OGI752 FUNDAMENTALS OF PLANETARY REMOTE SENSING

DETAILED SYLLABUS

OBJECTIVES:

- To provide an insight to the basics of planetary Remote Sensing
- To demonstrate how the Remote Sensing technique is applied to explore the surface characteristics of the planets and its environ.

UNIT I PLANETARY SCIENCE

History and inventory of solar system – planet-definition –properties – Formation of solar system. Planetary Atmospheres: composition - thermal structure – clouds – meteorology – photo chemistry – Eddy Diffusion. Surfaces and Interiors: Mineralogy and Petrology – Planetary interiors – surface morphology. Terrestrial planets and the Moon: The moon & Mercury – surface – Atmosphere – Interior – Magnetic Field.

UNIT II SATELLITE ORBIT

Equation of 2 body motion: Energy, orbits and energy – Circular Orbits-EOS TerraGeosynchronous satellite orbit- orbital elements. Launching Satellites and space probes – Retrograde orbits-Inter planetary Transfer – Hohmann Transfer – Gravity Assist-CassiniMessenger. Breaking into orbit or landing- Retro Rockets-Aerobraking- Parachutes-Impact.

UNIT III PROPERTIES OF EMR

Definition of Remote Sensing – Electro Magnetic Radiation: Electromagnetic SpectrumDevelopment of EM theory – White Light – Excited hydrogen gas – Quantum physics – Definition. EM Radiation: Properties – Radiant energy – Sun's luminosity calculation. Other Energy: Black body radiation – Plank curve of black body. Properties of EMR: Kinetic energy – Polarization, laws of Max Plank, Wien's and Stephen Boltzmann

UNIT IV RADIOMETRY AND SCATTEROMETRY

Radiometry – Radar Altimetry – Effect of surface roughness – Altimetry derived data – Reflectivity – Radiometry and Derived emissivity – Incorporation of data set into image analysis – Introduction to SAR – convolution – bidirectional reflectance distribution – Microwave scatterometry - side looking RADAR, SAR – Interferometry.

UNITV PLANETARY APPLICATION

Planetary Imaging Spectroscopy- USGS Tetracoder and Expert system - Mars Global Surveyor Mission (MGS) – Digital Elevation Model (DEM) of Mars – Mars Orbiter Camera (MOC) – Stereo and photoclinometric techniques for DEM.

OUTCOMES:

On completion of the course, the students have

- Exposure to fundamentals of planetary science or orbital mechanics
- The principles of observing the planets
- Knowledge of Remote Sensing methods for determining surface elevation and mapping of planets.

REFERENCES:

1. Fundamental Planetary Science: Physics, Chemistry and Habitability, Jack J. Lissauer, Imke de Pater (2013) Cambridge University Press

2. Physical principles of Remote Sensing, Rees, W.G. (2013) 3rd Edn, Cambridge University Press

3. Radar Remote Sensing of Planetary Surfaces, Bruce A Campbell (2011) Cambridge University Press

4. Remote Sensing Application for Planetary Surfaces, Kumar Deepak (2014) Lambert Publication.