Topic: Stellar structure and evolution
Lecturer: Dshazrene Mohammed

Description:
This course gives an overview of the essential physics related to stellar structure and evolution. We will study the structure of stars and the basic equations necessary to model their interiors, together with the relevant microphysics, e.g., the equation of state, opacity, nuclear reactions and energy transport. We will examine how stars of different masses evolve as well as the stellar remnants that result at the endpoints of their evolution (white dwarfs, black holes and neutron stars). Throughout the course we will discuss current research hot topics, as well as highlight some of the cutting-edge tools being used to investigate them.

Syllabus:

Lecture 1: Observed properties of stars
- Review of the basics and motivation - why study stars?
- Stellar classification
- The Hertzsprung-Russell diagram

Lecture 2: Stellar interiors (1)
- Equations of stellar structure
- Energy generation in stars
- Energy transport in stars
- Dynamical, thermal, nuclear timescales

Lecture 3: Stellar interiors (2)
- Equation of state
- Mean molecular weight
- Opacity
- Simple polytropic models

Lecture 4: Stellar evolution (1)
- Star formation
- Pre-main sequence evolution
- The Sun and the stellar main-sequence

Lecture 5: Stellar evolution (2)
- Post-main sequence evolution: low/intermediate mass stars
- Post-main sequence evolution: high mass stars
- Stellar remnants: white dwarfs, neutron stars and black holes

Lecture 6: Hot topics
- Binary/multiple star systems
- Gravitational wave sources

- Stellar transients

Requirements: Video projector in the class room, computer stations/laptops

Bibliography:

- An Introduction to Modern Astrophysics, B.W. Carroll & D. A. Ostlie
- An Introduction to the Theory of Stellar Structure and Evolution, D. Prialnik