GALGOTIAS COLLEGE
OF ENGINEERING & TECHNOLOGY

GELCOM

2022-2023

Volume 9

Department of
Electronics & Communication

Chief Editor : Dr. R. Swaminathan (Prof. and Head, ECE Dept)
Faculty Editor : Mr. Shivam Gupta (Asst. Professor)
Student Editor : Shiven Pandey
Somica Pathak

About ECE Department

The Department of ECE offers B.Tech courses in Electronics and Communication Engineering from Dr. A.P.J. Abdul Kalam Technical University, (formerly Uttar Pradesh Technical University/Gautam Buddh Technical University) Lucknow. Electronics & Communication Engineering deals with the electronic devices, circuits, communication equipments like transmitter, receiver, integrated circuits (IC). Microprocessors, satellite communication, microwave engineering, antenna and wave propagation. The department aims to impart high quality education in ECE and conduct top notch research in ECE related fields.

The department provides state-of-art infrastructure and computing facilities to students and faculty. The faculty members are actively involved in different domains of research with special focus in five thrust areas:

1. Wireless Communication and Networks
2. Microwave and Antennas,
3. VLSI Design
4. Communication Systems
5. Signal and Image Processing.

The department has regular hardware and software labs as well as state-of-the-art research labs in microwave and antennas, where faculty and students are working on funding projects and offering consultancy services. Some of the available software in the ECE department are Riverbed Academic edition, OrCAD PSPICE, eSim, SCILAB, OR-Tools, Expeyes, etc. The Department follows a well-proven pedagogy of sharing knowledge with the young and vibrant minds of the college. As we are affiliated with AKTU University, Lucknow, the curriculum and subjects are prescribed by AKTU University. In addition to instruction in core ECE subjects, we also teach elective subjects in advanced topics such as Voice over Internet Protocol, Filter Design, Digital Image Processing, Digital System Design using VHDL, Speech Processing, Advance Digital Design using Verilog, Microcontroller for Embedded Systems, etc. The department imparts world-class training and research besides promoting active industry-institute collaboration by identifying current trends and taking part in sponsored research projects and consultancy services. The department also has a worldwide reach with its vibrant alumni network. Working shoulder by shoulder with the institution, it is constantly aiming towards reaching greater heights to serve the needs of society and meet the aspirations of the student community.

Vision of Institute

To be a leading educational institution recognized for excellence in engineering education and research producing globally competent and socially responsible technocrats.

Mission of Institute

IM1: To provide state of the art infrastructural facilities that support achieving academic excellence.

IM2: To provide a work environment that is conducive for professional growth of faculty and staff.

IM3: To collaborate with industry for achieving excellence in research, consultancy and entrepreneurship development.

Vision of Department

To be recognized as a center of excellence in Electronics and Communication Engineering for the quality and global education, interdisciplinary research and innovation, to produce committed graduates who can apply knowledge and skills for the benefit of society.

Mission of Department

DM1: To provide quality education by providing state of the art facility and solutions for global challenges.

DM2: To provide a framework for promoting the industry-institution collaboration and empower the students in interdisciplinary research.

DM3: To transform students into socially responsible, ethical and technically proficient engineers with innovative skills and usage of modern tools.

DM4: To make the students corporate ready with spirit and necessary interpersonal skills.

Program Outcomes

PO1 **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent

And life-long learning in the broadest context of technological change.

Program Specific Outcomes

By the completion of Electronics & Communication Engineering program the student will be able to:

PSO1: Design and develop models for analog & digital electronic circuits and systems.

PSO2: Design, develop and test electronic and communication systems for applications with real Time constraints.

Program Educational Objectives

PEO 1	Graduates will excel in their career by acquiring knowledge in the field of Electronics and Communication Engineering with the usage of modern tools and emerging technologies.
PEO 2	Graduates will have the capability to analyze real life problems of the society and produce innovative solutions.
PEO 3	Graduates exhibit professionalism, ethical attitude, communication skills and team work in core engineering, academia and research organizations through professional development and lifelong learning.

List of Faculty in The Department:

S. No	Name	Qualification	Area of Specialization	Designation
1	Dr. R Swaminathan	Ph. D	Antenna Design and Image Processing	Professor & HOD
2	Dr. R.L. Yadava	Ph. D	Communication	Professor
3	Dr. Jaspreet Kour	Ph. D	Image Processing	Professor
4	Dr. S. Pratap Singh	Ph. D	Wireless Communication	Professor
5	Dr. Shahid Eqbal	Ph. D	Digital Electronics and Systems	Associate Professor
6	Dr. Gaurav Saxena	Ph. D	RF and Microwave	Associate Professor
7	Dr. Monika Bhatnagar	Ph. D	Antenna and Communication Engineering	Associate Professor
8	Dr. Ankit Sharma	Ph.D	Signal Processing	Assistant Professor
9	Dr. Kuldeep Singh	Ph.D	Electronics and Communication	Assistant Professor
10	Mr. Atul Kumar	M. Tech	Electronics and Communication	Associate Professor
11	Mr. Amanpreet Singh Saini	M. S	Wireless Communication	Assistant Professor
12	Mr. Saurabh Katiyar	M. Tech	Micro Electronics and Embedded Technology	Assistant Professor
13	Mr. P.C. Joshi	M. Tech	VLSI Design	Assistant Professor
14	Mr. Deependra Sinha	M. Tech	Electronics and Communication	Assistant Professor
15	Mr. Gavendra Singh	M. Tech	Control and Instrumentation	Assistant Professor
16	Mr. Amit Gupta	M. Tech	VLSI Design	Assistant Professor
17	Ms. Ranjana Kumari	M. Tech	Electronics and Communication	Assistant Professor
18	Ms. Ruchi Agrawal	M. Tech	Communication Engineering	Assistant Professor
19	Mr. Shivam Gupta	M.Tech	Process Control	Assistant Professor
20	Mr. Gaurav Mehra	M. Tech	VLSI Design	Assistant Professor

21	Mr. Bishnu Deo Kumar	M. Tech	Mechatronics	Assistant Professor
22	Mr. Mohd. Shibly	M. Tech	Nano Technology	Assistant Professor
23	Ms. Rekha Rani	M.E	Optical Wireless Communication	Assistant Professor
24	Mr. Ausaf Hasan Tarique	M. Tech	Electronics and Communication	Assistant Professor
25	Mr. A. S. Mohammed Shariff	M.E	VLSI Design	Assistant Professor
26	Dr. Nitin Garg	Ph.D	Free Space Optical Communication	Assistant Professor
27	Dr. Kirti	Ph.D	VLSI Design	Assistant Professor
28	Dr. Ashish Pandey	Ph.D	Machine Learning, Optimization Algorithms, Wireless Communications	Assistant Professor
29	Mr. Mukesh Chauhan	M.Tech.	Signal Processing	Assistant Professor
30	Mr. Dhinakaran M	M.E.	Applied Electronics	Assistant Professor
31	Apurva Thakur	M.Tech.	Nanosensors	Assistant Professor
32	Priyanka Rahi Bhalla	M.Tech.	Wireless Communication	Assistant Professor

New Faculty Joined In This Academic Year:

S. No	Name	Qualification	Area of Specialization	Designation
1	Dr. Ningombam Ajit	Ph. D	Semiconductor Device	Assistant Professor
2	Dr. S. Mohamed Sulaiman	Ph. D	VLSI Circuit Design	Assistant Professor
3	Dr. Shilpee Patil	Ph. D	Antenna Design	Assistant Professor
4	Ms. Avinash Kaushal	M.Tech.	Sensors, image processing, Adulteration	Assistant Professor
5	Mr. Mohd. Alamgir Khan	M.Tech.	Renewable Energy, Control System, Instrumentation	Assistant Professor
6	Mr. Anil Kr. Pandey	M.Tech.	Antenna Design	Assistant Professor
7	Ms. Nahid Malik	M.Tech.	DIGITAL IMAGE PROCESSING	Assistant Professor
8	Ms. Shikha Gupta	M.Tech.	VLSI designs, embedded, IoT, ML	Assistant Professor

ARTICLE: 1 SMART SOIL MONITORING SYSTEM FOR SMART AGRICULTURE

Smart Soil Monitoring System for Smart Agriculture

Accurate and timely information is crucial for optimizing resources in modern agriculture, and smart soil monitoring systems play a pivotal role in achieving this goal. These systems use advanced sensors to measure soil parameters such as clay content, organic matter, moisture, and nutrients, providing valuable data to farmers. Sensors placed at various locations broadcast data to local base stations (LBS) using technologies like Wi-Fi, LoRaWAN, Bluetooth, and more, which then relay this information to a central base station (CBS) located farther away. From the CBS, data is sent to the cloud for in-depth analysis, visualization, and trend identification without needing an active internet connection on-site. Techniques like modulation, coding, and maintaining line-of-sight ensure the integrity of the signal during transmission. This automated process delivers real-time insights to farmers, significantly reducing the need for manual soil monitoring, conserving water, cutting costs, and enhancing overall efficiency. Additionally, when integrated with other data sources, such as weather forecasts, the system provides even more precise information, making agriculture smarter and more sustainable.

Long Range Wide Area Networks (LoRaWAN) in Smart Agriculture

LoRaWAN is a low-power wireless communication protocol specifically designed for long-range data transmission between field sensors and base stations, making it highly suitable for smart agriculture applications. Operating on unlicensed ISM frequencies worldwide, LoRa supports communication distances of up to 40 km in rural areas and up to 3 km in urban settings, offering a cost-effective and energy-efficient solution for the Internet of Things (IoT). One of LoRa's key benefits is its ability to drastically reduce power consumption, extending the battery life of connected sensors to over 10 years. Proven use cases of LoRa in agriculture have demonstrated significant benefits, including reduced environmental impact, maximized crop yields, and minimized operational costs. As a cornerstone of IoT-based agriculture, LoRa technology has established itself as a reliable and scalable solution for enhancing the efficiency and sustainability of modern farming practices.

Fig: LoRa WAN Based Smart Soil Monitoring

Ms. Rekha Rani
Asst.Prof./ECE/GCET

ARTICLE: 2 6G and Biomedical Technology: Pioneering the Future of Connected Healthcare

The integration of 6G technology with biomedical innovations is set to revolutionize the healthcare landscape, paving the way for a new era of connected and intelligent healthcare systems. 6G networks will provide ultra-high-speed data transfer, near-zero latency, and unparalleled reliability, creating a robust foundation for advanced medical applications such as real-time remote surgery, AI-assisted diagnostics, and personalized treatments. This next-generation connectivity will enhance telemedicine by enabling high-definition, real-time video consultations and patient monitoring, making healthcare more accessible even in remote or underserved regions. The integration of augmented and virtual reality in medical training and patient care will also be significantly improved, allowing for immersive, hands-on experiences that can enhance the skills of healthcare professionals and improve patient outcomes.

Furthermore, 6G's ability to support massive numbers of interconnected devices will drive the growth of the Internet of Medical Things (IoMT), where smart implants, biosensors, and wearable devices continuously collect and transmit health data. This real-time flow of information enables predictive and preventive healthcare by allowing clinicians to detect potential health issues early and respond swiftly with tailored interventions. For example, continuous glucose monitors, smart pacemakers, and advanced imaging devices connected through 6G networks can provide immediate insights, improving the management of chronic conditions and emergency responses. As 6G and biomedical technologies converge, they will create an ecosystem of smart, connected healthcare that enhances patient care, reduces healthcare costs, and ultimately transforms the way healthcare is delivered worldwide.

Fig: 6G- Ttechnology

Dr. Gaurav Saxena
Assoc.Prof./ECE/GCET

ARTICLE: 3 METAMATERIAL ABSORBER AND ITS APPLICATION IN RADAR CROSS SECTION REDUCTION

Metamaterial Absorbers (MAs) are engineered composite structures consisting of periodic arrays of metallic patches on the top surface and a grounded metal layer, separated by a dielectric substrate. These structures are designed to manipulate electromagnetic waves in unique ways, making them highly efficient at absorbing incident energy. When a plane wave strikes the MA, the electric field excites the top surface, while the magnetic field interacts with the dielectric substrate, generating circulating surface currents within the structure. This interaction allows the MA to adjust its effective permittivity and permeability, matching the impedance of free space at specific frequencies. Consequently, the reflection and transmission of electromagnetic waves are minimized, resulting in maximum absorption. Due to these properties, MAs are highly valuable in applications such as radar cross-section (RCS) reduction and stealth technology, where minimizing electromagnetic wave reflection is crucial.

A novel, ultrathin MA has been developed specifically to reduce the RCS of patch antennas without compromising their performance. This innovation is particularly significant in enhancing stealth capabilities, as it allows antennas to maintain their operational efficiency while becoming less detectable by radar systems. Additionally, Metamaterial Perfect Absorbers (MPAs) are being utilized to reduce in-band RCS while preserving the radiation characteristics of guide wave slot array antennas. These advancements showcase the potential of MAs in various fields, from military stealth applications to improving antenna designs, where controlling electromagnetic interactions is critical.

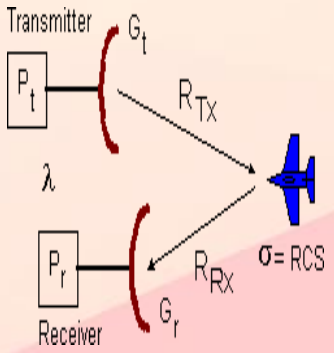

Fig: RCS measurement

The surface current distributions of the array antennas are analysed and the MPA is only loaded on the weak current area by the three layers of MPA for RCS reduction. Meanwhile, a novel design method is presented to reduce the RCS of ridged waveguide slot antenna array with MA. The MA consists of a metallic pattern and solid metal on the sides of a dielectric slab covering the PEC ground plane.

Dr. Ankit Sharma
Assoc.Prof./ECE/GCET

ARTICLE: 4 WIRELESS SENSOR NETWORK DESIGN

Wireless Sensor Networks (WSNs) have grown in recent years and have become an essential part of various applications such as military surveillance, environment monitoring, and medicine. Despite great potential in various applications still successful installation of WSN is a demanding task. For the sake of simplification of WSNs design and abstract from low-level details, high-level approaches are proposed.

WSNs have a large number of nodes that are densely deployed and wirelessly communicated to send and receive environmental information. Every node consists of one or more sensors, a processor, a power supply. Due to complexity, the development of WSNs is a difficult task. Because of this reason, many researchers are going on WSN Design.

For simplicity, WSN design approaches are classified as

1. Low-level-based approaches
   - Node-level abstraction approaches
   - Group-level abstraction approaches
   - Network-level abstraction approaches
2. High-level-based approaches
   - Component-based approaches
     i. High-level SDL Models(HL-SDL)
     ii. Intense language
     iii. Sensor ML
     iv. UM-RTCOM
     v. MathWorks Modeling approaches
     vi. SystemC
     vii. Middleware
   - Model-driven engineering-based approaches
     i. MDE-based approaches (MARTE)
     ii. Design pattern-based approaches

Here WSN modelling techniques and programming methodologies for WSN development are classified in two categories according to the abstraction level of their design. First low-level techniques for WSN and programming models.

The second dealt with high-level-based approaches consist component-based modelling techniques and MDE-based approaches and specifically which used UML and MARTE standards and pattern-based concept. Development of WSN can be investigated at different abstraction levels.

Shachee Mishra

2000970310154
Student/ECE/GCET

EminentRecruiters: