



Università degli Studi di Cagliari
DIPARTIMENTO DI INGEGNERIA MECCANICA
CHIMICA E DEI MATERIALI



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Research Seminar

Date: **Wednesday 27th March 2019**

Time: **11:00**, Room: **Aula Q**

On the discrete scattering effects due to edges in certain simple structures

Speaker: **Prof. Basant Lal Sharma,**
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Abstract:

It is well known that the elastic wave propagation problems in continua as well as lattices, as well as those involving analogous formulations for the transport of phonons, electrons, etc, lead to rich mathematical analyses. The Helmholtz equation and specific boundary conditions arising due to certain structural features often dictate the terms of this arena. The present talk concerns the discrete scattering effects in two- and quasi-one-dimensional lattice structures, while restricting the discussion to scalar waves. The latter can be visualized in the paradigm of two-dimensional mechanical structures as the waves corresponding to an out-of-plane motion. The talk will present a glimpse of the recently introduced discrete Sommerfeld problems and their applications in the study of certain waveguides. The boundary conditions on the edges are restricted to be discrete counterparts of Dirichlet and Neumann conditions. The simplified expressions for the reflectance and transmittance, in so-called bifurcated waveguides, have been found using Wiener-Hopf technique and the concept of normal modes. The analysis and results are also relevant in a problem of current technological interest, involving the electronic transport in nanotube-nanoribbon junctions.

References:

1. Sharma BL, "*Diffraction of waves on square lattice by semi-infinite crack*", SIAM Journal on Applied Mathematics, 75(3), 1171-1192 June 2015 DOI 10.1137/140985093
2. Sharma BL, "*Wave propagation in bifurcated waveguides of square lattice strips*", SIAM Journal on Applied Mathematics, 76(4), 1355--1381, Apr 2016 DOI 10.1137/15M1051464
3. Sharma BL, "*Electronic transport across a junction between armchair graphene nanotube and zigzag nanoribbon*", The European physical journal B, Volume 91(5):84, Mar 2018 DOI 10.1140/epjb/e2018-80647-2
4. Sharma BL, "*On electronic conductance of partially unzipped armchair nanotubes: further analysis*", The European physical journal B, Volume 92:1, Mar 2019 DOI 10.1140/epjb/e2018-90391-2

All are welcome!



Prof. Sharma is an applied mathematician at the Department of Mechanical Engineering, IIT, Kanpur. With his expertise, he develops analytical approaches for tackling challenging problems relevant in engineering and physics. In particular, one of his main research interests focuses on the mathematical modelling of waves in structured media, which are currently creating new pathways in the design of materials with remarkable properties.

For more information, see: <https://www.iitk.ac.in/new/basant-lal-sharma>

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