



**SECOND SEMESTER 2019-2020**  
**Course Handout Part II**

**Date: 6.1.2020**

**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 spectra 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

**Reference Book:** An Introduction to Modern Cosmology by Andrew Liddle

**Detailed Course Plan:**

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1	<b>Scope of the Course</b>	Brief historical timeline of astronomy and discussion on the course.	Class notes
2 to 5	<b>Basic Concept of Astronomy</b>	Celestial coordinates, Constellations, Telescopes, Photometric concepts (Intensity, radiation, luminosity), Magnitude scale, Optical Thickness.	TB 2-4
6-10	<b>Radiation Mechanism &amp; Stellar Spectra</b>	Radiation of Atoms and Molecules, Blackbody Radiation, Temperatures, Radiative Transfer, Stellar Spectra, The Hertzsprung--Russell Diagram ,Model Atmospheres,What Do the Observations Tell Us?	TB-5 &8
11 to 15	<b>Celestial Mechanics</b>	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	<b>Solar System</b>	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	<b>Binary stars, Variable Stars</b>	Visual Binaries, Astrometric Binary Stars, Spectroscopic Binaries, Photometric Binary Stars	TB 9, 13
25-27	<b>Stellar Evolution</b>	Evolutionary Time Scales, The Contraction of Stars Towards the Main Sequence. The Main Sequence Phase. The Giant Phase, The Final Stages of Evolution, The Evolution of Close Binary Stars, Comparison with Observations, The Origin of the Elements	TB 11, class notes

<b>28 to 35</b>	<b>Compact Stars</b>	Degenerate Fermi Gas, Equation of state, TOV equation. Newtonian Stars: Hydrostatic equilibrium, equation of state. White dwarf: Electron degeneracy pressure, Chandrasekhar mass limit Neutron star: composition, radius, maximum mass Pulsars: Discovery, rotation period, energy loss from a pulsar, magnetic field strength, ages of pulsars, mergers of NS-NS. Black holes: Creation of black holes, black hole binaries, observational evidence, Gravitational waves	TB 14, class notes
<b>36-38</b>	<b>The Interstellar Medium</b>	Interstellar Dust, Interstellar Gas, Interstellar Molecules, The Formation of Protostars, Planetary Nebulae, Supernova Remnants, The Hot Corona of the Milky Way, Cosmic Rays and the Interstellar Magnetic Field.	TB15
<b>39 to 42</b>	<b>Galaxies</b>	Our Galaxy ( Milky Way), Classification of Galaxies Distribution of Galaxies: Luminosity and mass, Spectra of Galaxies, Local Group of Galaxies, Cluster of Galaxies, Radio Galaxies, AGN, Quasars.	TB 17, 18, lecture notes

#### 5. Evaluation Scheme:

	<b>Evaluation</b>	<b>Duration</b>	<b>Weight age (%)</b>	<b>Date, Time</b>	<b>Nature of Component</b>
1.	Mid-Sem	90 mins.	30.00%	7/3 11.00 -12.30 PM	Open Book
3.	Quiz(BEST 2 out of 3)	25 mins each	20.00%		Closed Book
4	Observation Project/Seminar	10 mins. each	10.00%		Open Book
5	Comprehensive Examination	180 mins.	40.00%	14/05 AN	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 only against the application forwarded by chief warden. No make up requests after completion of examination will be entertained.

**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**  
**PHY F215**