Birla Institute of Technology & Science, Pilani
Hyderabad Campus

Summer Term 2022
Course Handout Part II

Date: 28.5.2022

Course No. : **PHY F215**
Course Title : **INTRODUCTION TO ASTRONOMY & ASTROPHYSICS**
Instructor in Charge : **Sarmistha Banik**

Objectives & Scope of the Course:

The course aims to give Physics/non-Physics major students an elementary introduction and overview of Astronomy & Astrophysics. This is for students who were always curious about the sky out there but never had a chance to know it deeper. And of course, for students who want to pursue their career in Astro. The course covers a broad spectrum of topics, from the era of Kepler to recent observation of gravitational waves, using basic principles of physics, keeping rigorous mathematics to minimum. We plan to have some hands-on session with telescope.

Text Book: Fundamental Astronomy: Karttunen, H., Kröger, P., Oja, H., Poutanen, M., Donner, K.J

Detailed Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1to 5	**Basic Concept of Astronomy**	Celestial coordinates, Constellations, Telescopes, Magnitude scale, Optical Thickness, Hertzsprung--Russell Diagram.	TB 2-4,8
6-10	**Radiation Mechanism & Stellar Spectra**	Radiation of Atoms and Molecules, Brightness and Flux Density, Photometric concepts, Polarization, Blackbody Radiation, The Rayleigh–Jeans Approximation, Planck Radiation Law, Temperature, Cosmic microwave radiation, Radiative Transfer(Absorption, Emission Reflection from an Opaque Body), Radiation from an Accelerated Charge.	TB-5, class notes
11 to 15	**Celestial Mechanics**	Equations of Solution of the Equation of Motion Equation of the Orbit and Kepler's First Law Orbital Elements Kepler's Second and Third Law Systems of Several Bodies, Orbit Determination, Position in the Orbit, Escape Velocity, Virial Theorem, The Jeans Limit	TB 6, class notes
16 to 22	**Solar System**	An overview of solar system, planets, minor bodies of solar system, Energy sources of the sun, Internal Structure,The Atmosphere, Solar Activity	TB 7, 12, class notes
23-24	**Binary stars, Variable Stars**	Visual Binaries, Astrometric Binary Stars, Spectroscopic Binaries, Photometric Binary Stars	TB 9, 13
25-26	**Stellar Evolution**	Evolutionary Time Scales, The Main Sequence Phase, The Giant Phase, The Final Stages of Evolution, Origin of the Elements	TB 11, class notes
27 to	**Compact Stars**	Degenerate Fermi Gas, Equation of state, TOV equation.	TB 14,

38		Newtonian Stars: Hydrostatic equilibrium, equation of state. White dwarf: Electron degeneracy pressure, Chandrasekhar mass limit Neutron star: composition, radius, maximum mass, magnetic field Pulsars: Discovery, rotation period, energy loss from a pulsar, magnetic field strength, ages of pulsars, Braking index, Pulsars and the Interstellar Medium, Pulsar Timing Black holes: Creation of black holes, black hole binaries, observational evidence Gravitational waves, mergers of NS-NS.	class notes
39 to 42	**Project Presentation**	Topics to be given during course work	

5. Evaluation Scheme:

	Evaluation	Duration	Weight age (%)	Date, Time	Nature of Component
1.	Mid-Sem	90 mins.	30.00%	24/06 3.30 - 5.00PM	Closed Book
3.	Quiz	50 minutes	10.00%		Open Book
4	Observation Project/Seminar	NA	20.00%		Open Book
5	Comprehensive Examination	180 mins.	40.00%	23/07 FN	Closed Book

6. Chamber Consultation Hour: TBA

7. Notices: Notices for the course will be displayed on CMS.

8. Make-up Policy: Make up for Mid-Sem and Compre will be given to emergency (hospitalization) case only, if forwarded by chief warden. Make up requests should reach the IC before the examination.

9. Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
PHY F215