

### **Research talk:**

Title: A particle sliding on a horizontally shaken table

Abstract:

If a horizontal frictional table is shaken horizontally and unidirectionally at a high frequency, and if a small (point mass) slider is placed on it, then the slider develops a mean velocity equal to the median velocity of the table. Without position feedback in this unidirectional case, the slider cannot approach a stable attracting point. In contrast, under two-dimensional horizontal shaking of the table, also at high frequency, the slider can move in more interesting ways. In particular, even without position feedback, we have found a method of open-loop shaking under which one point on the table becomes a stable attractor for the averaged motion of the slider. I will show some numerical simulation results, quickly introduce the method of multiple scales (MMS), and then develop an MMS analysis of the equations of motion to obtain slow flows for the slider motion. The MMS will be applied twice in succession. After one application, the fastest oscillations will be averaged out. After the second application, remaining slower oscillations will be averaged out as well. Application of the MMS presents some analytical difficulties which may be of academic interest. However, I will suppress some long intermediate expressions to retain clarity and brevity.

### **Career talk for undergraduates:**

Title: Career Planning for Next-Gen Indian Engineers

Abstract:

This is a talk for young Indian engineers, although their teachers and mentors may find it interesting as well.

First, the bad news. India produces a large number of young engineering graduates every year. If the young people of tomorrow can do your work when you are 40 years old, they will do it for less money and for longer hours, and you may get laid off. AI tools and online lectures are taking away some of the advantages of studying in excellent colleges. These technologies can scale up to teach some types of work to a vast number of young people, and then the salaries for doing that work will come down (or the hours of work expected will go up, or both). We have begun to see some of these things.

How do we plan for an uncertain future in such a world? We examine basic principles, try to understand what may work, think about probability, try to understand where we fit in the picture, assess where our chances may be better, remain patient where others are hasty, build up our ability, improve our technical and our soft skills, and generally speaking, have a long-term plan.

Some people will do well, and we can try to be among those people. No emphasis on shortcuts, though. Shortcuts have low entry barriers and too many people easily take the same shortcuts until the advantage disappears. I will emphasize a long view. I will try to present my ideas in a rational way and you can see if you like the picture that emerges.

### **Brief Bio:**

Prof. Anindya Chatterjee got his BTech in mechanical engineering from IIT Kharagpur, concurrent masters degrees in engineering mechanics and in applied mathematics from the University of Florida, a PhD in mechanics from Cornell University, and postdoc research experience at Penn State University. He has taught mechanical engineering at IISc Bangalore, IIT Kharagpur, and IIT Kanpur. He is presently a professor (HAG) at IIT Kanpur. He is a Fellow of INAE and NASI. His research interests are in applied mechanics and applied mathematics. He is interested in the career prospects of the next generation of Indian engineers. He also enjoys working with small engineering companies, which present opportunities for quick progress in multidisciplinary areas.