In addition to part I (General handout for all courses appended to the timetable) this portion gives further details regarding the course.

Course No. : PHY F215
Course Title : Introduction to Astronomy & Astrophysics
Instructor In-Charge : KAUSHAR VAIDYA

Scope and Objective of the course:

This course will introduce a student to the field of Stellar Astrophysics, mainly. The course will begin with an introduction of some observational astronomy concepts. It will then cover various tools of observational astronomy, such as telescopes, detectors, and touch upon the techniques used in multi-wavelength astronomy, ranging from X-ray to Radio wavelengths. Students will then be exposed to the necessary concepts in radiative transfer in Astrophysics, which will enable them to interpret the signals received at the telescopes in the form of electromagnetic waves, Stellar astrophysics comprises of stellar atmospheres (or outer layers of stars) and stellar interiors (or inner layers of stars). We will first learn about stellar atmospheres by making use of stellar spectra. We will then learn about stellar interiors, and build a theory of stellar structure. This theory, in addition to establishing stability of stars, will rely on the energy generation mechanism inside stars, as well as the energy transport mechanisms inside stars. After stellar structure, we will learn about stellar evolution, reaching the end states of stars, that is, white dwarfs, neutron stars, and black holes. If time permits, a brief introduction to Newtonian Cosmology will be covered.

Textbook: "An Introduction to Modern Astrophysics" by Bradley Carroll & Dale Ostlie, Second Edition, Pearson (Addison Wesley), 2007
Reference Books: "The Physical Universe" by Frank Shu, University Science Books, 1982
"Astrophysics For Physicists by Arnab Rai Choudhuri, Cambridge University Press, 2010

Course Plan:

Lecture No.	Learning Objectives	Topics to be covered	Reference Section
1-2	Introduction; Some Astronomy Definitions	Introduction, Celestial Sphere, Coordinate Systems, Magnitude Scale, Parallax, Color Index	Ch.1 (S 1.3); Ch. 3 (S 3.1, 3.2, 3.6)
3-4	Telescopes	Basic Optics, Optical Telescopes, Radio Telescopes, Infrared, Ultraviolet, X-ray, and Gamma-Ray Astronomy	Ch. 6
5-8	The Classification of Stellar Spectra	Formation of Spectral Lines, H-R Diagram	Ch.8
9-12	Stellar Atmospheres	Description of Radiation Field, Stellar Opacity, Radiative Transfer, Transfer Equation	Ch.9

13-18	Interiors of Stars	Hydrostatic Equilibrium, Pressure Equation of State, Stellar Energy Sources, Energy Transport, Main Sequence	Ch. 10
19-22	Main-Sequence and Post-Main-Sequence Evolution	Evolution on the Main Sequence, Late Stages of Stellar Evolution, Stellar Clusters	Ch. 13
23-26	Fate of Massive Stars	Post-Main-Sequence Evolution of Massive Stars, Classification of Supernovae, Gamma Ray Bursts, Cosmic Rays	Ch. 15
27-29	Degenerate Remnant Stars	White Dwarfs, Chandrasekhar Limit, Neutron Stars, Pulsars	Ch. 16
30-33	Black Holes	GTR, Black holes	Ch. 17
34-40	Cosmology and Early Universe	Newtonian Cosmology, CMBR, Relativistic Cosmology, Observational Cosmology, The Very Early Universe	Some topics from Ch. 29, 30

Evaluation Scheme:

EC No.	Component	Duration	Weightage	Date, Time & Venue	Remarks
1.	Mid-Sem Test	90 min	27	17/3 2:00 -3:30 PM	Closed/Open Book
2.	Quiz	TBA	13	TBA	Closed Book
3.	Assignments	TBA	10	TBA	Open Book
4.	Tutorial Tests	TBA	10	TBA	Closed Book
5.	Comprehensive Exam	TBA	40	4/5 FN	Closed/Open Book

Chamber Consultation Hour: To be announced in class.
Notices: Notices will be displayed only on **Physics** notice board and uploaded on Nalanda.

Make-up Policy: To genuine cases only, for either sickness leading to hospitalization or out of station with prior intimation & permission.

Instructor-in-Charge, PHY F215