PHY 310 1.0 – Space Physics I

Lecturer in Charge **:** Dr. M. M. P. Madhuranga Fernando

Objectives of the Course Unit:

This unit attempts to enhance the knowledge of students with the Space Physics.

Field of Study

This course is an introduction to the fields of Solar and Space Physics. The domain of Space Physics is from Earth's upper atmosphere to the solar photosphere to the outer boundaries of our solar system where the solar wind encounters the local interstellar medium. Space Physics is sometimes defined as "astrophysics of our solar system", overlapping with solar physics in the study of the Sun.

This course should be of particular interest to people wanting to learn more about our solar system and near-Earth space environment, astrophysics, plasma physics, atmospheric physics, and solar-terrestrial interactions.

Philosophy and Motivations

Space physics and solar physics are active research fields. As such there are many phenomena which remain unexplained and theoretical problems which remain unsolved. Some of these will be described and/or posed to you.

Aims and Objectives of the course unit :

The course unit aims to familiarize the students with the fundamental aspects of Space Physics through a series of lectures, solving problems as well as discussions. It further aims to develop the theoretical knowledge of the Earth's Atmosphere, the Sun and what are the steps to do Radio Wave Communications using the fundamental knowledge of Space Physics.

Learning Outcomes

On completion of the course unit students will be able to,

1. Describe Planetary Atmospheres in our Solar System.
2. Describe Earth's Atmosphere with atmospheric parameters such as Pressure, Number Density, Air Density, Mean Molecular Distance, Mean Molecular Weight, Temperature Distribution and Gravity Variations
3. Describe The Ionosphere, the Plasma-sphere and plasma frequency of the ionosphere.
4. Describe the Earth's Magnetic Field.
5. Explain & derive an equation for the Earth's Magnetic Field.
6. Describe The Active Sun.
7. Identify the regions of the Sun.
8. Describe how to do Radio Wave Communication using the space physics knowledge.

Recommended readings:

* Space Physics and Space Astronomy – Michael D. Papagiannis
* Space Physics - May-Britt Kallenrode
* Radio Emission of the Sun and Planets – V. V. Zheleznyakov
* Horizons - Exploring the Universe – Michael A. Seeds
* Introduction to Astronomy – Cecilia Payne - Gaposchkin
* Foundations of Astronomy – W. M. Smart
* Answer Book of Astronomy – Iain Nicolson
* Sun, Solar Cycle, Ionosphere, Absorption cross section, Maxwell's equations, Atmospheric dispersion modeling, Wave plate – Wikipedia (Internet)
* Solar Radiation - Encyclopedia of Earth (Internet)
* Ultraviolet - Wikipedia (Internet)
* Sunspot Numbers - IPS - Solar Conditions (Monthly Sunspot Numbers) (Internet)
* Solar Physics – NASA - Marshall Solar Physics (Internet)
* Interplanetary Ionization by Solar Extreme Ultraviolet Radiation, Hinteregger, H. E., Astrophysical Journal, vol. 132, p.801
* Ionospheric Physics of Radio Wave Propagation - Edwin C. Jones (Internet)

Method of teaching/learning for the course unit

1. Lectures
2. Tutorial classes
3. Self studies / written assignment on the given topics

4. Discussion classes

Method of evaluation

End of the semester examination	- (100%)

OR

Continuous Assignments	- (40%)
End of the semester examination	- (60%)

OR

Mid Semester Examination	- (20%)
End of the semester examination	- (80%)

OR

Attendance	- (40%)
End of the semester examination	- (60%)