Progress Seminar

Seminar Title	: Performance Analysis of LEO Satellite-based Non-Terrestrial Networks
Speaker	: Anuradha Verma (Rollno : 519ec1026)
Supervisor	: Dr. Pankaj Kumar Sharma
Venue	: EC-303, Seminar Room, EC Department
Date and Time	: 02 Apr 2024 (05:30 PM)
Abstract	: The next generation of wireless networks aims to provide diverse services and seamless coverage to rural and remote areas by leveraging both satellite and terrestrial networks. Integrated satellite-terrestrial network architecture holds the potential to deliver global broadband access to meet increasing traffic demands. Space-air-ground integrated networks (SAGINs) incorporating low earth orbit (LEO) satellites have gained tremendous attention for achieving sixth-generation (6G) objectives like low propagation delay and low-power communications. However, direct satellite-to-ground (S2G) transmission faces challenges such as the masking effect caused by atmospheric conditions and physical obstructions, leading to signal disruptions. Aerial relays such as UAVs, low altitude platforms (LAPs), and high altitude platforms (HAPs) are expected to enhance S2G communications, but their service duration is constrained by onboard battery capacity. Simultaneous wireless information and power transfer (SWIPT) technology can partially recharge energy for UAVs&rsquo systems, extending their lifespan. It is anticipated that the aerial user population will experience a significant surge in the coming years as aerial networks become integrated into the Internet of Things (IoTs). This trend could potentially lead to a shortage of spectrum resources. A primary (licensed) S2G network can operate alongside a secondary (unlicensed) aerial-to-aerial (A2A) network within the same spectrum. Employing overlay spectrum sharing, the A2A network utilizes licensed spectrum allocated to the satellite network, aiding S2G communications. To maximize the potential of wireless power transfer (WPT) and spectrum sharing, an overlay SAGIN architecture featuring SWIPT-enabled integrated A2A networks is of interest. Further, for the longevity of its service time, the ATx is assumed to be outfitted with simultaneous wireless information and power transfer (SWIPT) as well as a solar energy harvesting subsystem. Here, the ATx can utilise the electrical energy harvested from the satellite&rsquos radio-frequency signal in the first hop, along with that stored in its fixed solar energy harvesting battery, to retransmit the combined satellite and A2A signals in the second hop. Considering the random locations for both the S2G and A2A receivers, we analyse the outage performance of both S2G and A2A networks. Herein, for the outage performance analysis of the A2A network, we consider both the perfect and imperfect interference cancellation scenarios at the A2A receiver. The theoretical analysis is corroborated by the simulations.