ST. XAVIER'S COLLEGE (AUTONOMOUS), AHMEDABAD-9
FACULTY OF SCIENCE

DEPARTMENT OF PHYSICS & ELECTRONICS

SEMESTER – III

SYLLABUS

OF

BSc PHYSICS (HONOURS)

BASED ON UNDERGRADUATE CURRICULUM FRAMEWORK
(NEP – 2020)

(Effective from Academic Year 2023)

Curriculum Framework for Semester – III

Course	Title	Content		Credit
DSC-5 (Theory)	PHMC331C Solid State Physics and Classical Mechanics	U1	Inter atomic forces & bonding, Crystal Physics	4
		U2	Solid State Physics: Lattice Vibrations Thermal properties	
		U3	Lagrangian Formulation	
		U4	Classical Mechanics, Moving Coordinate System.	
DSC-6 (Theory)	PHMC332C Optics and Instrumentation	U1	Diffraction and Resolving power	4
		U2	Polarization	
		U3	Laser	
		U4	Instruments and Transducers	
DSC-7 (Laboratory)	PHMC333L Physics and Experiential Lab-III	14 Physics Experiments		4
		1 Hands on experiment.		
		14 experiments as mentioned in syllabus		
SEC	PHSE331C Physics Analysis using Python	U1	Introduction to Python Programming.	2
		U2	Python Laboratory	
MDC	MDC206C Astronomy for Beginners	U1	Intr. to Astronomy and Observations in Astronomy	4
		U2	Principles and Tools for Observations in Astronomy	
		U3	Celestial Objects and Their Nature	
		U4	Field Trip/Project/Stargazing	
AEC	Ability Enhancement Course	(To be offered by the concerned subject Department)		2
VAC	Value Added Course	(To be chosen from a basket of courses)		2
Total Credits				**22**

* DSC: Discipline Specific Core

St. Xavier's College (Autonomous), Ahmedabad

Syllabus of Semester–III to be implemented from the Academic Year **2025-26.**

DEPARTMENT OF PHYSICS & ELECTRONICS

MDC Course: Physics Astronomy for Beginners

Course Code & Title	Credit Distribution of The Course				Eligibility Criteria	Prerequisite(s) of the Course (if any)
	Cr	Lecture hrs	Laboratory hrs	Activity/Case study analysis		
MDC206C: Astronomy for Beginners	4	15x3	14x2		10 + 2 from a recognized board	Science Stream

Learning Objectives(LO):

LO1	Gain historical perspective from ancient to modern astronomy, including key figures and their contributions.
LO2	Understand the structure and composition of the Solar System, including planets, moons, asteroids, comets, and exoplanets.
LO3	Explain the formation of seasons, phases of the Moon, and the causes of eclipses using scientific principles.
LO4	Become familiar with different astronomical instruments, such as telescopes, and the basics of data analysis related to astronomy.
LO5	Grasp the Sun's structure, solar cycle, and space weather impact.
LO6	Comprehend the universe's scale, star properties, and classifications.
LO7	Explore basic star structure, variability, and formation fundamentals.
LO8	Participate in sky gazing, field trips, and practical projects to gain hands-on experience observing and analyzing celestial objects.

Course Outcomes (CO)

CO1	Explain the historical development of astronomy, identifying major contributions by historical figures like Galileo and Copernicus.
CO2	Describe the makeup of the Solar System, differentiating between planets, moons, and other celestial objects, and discussing the existence of exoplanets outside our system.
CO3	Use their understanding of astronomy to explain Earthly phenomena like seasons, tides, and eclipses, drawing connections between celestial bodies and their impacts.
CO4	To explain the functions of various astronomical instruments, understand the principles of spectroscopy, and demonstrate basic data visualization techniques relevant to astronomical observations.
CO5	Attain a comprehensive understanding of the Sun's composition and behavior, facilitating space weather prediction.
CO6	Interpret star properties using the H-R diagram, gaining perspective on universal scale and diversity.
CO7	Practical experience through observing the night sky, using telescopes, and analyzing astronomical data, enhancing their understanding of the methods and applications of astronomy.

Unit 1: Introduction to Astronomy and Observations in Astronomy

Credit of Course: 1 Cr **Lecture 12 Hrs** **Tutorial 3Hrs**

[A] The history of astronomy from ancient astronomy to modern astronomy (Pythagoras, Aristotle, Eratosthenes, Hipparchus, Ptolemy Copernicus and Galileo).

[B] Solar system: Kepler's laws of planetary motion and Newton's gravitation law. Planets in our solar system, their moons. Asteroids and comets: debris of the solar system. Other solar systems and exoplanets.

[C] Seasons on Earth. Calendar: day (solar and sidereal), month, year. Moon; its phases; ocean tides. Lunar and Solar eclipses.

Text Book:
[A] OpenStax Astronomy, (2nd edition) Chapters 1 – 4, 13.

Unit 2: Principles and Tools for Observations in Astronomy

Credit of Course: 1 Cr **Lecture 12 Hrs** **Tutorial 3Hrs**

[A] Electromagnetic radiation and spectrum. Astronomical Instruments: optical telescopes (reflecting and refracting); Detectors and instruments; Components of spectroscopy; Radio telescopes. A few large optical and radio telescopes.

Text Book:
[A] OpenStax Astronomy, (2nd edition) Chapters 5 – 6.

Unit 3: Celestial Objects and Their Nature

Credit of Course: 1 Cr **Lecture 12 Hrs** **Tutorial 3Hrs**

The Sun: Structure and composition of Sun, Solar cycle, Sun and space weather, Sources of sunshine, nuclear fusion and fission.

Stars: Overall Structure, size scale of the Universe, properties and classifications (H-R diagram). Basic Structure, multiple star systems and Variability of the stars, Interstellar medium: dust, gas, and nebula, Basics of formation and evolution of stars.

Text Book:
[A] OpenStax Astronomy, (2nd edition) Chapters 15–20.

Unit 4: Astronomical Techniques and Tools (28 hours)

- Sky gazing
- Field trips and/or projects
- Observing the night sky: naked-eye observations
- Observing the night sky: with telescopes
- Introduction to astronomical data analysis (plotting & visualization of the data)

Essential / Recommended Readings:

- Astronomy 2e: https://openstax.org/details/books/astronomy-2e.
- Introduction to Astronomy and Cosmology by Ian Morison, A John Wiley and Sons, Ltd., Publication.
- Astronomy by Franknoi, Morrison & Wolff.

Suggestive Readings:

- Introductory Astronomy & Astrophysics, Michael Zeilik, Stephen A. Gregory, Brooks/Cole (Thomson Learning).
- Lecture-Tutorials for Introductory Astronomy (LT) by Prather, Slater, Adams & Brissenden, 3rd Edition.
- Frank Shu, The Physical Universe, Latest Edition, University Science Books.
- Sparke and Gallaghar, Galaxies in the Universe: An Introduction, Latest Edition, Cambridge University Press.
- Dina Prialnik: An Introduction to the Theory of Stellar Structure and Evolution, Latest Edition, Cambridge University Press.
- 1st Century Astronomy by Kay, Palen, Smith, and Blumenthal.