

**Workshop on
“COMSOL RF MODULE & 3D
PRINTING
Department of EC(ACT)”**

Report on Two-days Workshop on “COMSOL RF MODULE & 3D PRINTING”

The Department of Electronics and Communication (Advanced Communication Technology) successfully organized a two-day workshop on "COMSOL RF Module and 3D Printing" on March 5th and 6th, 2025, from 9:00 AM to 4:00 PM at the Robotics and Automation Lab. A total of 31 students from the 4th semester EC (ACT), 6th semester ECE, and MTech 3rd semester EC (ACT) actively participated in the workshop. The sessions were conducted by the resource persons namely Mr. Arithra Sen (RF Engineer) and Mr. Anudeep Vaggar (Manager) from Trident TechLabs Ltd., Bangalore.

05.03.2025: DAY 1 - Session 1 (09:30AM to 12:30PM):

Introduction to COMSOL RF Module

The first day's session was conducted by Mr. Arithra Sen, focusing on the COMSOL RF Module. He began with an overview of COMSOL Multiphysics, explaining its capabilities and key features of the RF Module. Participants were introduced to fundamental concepts such as electromagnetic wave propagation, waveguide simulations, antenna design, and optimization techniques. Under his guidance, students were engaged in hands-on practice, following step-by-step instructions to create their own RF simulations. They learned the initial setup, model solving, and result interpretation, gaining practical insights into RF simulations using COMSOL.

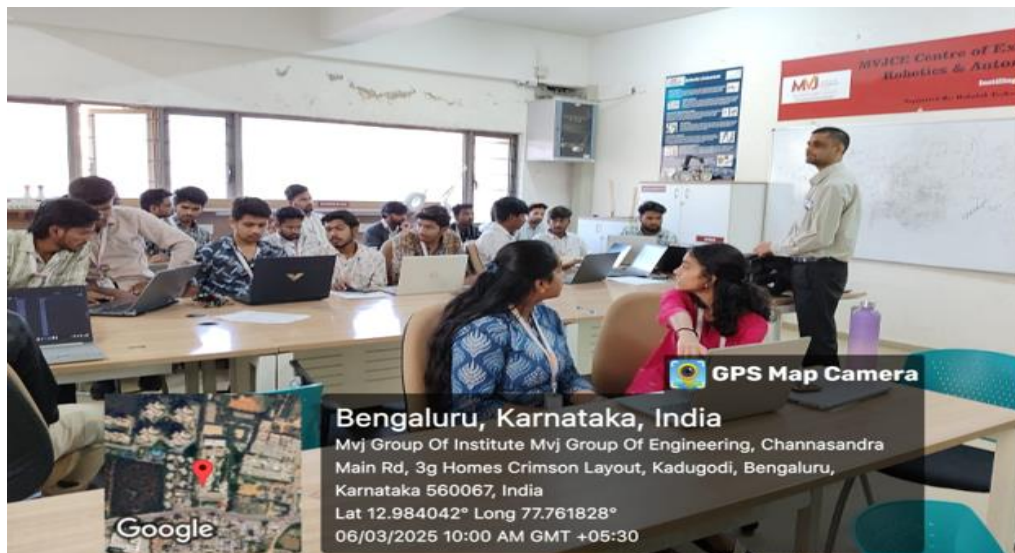


Figure 1: Session by Mr. Arithra Sen on Introduction to COMSOL RF Module.

05.03.2025: DAY 1 - Session 2 (01:30AM to 04:0PM):

Advanced RF Simulations in COMSOL and Hands-on Session

The second session focused on modelling more complex RF systems using COMSOL Multiphysics. Mr. Arithra Sen provided detailed insights into the design of microwave antennas and rectangular waveguides.

During this session, students gained hands-on experience in designing advanced RF components, including multi-port networks and antenna arrays. Additionally, they learned to analyze simulation results and optimize their designs, enhancing their practical understanding of RF system development.



Figure 2: Students practicing during the workshop

06.03.2025: DAY 2 - Session 1 (09:30AM to 12:30PM):

Introduction To 3D-Printing Technology

On the second day, Mr. Anudeep conducted a session on 3D printing techniques and their applications in RF technology. He provided an overview of various 3D printing methods, including Fused Deposition Modelling (FDM), Stereolithography (SLA), and Selective Laser Sintering (SLS), and discussed the materials commonly used for 3D-printed RF components.

He emphasized the importance of precision and post-processing in ensuring optimal RF performance. Additionally, he explained how 3D printing can influence RF characteristics and guided participants on preparing models for fabrication.

During the hands-on session, participants designed simple RF components using COMSOL and exported their models in STL and other formats for 3D printing. This practical experience helped them understand the integration of RF simulation with additive manufacturing.



Figure 3: Session on 3D printing by Mr. Anudeep Vaggar.

06.03.2025: DAY 2 - Session 2 (01:30AM to 04:00PM):

Integration of 3D printing with COMSOL RF Simulation

The session began with Mr. Anudeep addressing the key design challenges and trade-offs in RF applications, particularly focusing on material properties and manufacturing tolerances. He elaborated on how 3D-printed components are integrated into real-world RF system testing, emphasizing their practical applications.

Participants then worked on simulating 3D-printed RF components in COMSOL, gaining a deeper understanding of the post-processing steps required after fabrication to optimize RF performance. The session concluded with case studies showcasing successful implementations of 3D-printed RF components in industry and research.



Figure 4: Mr. Anudeep discussing case studies showcasing successful implementations of 3D-printed RF components in industry and research.

OUTCOME: The workshop provided students with valuable hands-on experience and practical insights into RF simulations and additive manufacturing. Overall, the workshop enhanced participants' technical skills in RF simulation and 3D printing, equipping them with practical knowledge applicable to real-world engineering challenges. Students gained a clear understanding of market requirements, and the current industry demands for RF engineers. Additionally, Mr. Anudeep announced opportunities for students to collaborate with TechLabs through funded internships, providing them with hands-on industry exposure.

The two-day workshop successfully concluded with certificate distribution followed by a vote of thanks delivered by Dr. Biswaranjan Barik.



Figure 5: Students alongside the resource persons of the workshop.