Sajan Kumar Wahi

Skill Assistant Professor
Shri Vishwakarma Skill University, Village Dudhola, Palwal, Haryana 121102, India
+91 9729227700
sajan.kumar@svsu.ac.in
https://svsu.ac.in/faculty/SKWahi
DOB: 05 September 1991

Research Interests

Smart Material and Structures, Magnetostrictive Materials, Constitutive Modelling, Unimorph Energy Harvester, Asymptotic Modeling of Membrane and Plate Formulation, Transducer Modeling, Large Deformation, Finite Elasticity.

Education

Ph.D., Applied Mechanics Jan. 2017 – August. 2023
Indian Institute of Technology, Delhi (IITD), New Delhi, India *CGPA: 9.231/10*

PhD Dissertation: "Asymptotic modeling of magnetostrictive material based structures with application to energy harvesting". Advisor – Prof. Sushma Santapuri, IITD

M.Tech., Machine Design Engineering July. 2013 – June 2015
National Institute of Technology, Kurukshetra (NITK), Haryana, India *CGPA: 9.2174/10 (**Rank 3**)*

B.Tech., Mechanical Engineering Aug. 2009 – May 2013
JMIT, Kurukshetra University, Kurukshetra (KUK), Haryana, India *CPI: 73.67/100*

Technical Skills

Software Tools: MATLAB, LaTeX, COMSOL Multiphysics, Mathematica, Microsoft Office, Inkscape, GLE, Origin
Experimental Tools: Hands-on experience with DAQ system, DAQExpress/LABView, vibration related devices
FEA Expertise: Analysis of Static, Transient, Modal, Harmonic, Random (PSD), Linear, Nonlinear and Multiphysics problems

Current Project Description

1. Coupled magnetomechanical modeling of magnetostrictive materials with application to transducer and energy harvester design:

- Computationally efficient nonlinear constitutive model develop using energy minimization
- Magnetostrictive rod transducer characteristics analysed using 2D axisymmetric COMSOL model along with MATLAB livelink
- 2D COMSOL simulation setup for the energy harvester and a novel flux path based design proposed

2. Modeling and analysis of a magneto- and electroelastic structures for large deformation

- Development of 2D nonlinear magnetoelastic thin membrane undergoing large deformations
- Model specialized to axisymmetry and pre-stretched annular membrane deforming under azimuthal magnetic/electrical field and transverse pressure loading

3. Constitutive modelling of brain tissues: Experiments, Fitting and FEA

- Demonstrated the brain modelling using nonlinear elasticity and FEA Abacus model
- Coefficient of models such as Ogden, Mooney-Rivlin and Neo-Hookean evaluated using experimental data

Journal Publication

1. **S K Wahi**, M Kumar, S Santapuri, and M J Dapino. "Computationally efficient locally linearized constitutive model for magnetostrictive materials." **Journal of Applied Physics** 125, no. 21 (2019): 215108. DOI: 10.1063/1.5086953

2. M N Ali, **S K Wahi**, and S Santapuri. "Modeling and analysis of a magnetoelastic annular membrane placed in an azimuthal magnetic field." **Mathematics and Mechanics of Solids** (2021): 1081286521997511. DOI: 10.1177/1081286521997511

3. A Mishra, Y S Joshan, **S K Wahi**, S Santapuri. "Structural instabilities in soft electro-magneto-elastic cylindrical membranes." **International Journal of Non-Linear Mechanics** (2023):151, 104368. DOI: 10.1016/j.ijnonlinmec.2023.104368

4. **S K Wahi**, D Gupta, S Santapuri. "Finite element analysis and design of a magnetostrictive material based vibration energy harvester with a magnetic flux path. **Smart Materials and Structures**, (2024): 33(11), 115038.." DOI: 10.1088/1361-665X/ad8408

5. **S K Wahi**, and S Santapuri. "Design of an efficient magnetostrictive material based vibration energy harvester with a modified flux path." **Indian Patent Published.** DOI: Reference number: 202211035693

Conference Paper/Presentation/Poster/Workshop

1. CEP short-term course, Machine learning for engineering applications organize by IIT, Delhi, 2019 **(Workshop)**

2. M Kumar, **S K Wahi**, S Santapuri, "Modeling and Analysis of Magnetostrictive Material based Structures" poster presentation at open house, IIT, Delhi, 2018. **(Poster Presentation)**

3. M Kumar, **S K Wahi**, S Santapuri, "Modeling and Analysis of Magnetostrictive Material based Structures", **Proceedings of COMSOL Conference**, 9-10 August 2018, Bangalore, India. DOI: https://www.comsol.co.in/paper/modeling-and-analysis-of-magnetostrictive-material-based-structures-61511 **(Conference Paper)**

4. **S K Wahi**, M Kumar, S Santapuri, "A computationally efficient energy averaged nonlinear constitutive model for magnetostrictive materials", **International Symposium on Integrated Functionalities**, 10-13 December 2017, Delhi, India. **(Presentation Talk)**

5. **Workshop** on "Multiscale challenges in continuum mechanics" at IIT Delhi, June 2017

6. **S K Wahi**, R Verma, "Static Characteristics of Hydrodynamic Two Lobe Elliptical Bearing" **National Conference on Recent Advances in Manufacturing (RAM 2015)**, at S.V. National Institute of Technology, Surat (Gujarat) held during 15-17 May, 2015. **(Presentation Talk)**

Teaching Experience

SVSU Haryana (Skill Assistant Professor) March 2022 – Present

- ME403: Applied Mechanics
- ME501L: Engineering Graphics and Drawing
- ME601L: CAD Lab
- ME503: Measurement and Metrology

IIT Delhi (Teaching Assistant) January 2017 – March 2022

- APL100: Engineering mechanics
- APL104: Solid mechanics

- APL831: Theory of plates and shells
- APL774: Modeling and analysis

Assistant Professor, Lovely Professional University, Punjab, India July 2015 – November 2015

- MEC201: Solid mechanics
- MEC228: Creo-2.0
- MEC220: Solid Mechanics Lab

Scholastic Honours, Awards and Certificates

- Research scholar **travel award** (RSTA) from IIT, Delhi for attending international conference (2020)
- Awarded **third position** in M.Tech. (Machine Design Engineering) NIT Kurukshetra (July, 2015)
- **Qualified** (**GATE**-2013) in Mechanical Engineering with 97.83 percentile, AIR 3597
- Awarded 29^{th} rank in State and **first position** in district Kurukshetra in class XII (May, 2009)

Industrial Training

- Study of **Thermal Power Plant Gas Turbine section**, Deenbandhu Chhotu Ram TPP, Yamunanagar (2011)
- Study of Rear Fender Bolt Thread NG, **HONDA Motorcycle Scooter India Pvt. Ltd**, Gurgaon (2010)

Extra-Curricular

- Volunteer of Pranyas development foundation: NGO dealing with the education 2019 - Present
- Student coordinator, Open house 2018, IIT, Delhi
- Drama: Participated in drama competition at various platform of academic journey

Past Projects

Journal bearings lubricated with Newtonian and micro-polar fluid (M.Tech Thesis) 2015

- Developed in-house MATLAB code using finite difference scheme for hydrodynamic bearing

Fabrication of Vacuum Forming Machine (B.Tech Major Project) 2012

Fabrication of Magnetic Levitation train (B.Tech Minor Project) 2012

Rear Fender Bolt Thread NG (Industrial Project: Honda Two Wheeler's) 2011

Referee services

- Conference papers of Virtual Seminar on Applied Mechanics (VSAM)

References

Prof. Sushma Santapuri
Department of Applied Mechanics
IIT Delhi, New Delhi-110016, India
ssantapuri@am.iitd.ac.in
Tel:+91-11-26597393

Prof. Puneet Mahajan
Department of Applied Mechanics
IIT Delhi, New Delhi-110016, India
mahajan@am.iitd.ac.in
Tel:+91-11-26591229

Prof. Puneet Kumar
Department of Mechanical Engineering
NIT Kurukshetra, Kurukshetra-136118, India
punitkumar@nitkkr.ac.in
Tel:+91-8059000776