation: Investigations on the use of rubber concrete in railway sleepers
- CGPA: 8.90/10, Major: Structural Engineering

EXPERIENCE

Pre-Doctoral Research Assistant Oct 2022 - Present
Structural Engineering Division, Indian Institute of Technology Madras, India

- Currently working on various topics involving multistable structural mechanics
- Actively engaged in guiding bachelor and master students for the dissertations
- Teaching assistantship for the gradate level course on Finite element analysis

Doctoral Research Assistant (PMRF) Jul 2018 - August 2022
Structural Engineering Division, Indian Institute of Technology Madras, India

- Prime Minister Research Fellowship for the research on morphing structures
- Under the supervision of Prof. B. N. Rao
- Actively engaged in guiding bachelor and master students for the dissertations

- Teaching Assistantships: Finite element analysis, Structural dynamics, Reinforced concrete design.

Visiting Research Assistant Feb 2022 - May 2022
Bernal Institute, University of Limerick, Ireland

- Visiting IIE Research Fellow for the research on morphing structures
- Under the supervision of Prof. Paul M. Weaver
- Manufacturing of variable stiffness composite laminate plates

Visiting Research Assistant Aug 2019 - Oct 2020
Institute of Structural Analysis, Leibniz Universität Hannover, Germany

- Visiting DAAD Research Fellow for the research on morphing structures
- Under the supervision of Prof. Raimund Rolfes and Dr.-Ing. Sven Scheffler
- Manufacturing and conducting experiments on multistable laminates
- Actively engaged in guiding master students for the dissertations

JOURNAL PUBLICATIONS

J10. **P. M. Anilkumar**, S. Scheffler, A.Haldar, M. Brod, B. N. Rao, E. L. Jansen and R. Rolfes (2022), Nonlinear dynamic modeling of bistable variable stiffness composite laminates, *Journal of Sound and Vibration*, 545, 117417.

J9. K. S. Akhil, **P. M. Anilkumar**, A.Haldar, and B. N. Rao (2022), Vibration analysis of bistable unsymmetric laminates with curvilinear fiber paths, *International Journal of Structural Stability and Dynamics*, 2350089, 1-31.

J8. A. P. Kumar, **P. M. Anilkumar**, A.Haldar, S. Scheffler, O. Dorn, B. N. Rao, and R. Rolfes (2022), Investigations on the multistability of series-connected unsymmetric laminates, *Composites Science and Technology*, 229, 109635.

J7. **P. M. Anilkumar**, A. Haldar, S. Scheffler, E. Jansen, B. N. Rao, and R. Rolfes (2022), Morphing of bistable variable stiffness composites using distributed MFC actuators, *Composite Structures*, 289, 115396.

J6. **P. M. Anilkumar**, A. Haldar, E. Jansen, B. N. Rao, and R. Rolfes (2021), Snap-through of bistable variable stiffness laminates using MFC actuators, *Composite Structures*, 266, 113694.

J5. **P. M. Anilkumar** and B. N. Rao (2021), Impact of hygrothermal environment on the bistability of variable stiffness laminates with curvilinear fibre paths, *International Journal of Advances in Engineering Sciences and Applied Mathematics*, 13, 33-48.

J4. A. P. Kumar, **P. M. Anilkumar**, A. Haldar, S. Scheffler, B. N. Rao, and R. Rolfes (2021), Tailoring bistability in unsymmetrical laminates using an additional composite strip, *Thin-Walled Structures*, 168, 108212.

J3. A. Haldar, **P. M. Anilkumar**, E. Jansen, B. N. Rao, and R. Rolfes (2021), Semi-analytical investigations on bistable cross-ply laminates with MFC actuators, *Smart Materials and Structures*, 30, 105008.

J2. A. P. Kumar, **P. M. Anilkumar**, and B. N. Rao (2020), Study on the Actuation Force of Triangular Bistable Composite Laminates, *MDPC: Material Design & Processing Communications*, 3(5), e169.

J1. **P. M. Anilkumar**, A. Haldar, E. Jansen, B. N. Rao, and R. Rolfes (2019), Design optimization of multistable variable-stiffness laminates, *Mechanics of Advanced Materials and Structures*, 26(1), 48-55.

CONFERENCE PUBLICATIONS

C8. **P. M. Anilkumar**, B. N. Rao, A. Haldar, S. Scheffler, Marlene Wolniak, Raimund Rolfes, and Eelco L. Jansen (2022), Investigations on the linear vibration characteristics of bistable unsymmetrical laminates, *In AIAA SciTech Forum and Exposition*, American Institute of Aeronautics and Astronautics (SciTech 2022), 0258.

C7. K. S. Akhil, **P. M. Anilkumar**, and B. N. Rao (2022), Applicability of duffing oscillator on the dynamic analysis of bistable variable stiffness laminates, *In Book Aerospace and Associated Technology*, Proceedings of the Joint Conference of the ICTACEM, APCATS, AJSAE, and AeSI, 1, 77.

C6. K. S. Suraj, **P. M. Anilkumar**, B. N. Rao, and C. G. Krishnanunni (2022), Parametric perturbation studies on the behaviour of bistable unsymmetrical laminates, *In Book Aerospace and Associated Technology*, Proceedings of the Joint Conference of the ICTACEM, APCATS, AJSAE, and AeSI, 1, 76.

C5. A. P. Kumar, **P. M. Anilkumar**, A. Haldar, S. Scheffler, B. N. Rao, and R. Rolfes (2022), Multistability of connected variable stiffness laminates, *Recent Advances in Computational and Experimental Mechanics, Lecture Notes in Mechanical Engineering, Springer*, Selected proceedings of International Conference on Recent Advances in Computational and Experimental Mechanics (ICRACEM 2020), 1, 51-64.

C4. G. S. Srikanth, S. Scheffler, **P. M. Anilkumar**, B. N. Rao, and R. Rolfes (2022), Numerical investigation of bistable laminates on geometric scaling, *In Recent Advances in Applied Mechanics, Lecture Notes in Mechanical Engineering, Springer*, Selected proceedings of Virtual Seminar on Applied Mechanics (VSAM 2021), 1, 321–335.

C3. **P. M. Anilkumar**, B. N. Rao, S. Scheffler, R. Rolfes, A. Haldar, and E. L. Jansen (2021), Numerical studies on the dynamic characteristics of series-connected multistable laminates, *In Smart Materials, Adaptive Structures and Intelligent Systems*, American Society of Mechanical Engineers (SMASIS 2021), 85499.

C2. **P. M. Anilkumar**, A. P. Kumar, A. Haldar, and B. N. Rao (2020), Role of thickness variation on the tailored bistability of unsymmetric composite laminates, *In IOP Conference Series: Materials Science and Engineering*, Proceedings of 1st International Conference on Recent Advancements in Design and Manufacturing (ICRADM 2020), 1004(1), 012004.

C1. **P. M. Anilkumar**, A. Haldar, S. Scheffler, B. N. Rao, and R. Rolfes (2020), Numerical studies on the design of self-resetting active bistable cross-shaped structure for morphing applications, *In MDPI Proceedings*, Proceedings of 1st International Electronic Conference on Actuator Technology: Materials, Devices and Applications (IeCAT 2020), 64(1), 16.

CONFERENCE PRESENTATIONS

P7. B. Danish, **P. M. Anilkumar**, K. S. Suraj, A. Haldar, and B. N. Rao, Investigations on novel active tristable cross-shaped laminates, *15^{th} World Congress on Computational Mechanics & 8^{th} Asian Pacific Congress on Computational Mechanics (WCCM & APCOM 2022)*, Japan, 1-5 August 2022.

P6. K. Akhil Santhosh, **P. M. Anilkumar**, A. Haldar, and B. N. Rao (2021), Influence of design parameters on the natural frequency of bistable laminates, *In 33^{rd} Nordic Seminar in Computational Mechanics (NSCM 33)*, Jonkoping University, Sweden, 25-26 November 2021.

P5. K. Akhil Santhosh, **P. M. Anilkumar**, A. Haldar, and B. N. Rao (2021), Investigations on the natural frequency of bistable variable stiffness shells, *Virtual Seminar on Applied Mechanics (VSAM-2021)*, IIT Madras, 28-29 May 2021.

P4. **P. M. Anilkumar**, A. Phanendra Kumar, S. Scheffler, A. Haldar, B. N. Rao, and R. Rolfes (2021), Morphing of multistable connected unsymmetrical laminates using MFC actuators, *Wind Energy Science Conference (WESC 2021)*, Hannover, Germany, 25-28 May 2021.

P3. **P. M. Anilkumar**, B. N. Rao, A. Haldar, E. L. Jansen, and R. Rolfes (2019), Effect of piezoelectric fibre alignment on morphing of bistable composites, *29^{th} International Workshop on Computational Mechanics of Materials (IWCMM29)*, Dubrovnik, Croatia, 15-18 September 2019.

P2. **P. M. Anilkumar**, A. Phanendra Kumar, and B. N. Rao (2019), Displacement-based semi-analytical modeling for cured shapes of curvilinearly stiffened bistable laminates, *Indian Conference on Applied Mechanics (INCAM 2019)*, IISc Bangalore, India, 3-5 July 2019.

P1. **P. M. Anilkumar**, A. Haldar, E. L. Jansen, B. N. Rao, and R. Rolfes (2018), Effect of actuation procedure in MFC actuators for morphing of bistable laminates, *Eleventh Structural Engineering Convention (SEC 2018)*, Department of Civil Engineering, Jadavpur University, Kolkata, 19-21 December 2018- **Best Paper Award**.

SPECIAL ACHIEVEMENTS

Awards

- *Second prize in the thesis in three competition* for "presenting the thesis in three minutes with a compelling oration on the research significance", by AStruM-2022, The Bernal Institute, University of Limerick, April 2022.
- *Best Paper Award Best Paper* for the paper entitled "Effect of actuation procedure in MFC actuators for morphing of bistable laminates", in the category of Theoretical and Numerical Mechanics, by 11^{th} Structural Engineering Convention 2018 (SEC 2018).
- *Prime Ministers Research Fellowship* to "pursue doctoral research at IIT Madras", by Ministry of Education, Government of India in Dec 2018
- *ISTE National Award* for "Best M.Tech. Thesis in Civil Engineering (First Prize)", by The Indian Society for Technical Education (ISTE), January 2019.
- *Gold medal and Valli Anantharamakrishnan Merit Prize* for "the best performance in M. Tech in Civil Engineering", by IIT Madras, India for the academic year 2016-2018.
- *Shortlisted in the best 10- Innovative student projects award nominations* at "master's level" by Indian National Academy of Engineering (INAE) in 2018.
- *Smt. Jayalakshmi Narasimhan Memorial Prize* for "securing the highest CGPA in the first two semesters M. Tech programme in Civil Engineering" by IIT Madras, India during 2016-17.
- *All India 139 Rank* in "Graduate Aptitude Test in Engineering, GATE 2016", Ministry of Education (India) in 2016.
- *All Kerala 104 Rank* in "Kerala Engineering Entrance Examination, KEAM 2011", Commissioner of Entrance Examinations (Kerala) in 2011.

Fellowships

- *International Travel Immersion Fellowship* to "work on the cutting edge research at IIT Madras and to travel to a partner institution abroad", by the Office of Global Engagement, IIT Madras, February 2022.

- *DAAD Bi-nationality PhD Scholarship* to "carry out projects at the home university and at Leibniz Universität Hannover in Germany", by DAAD: German Academic Exchange Service, August 2019
- *DAAD India IIT Master Sandwich Programme fellowship* to "pursue M.Tech project at Leibniz Universität Hannover, Germany", by DAAD: German Academic Exchange Service from September 2017 to March 2018.
- *MHRD post-graduate fellowship* to "pursue M.Tech at IIT Madras", by Ministry of Education (India), from July 2016 to May 2018.

Invited Lectures

- Keynote address at International Conference on Systems, Energy and Environment, Govt. College of Engineering Kannur, Kerala, 5 - 6 August 2022. Title of the talk: Morphing of multistable laminates.
- Guest lecture at Virtual Faculty Development Programme (FDP) on Facilitating Digital Transformation in Design, Construction and Management Processes of Civil Engineering, NIT Warangal, 21 February to 2 March 2022. Title of the talk: Why do we need FE software like ABAQUS/ANSYS in Civil Engineering?.

Journal Roles

- Reviewer for Journal of Composite Structures

TEACHING ASSITANTSHIPS

- *CE5610 - Finite Element Analysis* *2017-2022*
  Under the course instructor- Prof. B. N. Rao
- *CE5620 - Structural Dynamics* *2018-2019*
  Under the course instructor- Prof. B. N. Rao
- *CE3060-Basic Reinforced Concrete Design* *2018-2019*
  Under the course instructor- Prof. B. N. Rao
- *CE5740-Experimental Techniques* *2018-2019*
  Under the course instructors- Prof. B. N. Rao & Prof. S. T. G. Raghukanth

STUDENT MENTORSHIP

All students listed here are official students of Prof. B. N. Rao who are working under in the theme of composite laminates/ morphing structures.

5. Mr. Sourav Pareek, *A Novel Solar Collector Integrated with Bistable Composites Laminates*, B.Tech. Thesis, 2023 [On-going].
4. Mr. Suraj Kumar Singh, *Uncertainty Quantification and Sensitivity Analysis of Unsymmetrical Bistable Laminate*, M.Tech. Thesis, 2022.
3. Mr. K. Akhil Santhosh, *Non-linear Vibration Analysis of Bistable Variable Stiffness Laminates*, M.S. Thesis 2022.
2. Mr. G. S. Srikanth, *Numerical Investigation of Bistable Composite Laminates: Dimensional Analysis and Design Based on Edge Effects*, M.Tech. Thesis, 2021.
1. Mr. A. Phanendra Kumar, *Design of variable stiffness bistable composite laminates for shape morphing applications*, M.Tech. Thesis, 2020.

MEMBERSHIPS

- Student Member of American Society of Mechanical Engineers (ASME).
- Student Member of American Society of Civil Engineers (ASCE).
- Student Member of Institution of Structural Engineers. (IStructE)
- Professional Member of American Institute of Aeronautics and Astronautics (AIAA).

POSITIONS HELD

- Organizing Secretary of National Conference on Technological Innovations for Sustainable Infrastructure (TISI 2015), Organized by Civil Engineering Association, Department of Civil Engineering, NIT Calicut, India.
- Secretary of Civil Engineering Association, CEA (2014-2015), NIT Calicut.
- Student in charge of Indian Concrete Institute , ICI (2014-2015), NITC Chapter, NIT Calicut.
- Student Co-ordinator, Student Guidance Cell, SGC (2014-2015), NIT Calicut.
- Event manager of Tathva 2013 (Technical Festival) Civil competitions, NIT Calicut.
- STAAD Workshop manager of Tathva 2013 (Technical Festival), NIT Calicut.
- Class Representative of M.Tech Structural Engineering (2016-2018), IIT Madras.
- Class Representative of B.Tech Civil Engineering (2012-2013), NIT Calicut.

INTERNSHIPS

- Experimental Investigations on Rubber Concrete, An Experimental Study
  - Period: May- July, 2014
  - Guide: Dr. A. P. Shashikala , Professor, NIT Calicut, Kerala
- Promoting Regional Schools to International Standards through Multiple Intervention (PRISM) Project for REC Govt. HSS, Calicut, Kerala
  - Period: July- December, 2013
  - Guide: Dr. T.P. Somasundaran, Professor (Retired), NIT Calicut, Kerala

COMPUTER SKILLS

- Operating System : All Microsoft windows based os
- CAD & CAM : Auto CAD 2D, SOLIDWORKS
- Applications : Microsoft office package, ABAQUS, ANSYS
- Programming : C++, MATLAB, MATHEMATICA, Python

HOBBIES AND INTERESTS:

- Reading short stories and Novels (Received A- Grade in district level story writing competition, Kerala School Kalolsavam, 2010)
- Teaching School Students and Volunteering Social Activities and Events.
- Learning Violin Musical Instruemnt for the last 3 years

REFEREES

- Dr. B. N. Rao
  Professor (HAG)
  Structural Engineering Division
  Department of Civil Engineering
  Indian Institute of Technology Madras
  Chennai 600036, Tamil Nadu, India
  Mail: *bnrao@iitm.ac.in*
- Dr.-Ing. habil. Raimund Rolfes
  Professor and Chair
  Institute of structural Analysis
  Bauingenieurwesen und Geodäsie
  Leibniz Universität Hannover
  Appelstr. 9A, 30167 Hannover
  Mail: *r.rolfes@isd.uni-hannover.de*

DECLARATION *I hereby declare that all the details furnished above are true to the best of my knowledge and belief.*

Anilkumar P M