

# Harini Subramanian

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## EDUCATION

Program	Institution	CGPA/%	Completion year
Ph.D. in Aerospace Engineering	Indian Institute of Technology Madras, Chennai	9.47	2022 (Expected)
B.E. in Aeronautical Engineering	Madras Institute of Technology (MIT), Chennai	9.56	2017
HSC (Tamil Nadu State Board)	Jawahar Higher Sec. School, Chennai	98.75	2013
SSLC (CBSE)	Jawahar Vidyalaya Sr. Sec. School, Chennai	10	2011

## SCHOLASTIC ACHIEVEMENTS

- **Prime Minister's Research Fellowship** - Awarded by MHRD to pursue Ph.D. in a top research institution in India through a rigorous selection process. **Jan 2020**
- **Best Outgoing Student Award** – Awarded out of 36 students by the Aerospace Engg. Dept, MIT. **Feb 2020**
- **Indian Academies of Sciences Summer Research Fellowship** – Awarded to undertake research internship with a scientist related to the academies at IIT Madras. **May 2016**
- **Funding grant** – Awarded Rs. 25000 by Centre for Technology Development and Transfer, Anna University, for a project proposal on the impact loading of tapered composite laminates. **Mar 2016**
- **CSIR Program on Youth for Leadership in Science** - Selected to attend at Structural Engineering Research Centre, Chennai, for meritorious achievement in class X examinations. **Jan 2012**

## SKILLS

**Competencies:** Constitutive modelling, Damage mechanics, Finite element (FE) analysis, Mechanics of composites

**Courses:** Composite Structures, Elasticity, Continuum damage mechanics (CDM), FE analysis, Viscoelasticity, Fracture mechanics, Micromechanics, Plasticity, Constitutive modelling in continuum mechanics, Finite elasticity

**Software:** MATLAB, Abaqus, Ansys APDL, Catia, SolidWorks, C, Python, Fortran, LaTeX

## RESEARCH EXPERIENCE

1. **Ph.D. thesis: Modelling of self-healing materials, IIT Madras** **Jul 2017 – Present**
  - Developed an elasto-plastic damage-healing model addressing the limitation of existing CDM models in capturing complete material failure. Solved boundary value problems using a finite element framework.
  - Developed a 3-D viscoelastic damage-healing model for uncoupled damage and healing evolution.
2. **Multi-level homogenisation of carbon nanotubes reinforced polymers, IIT Madras** **Mar 2018 – Apr 2018**
  - Evaluated the elastic modulus of nano-composites with Single Walled Carbon NanoTube (CNT) in a polymer matrix using micromechanical approaches.
  - Studied the agglomeration phenomenon of CNTs and evaluated its influence on the effective elastic modulus.
3. **Study of impact behaviour and damage characterisation of glass/epoxy laminates, MIT** **Jan 2017 – May 2017**
  - Investigated the low-velocity impact behaviour of preloaded glass fibre reinforced plastic (GFRP) laminates, addressing the limited availability of studies on the impact performance of pre-damaged laminates.
4. **Influence of preload on the impact behaviour of tapered composite laminates** **Mar 2016 – Jan 2017**
  - Studied the impact and compression after impact behaviour of preloaded tapered GFRP laminates by designing and fabricating a special fixture for impact testing tapered laminates in a state of compression.
5. **Study of milled glass fibre influence on the impact behaviour of GFRP laminates, MIT** **Jul 2016 – Jan 2017**
  - Studied the use of recycled milled glass fibre (MGF) as a sustainable and economical alternative compared to carbon nanotubes in GFRP laminates and analysed the low-velocity impact behaviour.
  - Filler loaded samples exhibited enhanced fracture toughness, higher peak load, and residual strength.

## INTERNSHIP EXPERIENCE

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**Analysis of composite laminated beams subjected to transverse loading**, IIT Madras **May 2016 – Jan 2017**

- Modified Pagano's laminate homogenisation theory to address its limited applicability to symmetric cross-ply laminates. Proposed model allows easy FE analysis of non-symmetric laminates compared to other approaches.
- Demonstrated progressive damage analysis using anisotropic damage mechanics.

## CONFERENCES

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1. **Harini S**, Shantanu S. Mulay (2021), 'A three-dimensional continuum damage-healing model for self-healing materials', 25th International Congress of Theoretical and Applied Mechanics
2. **Harini S**, Shantanu S. Mulay (2019), Continuum damage healing model for self-healing materials, 4th Indian Conference on Applied Mechanics (INCAM 2019), IISc Bangalore, Bengaluru, India
3. **Harini S**, Shantanu S. Mulay (2019), Elasto-Plastic Damage-Healing Model Applied to Self-Healing Materials, 10th International Conference on Materials for Advanced Technologies (ICMAT 2019), Singapore

## PUBLICATIONS

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1. **Harini S**, and Shantanu S. Mulay. "On the constitutive modelling of elasto-plastic self-healing materials." *International Journal of Solids and Structures* (2021): 111289.
2. Hemanth Putrevu, **Harini S**, and Shantanu S. Mulay. "On the viscoelastic dynamic beam modelling." *International Journal of Advances in Engineering Sciences and Applied Mathematics* 13.1 (2021): 18-32
3. **Harini S**, and Shantanu S. Mulay. "On the homogenisation of a laminate beam under transverse loading: extension of Pagano's theory." *Acta Mechanica* 232.1 (2021): 153-176.
4. Shantanu S. Mulay, and **Harini S**. "On the development of direct displacement control method: application to local and nonlocal damage mechanics." *International Journal of Advances in Engineering Sciences and Applied Mathematics* 12.3 (2020): 101-124.
5. Udhayaraman, R., **Harini S**, Shantanu S. Mulay, and S. Venkatachalam. "Multi-scale approach-based studies on the damage-healing and fracture behaviour of plain-woven textile composite." *Mechanics of Advanced Materials and Structures* (2020): 1-26.
6. Saravanakumar Kannivel, **Harini S**, Arumugam Vellayaraj, and Hom N. Dhakal. "Low-velocity impact-induced damage evaluation and its influence on the residual flexural behaviour of glass/epoxy laminates hybridised with glass fillers." *Journal of Composites Science* 4, no. 3 (2020): 99.
7. **Harini S**, and Shantanu S. Mulay. "Continuum damage–healing-based constitutive modelling for self-healing materials: application to one-dimensional cyclic loading cases." *International Journal of Advances in Engineering Sciences and Applied Mathematics* 12.1 (2020): 3-18.
8. Saravanakumar, K., **Harini S**, V. Arumugam, and H. N. Dhakal. "Influence of milled glass fillers on the impact and compression after impact behaviour of glass/epoxy composite laminates." *Polymer Testing* 75 (2019): 133-141

## HOBBIES

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Reading, Public speaking