

# Spectral Graph Theory

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## Overview

Spectral graph theory studies the properties of a graph in terms of associated matrices viz., adjacency matrix, Laplacian matrix, and so on. Eigenvalues and eigenvectors of these matrices reveal many of the exciting properties of the underlying graph. Expander graphs play an important role in theoretical computer science, error-correcting codes, and networks. The main idea of the proposed course is to introduce the basics of spectral graph theory, including Expander graphs, to the multidisciplinary audiences.

## Objectives

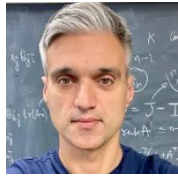
The goals of this course are:

- describe the main tools and methods used in spectral graph theory.
- describe some of the most important results in spectral graph theory from bottom up.
- present recent results involving spectral graph theory.
- state open problems in spectral graph theory.

By the end of the course, a motivated student will have a good understanding of some of the results in this area of research.

<b>Modules</b>	<b>Dates: 27-10-2025 to 31-10-2025</b> <b>Number of participants for the course will be limited to fifty.</b>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"><li>• <b>Ph.D. scholars</b> from Mathematics or Computer Science departments with research interests in combinatorics, graph theory, linear algebra, or spectral graph theory.</li><li>• <b>Master's students</b> (M.Sc./M.Tech. or equivalent, second year) with a strong background and interest in graph theory and linear algebra are encouraged to apply.</li><li>• <b>Faculty members and postdoctoral researchers</b> with relevant interests are also welcome to participate.</li></ul>
<b>Fees</b>	The participation fees for taking the course is as follows: <b>Participants from abroad: US \$500</b> <b>Industry/ Research Organizations: INR 30000</b> <b>Academic Institutions: INR 10,000</b> <b>Students: INR 1,000</b> The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis. <b>Note:</b> <u>There is no central registration on the GIAN portal (<a href="http://gian.iith.ac.in">gian.iith.ac.in</a>); registration will be managed directly by the hosting institute. Please do not pay the registration directly. Registration link is : <a href="https://forms.gle/1P1i44TE2SzCtLJB8">https://forms.gle/1P1i44TE2SzCtLJB8</a></u>

## The Faculty



**Prof. Sebastian Cioaba** is a Professor in the Department of Mathematical Sciences at University of Delaware. His research interests are spectral graph theory, algebraic combinatorics and their connections and applications to other areas of mathematics and science.



**Dr. M. Rajesh Kannan** is an Assistant Professor in the Department of Mathematics at the Indian Institute of Technology Hyderabad. His research interests include combinatorics, spectral graph theory, and matrix theory.

## Course Co-ordinator

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