



Report on One Day Hands on Training Program on Antenna Design using HFSS

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| Event Type | : | Guest Lecture |
| Date / Duration | : | 24.06.2025 |
| Name of Coordinator(s): | | Dr.G.L.N.Murthy |
| Name of the resource Person: | | Dr.P.Rakesh Kumar |
| Target Audience | : | Teaching and Non-Teaching Faculty |
| Total no of Participants: | | 21 Nos. |
| Objective of the event: | | To educate the staff members about the steps involved in the design of antennas and to expose to HFSS working environment. |
| Outcome of event | : | By attending the hands-on training, the faculty can be able to get acquainted with HFSS working environment and handle lab sessions irrespective of field of expertise. Further teaching faculty who are interested to work in antenna domain can gain hands of expertise. |

Description / Report on Event:

The session has begun by introducing the need of the program by Dr.G.Srinivasulu , Head of the department. It was emphasized that each faculty need to be exposed to modern tools available for either carrying out research as well as assisting in the day to day lab work. It was pointed out that antenna design has a much potential to generate revenue through consultancy. It was mentioned that Learning antenna design is increasingly important in the current technological trend due to the rapid growth of wireless communication systems, IoT, 5G/6G networks, satellite communication, and radar applications. Antennas serve as the critical interface between electronic systems and the electromagnetic spectrum, directly impacting signal quality, range, and efficiency. With the rise of compact, high-speed devices, there is a demand for miniaturized, high-performance, and multi-band antennas. Emerging technologies like smart cities, autonomous vehicles, wearable electronics, and biomedical implants rely heavily on innovative antenna designs for reliable connectivity. Furthermore, the advancement of millimeter-wave and massive

MIMO systems in 5G/6G requires specialized antenna arrays and beamforming techniques. Proficiency in antenna design equips engineers to meet these evolving requirements, optimize performance, and adapt to diverse frequency bands. In an era driven by wireless innovation, antenna design skills are vital for research, product development, and competitive advantage in the global communication industry. HFSS (High Frequency Structure Simulator) is a 3D electromagnetic simulation software developed by Ansys. It is widely used for designing and analyzing high-frequency components like antennas, RF/microwave devices, and waveguides. HFSS employs the finite element method (FEM) to accurately model electromagnetic behavior, optimize designs, and predict performance before physical prototyping.

The members present were initially explained about micro strip patch antenna by Dr.P.Rakesh Kumar. A micro strip patch antenna is a low-profile, planar antenna widely used in modern wireless communication due to its light weight, ease of fabrication, and compatibility with printed circuit technology. It typically consists of a metallic patch placed over a dielectric substrate with a ground plane underneath. The patch shape can be rectangular, circular, or other geometries, with the rectangular patch being the most common due to simple design equations. The design begins with selecting the operating frequency and substrate material (e.g., FR4, Rogers RT/duroid), which influence antenna size and performance. Using the transmission line model, the effective dielectric constant and patch dimensions (length and width) are calculated to achieve resonance. The width is chosen to enhance bandwidth, while the length is slightly less than half the wavelength in the substrate to account for fringing effects. Feeding techniques such as micro strip line feed, coaxial probe feed, or aperture coupling are chosen based on application and ease of fabrication. A micro strip feed is simple and planar, while a coaxial probe offers better impedance matching.

Various steps in patch antenna design were explained step wise to the members present and hands on session was also conducted. By simply changing the shape of the patch different antennas for numerous applications can be designed.

Photos:



Dr.G.Srinivasulu, Head, Department of ECE giving introduction to the workshop



Dr.P.Rakesh Kumar, presenting the insights of antenna design



Staff member practicing the antenna design steps



Head of the Department