

First Course Handout
(2024-25 Odd Semester)
Space, Planetary & Astronomical Sciences and Engineering
SPA616: Stars & Stellar Evolution

1. Instructor(s): Rohit Sharma (rsharma@iitk.ac.in, Ph. 2515)
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2. Lectures: Wednesday & Friday, 17:00-18:30 IST hours
Venue: T205

3. Objective:

Stars and their evolution forms an important ingredient in most astronomical contexts. This course introduces students to (a) the basic principles and equations governing stellar structures and evolution of different types of stars; hydrostatic equilibrium; and nuclear fusion, (b) Various observations (spectral) and the Hertzsprung-Russell diagram, (c) End products of the evolution; supernova explosion; compact stars like white dwarfs, neutron stars and black holes; and binary systems.

4. Course Evaluation:

Evaluation Type	Percentage Weightage
Quizzes / Presentations	15%
Assignments	35%
Mid-Semester Exam	25%
End-Semester Exam	25%
Total	100%

5. Course Contents:

S. No.	Topics
1	Introduction to Stars, Coordinates, Astronomical Scales
2	Observations Measurables - Luminosity Magnitude, Color Index
3	Observational Instruments & Techniques - Photometry
4	Blackbody Radiation, Stellar Spectra, Saha Equation
7	Hertzsprung-Russell diagram, Clusters of Stars
8	Stellar Structure
9	Stellar Nuclear Reactions

10	Standard Solar Model
11	Star Formation
12	Pre-main sequence / main sequence / Hayashi Track / Post-main sequence
13	Explosive Phenomenon - Supernova
14	Compact Stars & Binaries - White Dwarfs/neutron stars / Black holes

6. Course Policy

- Quizzes will not be announced apriori.

7. Books and References

- Carrol, B. W. & Ostlie, D. A., An Introduction to Modern Astrophysics
- Abhyanker K. D., Astrophysics - Stars and Galaxies
- The Fundamentals of Stellar Astrophysics, Collins, G. W. II