AMERICAN UNIVERSITY OF BEIRUT

CENTER FOR ADVANCED MATHEMATICAL SCIENCES

STARS
AN INTRODUCTION TO THEIR STRUCTURE AND EVOLUTION

SEPTEMBER 22, 24 AND 29, 2025

COLLEGE HALL, AUDITORIUM B1

MINI COURSE

SPEAKERS

Seshadri Sridhar
Inter-University Centre for Astronomy and Astrophysics, Pune, India

Nishant K. Singh
Inter-University Centre for Astronomy and Astrophysics, Pune, India

ABSTRACT

Stars are born from the gravitational collapse of clouds of gas and dust. Most of them shine steadily over timescales of millions to billions of years. At the end of this long-lived, quiescent period, they begin changing in size, color, and luminosity, resulting in outflows and explosions and leaving behind compact remnants such as white dwarfs, neutron stars, and black holes. This short course will provide an introduction to the physics of stellar structure and evolution, including a session on numerical model building using the MESA code.

LECTURES

STELLAR STRUCTURE
SEPTEMBER 22
3:00 PM (Beirut time)

STELLAR EVOLUTION
SEPTEMBER 24
3:00 PM (Beirut time)

NUMERICAL MODELING OF STARS
SEPTEMBER 29
3:00 PM (Beirut time)

BIOGRAPHY

Seshadri Sridhar has worked mainly in astrophysical turbulence and the gravitational dynamics of stars in galaxies. The Goldreich–Sridhar theory of magnetohydrodynamic turbulence is used widely to understand phenomena in systems as diverse as the solar system, galaxies, and clusters of galaxies. His contributions in galactic dynamics include: Recognition of the greater regularity of stellar orbits determining the structure of star clusters orbiting supermassive black holes, and the formulation of the kinetic theory of these systems; Demonstration that dynamical friction on globular clusters in the cores of dwarf galaxies is highly suppressed with respect to the Chandrasekhar formula, thereby resolving a long-standing paradox; Proposing a theory of “scars” in disk galaxies and elaborating their role in promoting transient and recurrent spiral structure. His current research is on turbulent convection, toward exploring the convective zones of stars and planets. He was a Professor at the Raman Research Institute (Bangalore, India), and is a Visiting Professor at the Inter-University Centre for Astronomy and Astrophysics (Pune, India).

Nishant K. Singh works in the area of astrophysical fluid dynamics, focusing currently on solar physics and turbulent dynamos. Sunspots are the footpoints of flares and coronal mass ejections that cause disturbances in the interplanetary medium. By analyzing helioseismological data, he demonstrated that the growth of the solar surface gravity mode precedes the emergence of sunspots, so the solar surface gravity mode could be used as a precursor to predict space weather. His research on the mechanism of sunspot formation challenges the standard paradigm, while he continues to work on the origins of solar magnetism. Solar convection is another area of interest, especially in light of recent observations indicating problems with the standard mixing-length theory of convection. He is an Associate Professor at the Inter-University Centre for Astronomy and Astrophysics (Pune, India).

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