Dr. Ashwani Kumar Sengar

Contact Information

Department of Mechanical Engineering,
SITCOE, Yadrav, Kohlapur, Maharastra.
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Research Interests

Computational Solid Mechanics, Multi-scale Material Modelling

Teaching Interests

Undergraduate courses: Continuum Mechanics, Mechanics of Solids, Introduction to Robotics
Graduate courses: FEM, Mathematical Methods in Engineering, Theory of Elasticity, Applied Dynamics and Vibration, Numerical Methods

Software Packages

MATLAB, LAMMPS, Python, ABAQUS, Maple, Inventor, Inkscape, Blender

Education

Indian Institute of Technology Kanpur, India
Phd(Thesis defended: Jan 2025), Department of Mechanical Engineering *2025*

- Dissertation Topic: "Self consistent estimates of the anisotropic stiffness of clays"
- Advisor: Prof. Sumit Basu
- CGPA: 7.33

BITS Pilani, Pilani Campus, India
M.E., Department of Mechanical Engineering *2012*

- Dissertation Topic: "Chaos prediction in a piece-wise linear system using Melnikov criteria"
- Advisor: Dr. Amol Marathe
- CGPA: 8.66

KNGD Modi Engg College, Modinagar (affiliated to UPTU, Lucknow, India)
B. Tech, Mechanical Engineering *2010*

- Percentage: 71.02

Work Experience

Sharad Institute of Technolog College of Engineering, Kohlapur, MS
Assistant Professor, Department of Mechanical Engineering *Aug 2026-*

Invertis University, Bareilly, Uttar Pradesh
Assistant Professor, Department of Mechanical Engineering *Sep 2025-July 2026*

TSTS Pvt Limited, Technopark, IIT Kanpur
AI Consultant (Intern) *Feb -Aug 2025*

- Worked on AI/ML solution using object detection, classification and segmentation for railway signalling project.

DY Patil College of Engineering, Akurdi, Pune
Assistant Professor, Department of Mechanical Engineering *March-July 2023*

IIT Kanpur
Teaching Assistant, Department of Mechanical Engineering, IIT Kanpur

- Finite Element Method
- Advance Mechanics of Solid
- Mathematical Methods in Engineering

Publications

Journal Papers

[1] Javed A, Sengar A, Rout. (2012) A FEM and image processing based method for simulation of manufacturing imperfections *Asian Review of Mechanical Engineering* , 1(2):1-5.

Conferences

[1] Oral presentation on "Studying thermo-oxidative degradation of polyimides in oxygen environment using MD simulations" at 9^{th} International Conference on Multiscale Materials Modelling, Osaka, Japan, Oct 28-2 Nov, 2018.

Workshops attended

[1] GIAN course on Failure of Materials, 14-23 Dec 2017 IIT Kanpur

[2] IIT Kanpur Intensive Training School (ITS) on PYTHON for Machine Learning, Neural Networks and Deep Learning, Dec 2-22, 2023.

Doctoral Dissertation

Clay minerals are fine-grained materials formed in the geological process. It is important to understand the effect of composition, shape and orientation of the grains on the overall stiffness of clays because, by virtue of being the major constituent of most sedimentary rocks, the overall stiffness determines the propagation velocities of elastic waves through these rocks. In this work, we attempt to predict the overall stiffness tensor of a large ensemble of clay single crystals through a two-step, fully computational route. At the lowest length scale, atomistic simulations provide the complete stiffness of single crystals of clay minerals like kaolinite, illite and montmorillonite. Further, we have developed a fast, MATLAB based computational tool that uses the atomistically determined stiffness of the single crystal to predict the overall stiffness of an aggregate of clay crystals using a self-consistent homogenisation technique. We show that, borrowing ideas from polycrystalline metals, reasonable estimates of the overall stiffness of these aggregates can be quickly generated using this procedure. Moreover, the effects of shape and orientation distribution of the grains and their effect on the anisotropy of the overall elasticity tensor can also be studied.

Masters Dissertation

We attempted to predict chaos in one dof system that consists of a spring with piecewise linear negative and nonlinear cubic stiffness using Melnikov function. The system is perturbed by a small damping and weak external excitation. To evaluate Melnikov function, we find parametrization of the separatrix in the phase plane of the unperturbed system in a piecewise linear fashion and then find limits of integration, i.e. the times along the separatrix where the governing equation switches due to piecewise linearity.

Hobbies

Running, gardening, street photography, blogging, improving Google Maps.

Reference

[1] Prof Sumit Basu,
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FB 304, Department of Civil Engineering.
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