SEMESTER 5

SPACE SCIENCE & SPACE ENVIRONMENT

Course Code	PEAOT528	CIE Marks	40
Teaching Hours/Week (L:T:P: R)	3:1:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	Nil	Course Type	Theory

Course Objectives:

1. Demonstrate a comprehensive understanding of the fundamental principles of space science, including astronomy, astrophysics, and planetary science.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Introduction to Astronomy:** Introduction —Coordinate Systems – Time - Observable quantities - Stellar Parameters –Brightness, Luminosity - Magnitude Scale - Colour - Black Body Temperature - Size.- Distances - Spectrum - Spectral Lines - Formation of Spectral Lines - Saha's Equation—Spectral Classification—H R Diagram— Binary stars and Stellar Masses and Sizes, Solar radiation and its safety precaution for astronauts as well as electronic components.	8
2	**Solar System Objects and their Exploration :** Planets ,satellites of the planets and their orbits - Structure and topography of planets and their satellites - Physical and chemical characteristics- Space imagery of planets and their environment - Comets, asteroids and other minor bodied in the solar system - Their orbits, surface and composition - Comet and asteroid collisions	8
3	**Introduction to earth:** Elements of earth's magnetic field, difference between geographic and geomagnetic coordinates, barometric altitude formula. The terrestrial upper atmosphere: Diffusion, molecular diffusion, eddy diffusion, diffusive equilibrium, maximum diffusion velocities, thermal structure, thermosphere, exosphere. Ionosphere; solar radiation	9

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	and production of ionization, Ionization profile, Ion composition and chemistry.	
4	**Space weather :** Interaction of the solar wind with the terrestrial magnetic field, the bow shock and the magnetopause, Themagnetospheric cavity, magnetospheric current systems, The ring current, field-aligned currents, Plasma convection in the magnetosphere-models, Magnetic diffusion and magnetic reconnection, Convection electric field and high-latitude electrodynamics, Ionospheric convection velocities, aurorae, space weather, magnetic activity and substorms, magnetic storms, geomagnetic activity indices, importance and applications of space weather.	**10**

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

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End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks (8x3 =24 marks)	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 subdivisions. (4x9 = 36 marks)	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the basic physics of astronomy.	**K2**
CO2	Discuss the concepts of solar systems and satellites	**K2**
CO3	Interpret the earth's atmospheric basics.	**K2**
CO4	Summarize the weather conditions and its applications	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	2	-	-	-	-	2
CO2	3	-	-	-	-	-	-	-	-	-	-	2
CO3	3	-	-	-	-	-	1	-	-	-	-	2
CO4	3	-	-	-	-	-	1	-	-	-	-	2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

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Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Physics of the Space Environment	Gombosi, T. I.	Cambridge University Press	1998
2	Space Weather: Physics and Effects	Ioannis A. Daglis and Volker Bothmer	Springer	2007
3	Understanding Space Weather and the PhysicsBehind It	Delores J. Knipp	McGraw-Hill	2004

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Space Physics, An Introduction to Plasmas and Particles in the Heliosphere and Magnetospheres	Kellenrode, M-B	Springer	2000
2	Space Mission Engineering: The New SMAD	James R. Wertz, David F. Everett, Jeffery J. Puschell	Microcosm Press	2015

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/101/101/101101079/
2	https://nptel.ac.in/courses/115107121
3	https://nptel.ac.in/courses/115107121
4	https://nptel.ac.in/courses/115107121

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