AKSHAYA
COLLEGE OF ENGINEERING AND TECHNOLOGY
(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai-An ISO 9001:2015 Certified Institution)
Kinathukadavu, Coimbatore - 642 109.

Department of Electronics and Communication Engineering

Technical Magazine

Issue 1 [March, 2022]

1. Message from the Head of Department

The department of Electronics and Communication Engineering (ECE) was established in the year2009 with an intake of 60 students and affiliated to Anna University. The department offers Post Graduate Programme (M.E. VLSI Design) with an intake of 9 students. The department has also been recognized as a research center for carrying out Ph.D Programme under Anna University. Our department offers tremendous opportunity to mould the young professionals to enhance their skills and knowledge as per current developments. The department affords professional training to the students in the emerging areas. The department of ECE has a team of dedicated and motivated faculty members to impart quality education excellent infrastructure is provided by the management to meet the requirements of current trend. Our department has been recognized as a Research Center by Anna University, Chennai from2017 onwards. We as a team to prepare and guide the students to face the forthcoming challenges of real life. The students are motivated to take part in extracurricular and co-curricular activities at the national and international levels to fetch accolades to the institution. The department strives hard to reach greater heights to address issues of society with the wonderful support offered by the management.

Dr.A.Umaamaheshvari, Prof/ECE

2. Vision and Mission of the department

Vision

To become a most sought after centre of learning in Electronics and Communication Engineering to produce engineers possessing domain knowledge with research focus to meet socio-economic needs.

Mission

- DM 1 : Adopt a systematic and technology enabled teaching-learning process with an ability to contribute for research.
- DM 2 : Develop electronics and communication engineers with managerial skills and life-long learning practices, for sustainable economic growth, beneficial to the society.
- DM 3 : Establish Centre of excellence in VLSI technologies and Embedded systems and provide a creative environment with industry linked initiatives for encouraging innovation.

3. Program Educational Objectives – PEOs

PEO 1 : The graduates will have successful careers in industries or pursue higher studies and research or emerge as entrepreneurs.

PEO 2 : The graduates will be able to apply fundamental and advanced knowledge, skills and techniques in devising innovative products for the benefits of society.

PEO 3 : The graduates will be able to critically analyze existing literature in an area of specialization and research oriented methodologies to solve the problems identified.

4. Program Specific Outcomes – PSOs

PSO 1: Professional skills: Students shall have skills and knowledge to work on analog and digital systems, adhoc and sensor networks, VLSI, embedded and communication systems

PSO 2: Competency: Students shall qualify at the State, National and International level competitive examination for employment, higher studies and research.

5. Program Outcomes –Pos

- PO 1 : Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO 2 : 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.
- PO 3 : 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
- PO 4 : 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.
- PO 5 : 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.
- PO 6 : 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.
- PO 7 : 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.
- PO 8 : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO 9 : Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

- PO 10 : 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.
- PO 11 : 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.
- PO 12 : 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.

6. Message From Editorial Team

Dear Students,

We hearty welcome you to the newly launched ECE Department's first issue of the Magazine for the academic year 2021-2022.

The objective of the magazine is to mainly focus on Achievement of the students from the ECE department in the Co-curricular and Extra-Curricular Activities.

We are also thankful to our Management and Principal for their support and encouragement. Finally we are gratified to our reviewers for their frank opinions and constructive suggestions, namely our colleagues and students.

- **Chief Editor:** [Dr.Umaamaheshvari,HoD /ECE]
- **Faculty Advisors:** [Mrs.A.Ambika,AP/ECE, Ms.S.Shanmugapriya, Ms.Kiruthika,AP/ECE]
- **Student Editors:** [A.RamjanBegam,I ME VLSI Design]
- **Design Team:** [Mrs. A.Ambika,AP/ECE]

7. Table of Contents:

FLASH-DNA: IDENTIFYING NAND FLASH MEMORY ORIGINS USING INTRINSIC ARRAY PROPERTIES

NAND flash memory is widely used in mainstream electronic products due to its high performance, low power consumption, non-volatility and high storage capacity. With the gradual reduction in feature size and more bits stored in each cell, NAND flash memory cells become more vulnerable to various channel noises, including data retention, cell-to-cell interference (CCI), program/erase (P/E) cycles and read disturb. The above noises significantly degrade the data-storage reliability. As a result, the data storage lifetime is dependent on retention time and P/E cycles. Retention and CCI are recognized as the main sources of noise, which lead to significant performance deterioration of flash memory systems.

To analyses the current flash memory model we have proposed a switching- voltage detector and compensation circuits for an ultra-low-voltage CMOS inverter. The switching voltage of an inverter is an important design parameters for a digital circuit, and is determined by the difference in threshold voltages between MOSFETS. However, switching voltage varies significantly with fabrication process conditions and temperature. To address this problem, we have developed a threshold voltage difference detector circuit. We have also proposed a possible compensation technique for the inverter. Monte Carlo simulations demonstrated that the threshold voltage detector circuit can monitor the threshold voltage difference between PMOSFET and nMOSFET, and that inverter can achieve 50% reduction in switching-voltage variation with CMOS inverter is utilized and implemented with HVTD compared to a conventional CMOS inverter. The Verilog version of the NAND flash memory is designed with the FIFO and FSM model for the FM which provides better results than existing design on NAND flash memory.

V.PRITHVIRAJ
II ME VLSI Design

BLOCK-BASED CARRY SPECULATIVE APPROXIMATE ADDER FOR ENERGY-EFFICIENT APPLICATIONS

In this paper, a low energy consumption block-based carry speculative approximate adder is proposed. Its structure is based on partitioning the adder into some non-overlapped summation blocks whose structures may be selected from both the carry propagate and parallel-prefix adders. Here, the carry output of each block is speculated based on the input operands of the block itself and those of the next block. In this adder, the length of the carry chain is reduced to two blocks (worst case), where in most cases only one block is employed to calculate the carry output leading to a lower average delay. In addition, to increase the accuracy and reduce the output error rate, an error detection and recovery mechanism is proposed. The effectiveness of the proposed approximate adder is compared with state-of-the-art approximate adders using a cost function based on the energy, delay, area, and output quality. The results indicate an average of 50% reduction in terms of the cost function compared to other approximate adders.

K.UMAMAHESWARI
II ME VLSI Design

A 16-kb 9T Ultralow-Voltage SRAM With Column-Based Split Cell-VSS, Data-Aware Write-Assist, and Enhanced Read Sensing Margin in 28-nm FDSOIA

In deep sub-micron technology, leakage power consumption has become a major concern in VLSI circuits, especially for SRAM, which is used to build the cache in System-on-Chip (SOC). This paper proposes a 9T static random-access memory (SRAM) cell design based on CMOS technology which consumes less power and high read and write stability. The proposed design uses read decoupled access buffer and power gating transistors for read and write stability, bit interleaving for soft error immunity and a

column based virtual VSS signal to avoid unnecessary bit line discharges in the unselected column for reducing power consumption. The proposed 9T SRAM is simulated using Cadence Virtuoso tool. The obtained butterfly curve and power calculated show an increase in read and write stability and considerable reduction in power consumption as compared to conventional 9T SRAM.

BALAKUMAR S

II ME VLSI Design

IHIGH-SPEED HYBRID-LOGIC FULL ADDER USING HIGH-PERFORMANCE 10-T XOR-XNOR CELL

Hybrid logic style is widely used to implement full adder (FA) circuits. Performance of hybrid FA in terms of delay, power, and driving capability is largely dependent on the performance of XOR-XNOR circuit. In this article, a highspeed, low-power 10-T XOR-XNOR circuit is proposed, which provides full swing outputs simultaneously with improved delay performance. The performance of the proposed circuit is measured by simulating it in cadence virtuoso environment using 90-nm CMOS technology. The proposed circuit reduces the power delay product (PDP) at least by 7.5% than that of the available XOR-XNOR modules. Four different designs of FAs are also proposed in this article utilizing the proposed XOR-XNOR circuit and available sum and carry modules.
The proposed FAs provide 2%-28.13% improvement in terms of PDP than that of other architectures. To measure the driving capabilities, the proposed FAs are embedded in 2-,4-, and 8-bit cascaded full adder (CFA) structures. Results show that two of the proposed FAs provide the best performance for a higher number of bits among all the FAs.

K. KAVIYARASU

II ME VLSI Design

LOW POWER AND FAST FULL ADDER BY EXPLORING NEW XOR AND XNOR GATES

In this project, novel circuits for XOR/XNOR and simultaneous XOR-XNOR functions are proposed. The proposed circuits are highly optimized in terms of the power consumption and delay, which are due to low output capacitance and low short-circuit power dissipation. We also propose six new hybrid 1-bit full-adder (FA) circuits based on the novel full-swing XOR-XNOR or XOR/XNOR gates. Each of the proposed circuits has its own merits in terms of speed, power consumption, power delay product (PDP), driving ability, and so on. To investigate the performance of the proposed designs, extensive HSPICE and Cadence Virtuoso simulations are performed. The simulation results, based on the 65-nm CMOS process technology model, indicate that the proposed designs have superior speed and power against other FA designs. A new transistor sizing method is presented to optimize the PDP of the circuits. In the proposed method, the numerical computation particle swarm optimization algorithm is used to achieve the desired value for optimum PDP with fewer iterations. The proposed circuits are investigated in terms of variations of the supply and threshold voltages, output capacitance, input noise immunity, and the size of transistors.

R.VIJAY

II ME VLSI Design

NEXT-GENERATION LOW-POWER CIRCUIT STRATEGIES FOR IOT TECHNOLOGIES

The Internet of Things (IoT) has revolutionized various sectors by connecting a multitude of devices, leading to increased demand for low-power circuits to enhance battery life, reduce operational costs, and support the proliferation of IoT applications. This article explores the latest advances in low-power circuit design tailored for IoT devices, focusing on novel design techniques, power-saving technologies, and real-world applications.

Low-Power Design Techniques:

Sub threshold Operation: Designing circuits to operate below the nominal threshold voltage to reduce power consumption. While this can lead to slower performance, it significantly decreases power usage.

Low-Voltage Design: Utilizing low supply voltage to reduce power consumption. Techniques like voltage scaling and using low-threshold transistors are common practices.

Efficient Data Encoding: Implementing data encoding schemes that minimize switching activity, such as Gray coding or run-length encoding, which reduces dynamic power consumption.

Energy-Efficient Analog Circuits:

Low-Power Operational Amplifiers: Design techniques include reducing bias currents, optimizing transistor sizing, and using feedback mechanisms to enhance efficiency.

Switched-Capacitor Circuits: Utilizing switched-capacitor circuits for analog-to-digital conversion or filtering while managing power consumption through careful design of the switch and capacitor networks.

Integration of Power Management with IoT Systems

Energy Harvesting Integration:

Harvesting Techniques: Utilizing energy sources such as solar, thermal, or kinetic energy to power IoT devices. Integrating energy harvesters with low-power circuits ensures extended operational life without frequent battery replacements.

Power Management ICs (PMICs): Specialized ICs designed to manage energy harvesting, storage, and distribution efficiently. PMICs ensure that harvested energy is optimally utilized and stored.

Wireless Communication Optimization:

Low-Power Communication Protocols: Implementing protocols like Zigbee, LoRa, or BLE that are designed for low-energy communication. These protocols help reduce power consumption during data transmission and reception.

Adaptive Communication Techniques: Adjusting communication parameters based on network conditions to minimize energy

usage. Techniques include adaptive transmission power control and efficient data encoding schemes.

Industrial IoT (IIoT) Applications:

Predictive Maintenance Systems: Overview of predictive maintenance systems in industrial settings that use low-power circuits to ensure long-term operation of sensors and communication modules.

Challenges and Future Directions

Design Trade-Offs: Balancing power consumption with performance and functionality is a critical challenge. Designers must carefully evaluate trade-offs between energy efficiency and computational capabilities.

A.RAMJAN BEGAM

II ME VLSI Design

SMART AGRICULTURE USING IoT

As initiatives to increase Japan's declining food self sufficiency rate and revitalize the field of agriculture, the concept of smart agriculture and urban agriculture are currently being implemented. However, the number of skilled farmers who can contribute to gathering crop growth data required for machine learning is restricted, and these data are also limited to local and environmental-based conditions. We propose a system for obtaining composite growth data in various environments and crops targeted for home gardens and paddy fields. An interactive cultivation sensing system consisting of IoT-based technologies is designed and realized to ensure the continuous growth of crops in optimum conditions daily. With this, progress will be made in determining the efficient cultivation conditions for open cv, and in finding solutions to future problems of agriculture.

-S.DHEENADHAYALAN

K.R.NIVETHITHA

G.S. PRAGATHISWARAN

Y.JESSY
IV ECE

DRUNKEN DRIVE DETECTION AND ACCIDENT DETECTION USING IoT

With the advent of technology, this is replaced with advanced technology in life-threatening situations. Nowadays, accidents are very common and sometimes it becomes very hard to protect someone's life. We are living in the modern world and the technologies are increasing day by day, especially humans achieving massive growth in the automobile industry. Each and every family has at least one vehicle either two wheeler or four wheeler. Development in technology is the destruction of human beings. Many accidents on the highway/ roadside and people are dying because of lack of immediate help. In this work the introduction of a system called GPS based vehicle accident detection system using GSM technology.

The system includes necessary sensors such as vibration sensor, alcohol sensor and GSM to detect and report to the given mobile number in case an accident occurs. The system will send necessary information to their relatives and friends so that people can be saved by giving immediate help. The alcohol detector is used to detect whether the driver takes alcohol or not. If a person consumes alcohol and tries to start the vehicle, the engine will be locked and also in case of an accident a GPS system is used to find the location where the accident occurs and send necessary details to the particular mobile number. We can't fully eradicate accidents but we can save lives by using this technology.

-DEEPIKA S
MUTHUKUMARAN P
NITHEESWARI E
SHANMUGA PRIYA B
SRINIVASAGAM S

IV ECE

REAL TIME CLOUD BASED WEATHER MONITORING SYSTEM

An experimental study effect of weather conditions such as solar light intensity, humidity, temperature, and rain on the Long Range (LoRa) communication in a campus environment has been carried out and analyzed. The weather parameters were obtained from an online meteorological weather station and the use of a local automatic weather station. We have analyzed the day-to-day variation and the effects of the weather condition based on the LoRa link in a LoRaWAN setup. A regular pattern of RSSI was observed with stronger RSSI values having a positive correlation with the atmospheric temperature and solar radiation during the day but degrading in late nights. The positive correlation and pattern observed can be characteristic of the prevailing meteorological conditions and opens room for further research needed for propagation modelling The RSSI signals and relative humidity, on the other hand, showed no correlation.. The study presents useful information to be considered on the effects of weather conditions in the deployment of LoRa for IoT communication.

-P.KAVIYA
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K.SELVA KUMAR
IV ECE

INTELLIGENT TRAIN ENGINE AND TRACK MONITORING SYSTEM IN HILL STATION

Nowadays public is facing many threats from the railway department by which they are hesitating to plan a train journey especially in the hilly areas. Railway accidents may occur due to

various reasons like engine problems due to climatic conditions, obstacles on the train track, frequent animal crossing in the railway track. Though the railway department is trying to take several actions to reduce such informal things but couldn't see the face of success completely. This project has been designed to help the railway department in overcoming accidents. Automation is introduced in the project for railway transportation. Here obstacle sensor is used to monitor the track and sense the obstacle, if sensed in short distance signal is transmitted to the receiver section which will give a horn i.e. buzzer and a message is displayed to the loco pilot, if he couldn't sense the danger or if the train speed is not reduced after the detection, the train will automatically stop by enabling the emergency brake system. In this project, a model is proposed based on sensors and control circuit. Sensors such as an IR sensor and an ultrasonic sensor are used to detect the obstacle. A control circuit with a microcontroller is used to stop the engine automatically if any animals or obstacle is detected. In this way, the speed of the train is adapted automatically and promptly to the conditions and the probability of an accident in an unforeseen circumstances is reduced.

ARAVINTH R
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SWATHI K
SNEHA R
IV ECE

FACE MASK DETECTION FOR COVID 19

Recognition from faces is a popular and significant technology in recent years. Face alterations and the presence of different masks make it too much challenging. In the real-world, when a person is uncooperative with the systems. An abundant number of research works has been performed for recognizing faces under different conditions like changing pose or illumination, degraded images, etc. Then facial features extraction is performed using the Google Face

Net embedding model And finally, the classification task has been performed by Convolution Neural Network (CNN). The COVID-19 pandemic is causing a worldwide emergency in healthcare. This virus mainly spreads through droplets which emerge from a person infected with coronavirus and poses a risk to others. The risk of transmission is highest in public places. One of the best ways to stay safe from getting infected is wearing a face mask in open territories as indicated by the World Health Organization (WHO). In this project, we propose a method which employs Open CV and Tenser flow to detect face masks on people. A bounding box drawn over the face of the person describes whether the person is wearing a mask or not. If person face is detected by camera, it identify whether the person wear the mask or not, and it automatically updated on google Sheet with timing.

R.K.KAMALESH
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P. SUGANTHI
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IV ECE

ARDUINO RADAR DETECTOR

RADAR is an object detection system which use radio waves to determine the range, altitude, direction or speed of the object. It can be used to detect aircraft, ship, space craft, guided missile, motor vehicle, weather formation and terrain.

In this project design of a simple Radar Application using Arduino and Processing is done. This Arduino Radar Project is implemented with the help of Processing Application. Radar is a long-range object detection system that uses radio waves to establish certain parameters of an object like its range, speed and position. Radar technology is used in aircrafts, missiles, marine, weather predictions and automobiles. Even though the title says Arduino Radar Project, technically the project is based on Sonar technology

as I will be using an Ultrasonic Sensor to determine the presence of any object in a particular range.

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IoT BASED ATM SECURITY ACCESS CONTROL SYSTEM USING RFID & ESP8266 Wi-Fi MODULE

This research demonstrates the design of RFID-based access control system using Arduino. It is a modern identification device used in various places such as offices and universities. It comprises a RFID (MF-RC522) reader and a tag, if a valid tag is put in front of the reader the access is allowed otherwise the access is denied. This setup is consisting of Arduino-Nano, RFID Reader, LCD Display, LED, etc. For compiling the complete setup we used Arduino-IDE.

KEYWORD: Arduino UNO, LED (Red, Green) ,RFID sensor (MFRC522) ,Servo, Jumpers ,Breadboard

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M.MADHUMITHRA
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M.MEENALOCHANI
II BE ECE

Wi-Fi VOICE-CONTROLLED ROBOT USING WRMOS DI ESP8266, IFTTT, AND GOOGLE ASSISTANT

This project presents the development of a Wi-Fi voice-controlled robot leveraging WRMOS DIY ESP8266, IFTTT (If This Then That), and Google

Assistant. The integration of these technologies enables seamless communication between the user's voice commands and the robot's actions. The ESP8266 microcontroller serves as the central processing unit, connecting the robot to the internet via Wi-Fi. IFTTT acts as a bridge, translating voice commands from Google Assistant into actionable tasks for the robot. Google Assistant, a voice-enabled virtual assistant, provides the interface through which users interact with the robot using natural language commands. The system's architecture ensures flexibility and ease of use, allowing users to control the robot remotely from any location with internet access. This abstract provides an overview of the key components and their roles in enabling the voice-controlled functionality of the robot, offering insights into its implementation and potential applications.

VARUNKUMAR N
MARUTHI VARA PRASAD C
HARIKRISHNAN S
II BE ECE

WIRELESS REMOTE CONTROL DOOR LOCKING SYSTEM

The Wireless Remote Control Door Locking System employs radio frequency technology to enable secure and convenient access control to doors. This system comprises a central control unit, remote transmitters, and electronic door locks. Utilizing RF signals, the remote transmitters communicate with the control unit, which then activates the door locks accordingly. The system offers enhanced security through encryption protocols and unique code recognition, mitigating the risk of unauthorized access. It provides users with the flexibility to remotely lock or unlock doors from a considerable distance, enhancing convenience and accessibility. Additionally, the WRC-DLS incorporates power-efficient design features and robust signal transmission protocols,

ensuring reliable operation and extended battery life. The system's modular architecture facilitates easy installation and integration with existing door locking mechanisms, minimizing retrofitting complexities. Moreover, its user-friendly interface enables straightforward programming and customization of access permissions. The WRC-DLS addresses various application scenarios, including residential, commercial, and industrial environments, offering scalable solutions tailored to diverse requirements. By leveraging RF technology, this system enhances security, convenience, and operational efficiency in door access control systems.

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WIRELESS NOTICEBOARD USING BLUETOOTH

The electronic notice board used in the suggested technique is managed by an Android device and shows messages. There used to be notice boards where any news or announcements needed to be posted every day. It gets tiresome and needs to be maintained every day. The concept introduces an electronic notice board that is Bluetooth-enabled and interfaced with an Android handset to solve this issue. The Android device sends a message to an Arduino, which is received over Bluetooth. In public spaces such as parks, train stations, and bus terminals, notice boards are essential to every institution or group. Sticking different notices every day, however, is a challenging task.

AMIRTHA YOHALAKSHMI A
DEEPIKA A

PRIYADHARSHINI A
PREETHI A
II BE ECE

THE RISE OF QUANTUM COMMUNICATION: THE NEXT FRONTIER IN SECURE NETWORKING

Quantum communication represents a transformative leap in secure networking technologies, leveraging the principles of quantum mechanics to enable unprecedented levels of security. This article explores the rise of quantum communication, its underlying principles, technological advancements, practical applications, and the challenges it faces. As the next frontier in secure networking, quantum communication promises to redefine data security in an increasingly interconnected world.

-ANITHA C
ROSHINI S
VARUNKUMAR N
III BE ECE

THE EVOLUTION OF SATELLITE COMMUNICATION SYSTEMS: FROM GEO TO LEO AND MEO

Satellite communication systems have undergone significant evolution from Geostationary Earth Orbit (GEO) satellites to Low Earth Orbit (LEO) and Medium Earth Orbit (MEO) satellites. Each orbit offers distinct advantages and challenges, impacting the performance, coverage, and application of satellite communication systems. This article explores the evolution of satellite communication systems, comparing GEO, LEO, and MEO satellites,

and discusses their implications for global connectivity and future advancements.

-KARTHIK K
SARAVANAN S
NARMATHA S
III BE ECE

SOFTWARE-DEFINED RADIO (SDR): TRANSFORMING COMMUNICATION SYSTEMS WITH FLEXIBILITY AND INNOVATION

Software-Defined Radio (SDR) represents a significant advancement in communication systems, providing unprecedented flexibility and innovation in radio technology. By leveraging software-based signal processing and programmable hardware, SDR enables the dynamic adaptation of communication protocols and standards, revolutionizing how radio systems are designed, deployed, and managed. This article explores the fundamental concepts of SDR, its technological advancements, applications, and future prospects, highlighting how SDR is reshaping the landscape of communication systems.

-NIVETHA M
PREM D
RISHNIKA M
SELVANAYAKIS
III BE ECE

FLEXIBLE ELECTRONICS: PUSHING THE LIMITS OF CIRCUIT DESIGN AND APPLICATIONS

Flexible electronics are revolutionizing the landscape of circuit design and applications by offering unprecedented versatility and performance. Unlike traditional rigid electronics, flexible electronics utilize substrates that can bend, stretch, and conform to various shapes, leading to novel applications and improved functionalities. This article delves into the advancements in flexible electronics, exploring the innovations in materials, circuit design techniques, and manufacturing processes that are pushing the boundaries of what is possible. By examining cutting-edge developments and diverse applications—ranging from wearable technology to advanced medical devices and beyond—this article highlights how flexible electronics are transforming industries and enabling new possibilities in circuit design and application. Through a comprehensive analysis of current trends and future directions, the article aims to provide insights into how flexible electronics are reshaping the future of technology and enhancing our interaction with electronic systems.

-AAKASH P
ARAVIND M
BOOPATHI G
III BE ECE

ADVANCES IN DIGITAL SIGNAL PROCESSING (DSP) FOR REAL-TIME APPLICATIONS

Digital Signal Processing (DSP) continues to evolve at a rapid pace, driving significant improvements in real-time applications across various industries. This article explores the latest advancements in DSP technology that are enhancing the performance, efficiency, and capabilities of real-time systems. Key developments include

innovations in algorithmic design, hardware acceleration, and integration with emerging technologies such as machine learning and edge computing. The article highlights how these advancements are optimizing real-time signal processing tasks, from high-speed data acquisition to real-time audio and video processing, and beyond. By examining state-of-the-art techniques and applications, the article provides insights into how modern DSP solutions are addressing the challenges of real-time processing and paving the way for future innovations in dynamic and demanding environments.

DHARSHINI PRIYA S
BRAMALATHA S
GODSON VJ
MARUTHI VARA PRASAD C
III BE ECE

MACHINE LEARNING IN SIGNAL PROCESSING: ENHANCING ACCURACY AND EFFICIENCY

Machine learning (ML) is increasingly transforming signal processing by enhancing accuracy and efficiency across a range of applications. This article investigates the integration of ML techniques into signal processing workflows, highlighting how these methods are revolutionizing traditional approaches. Key areas of focus include the development of advanced algorithms for noise reduction, pattern recognition, and predictive modeling, which significantly improve signal quality and processing speed. By leveraging ML's capabilities in data-driven analysis and adaptive learning, the article explores innovative applications from communications and audio processing to image and video analysis. It also addresses the challenges and future directions of

incorporating ML into signal processing, such as the need for large datasets, computational resources, and algorithmic transparency. Through a comprehensive review of recent advancements and practical implementations, the article provides insights into how machine learning is pushing the boundaries of signal processing and driving the next wave of technological progress.

SNEHA M
SWATHI S
III BE ECE

GREEN ELECTRONICS: INNOVATIONS DRIVING SUSTAINABLE TECHNOLOGY

Green electronics are at the forefront of sustainable technology, driven by innovations that aim to reduce environmental impact and enhance energy efficiency. This article explores the latest advancements in green electronics, focusing on breakthroughs in eco-friendly materials, energy-efficient designs, and sustainable manufacturing processes. It examines how emerging technologies, such as biodegradable components, low-power electronics, and recycling techniques, are contributing to a more sustainable electronic ecosystem. The article also highlights key trends and case studies that demonstrate how green electronics are transforming various industries, from consumer electronics to industrial applications. By addressing the challenges and opportunities in integrating sustainability into electronic design and production, the article provides a comprehensive overview of how innovations in green electronics are shaping the future of technology while promoting environmental responsibility.

-HARIPRIYA U

HARIPRIYA J
III BE ECE

ENERGY HARVESTING TECHNOLOGIES: POWERING THE FUTURE WITH AMBIENT ENERGY

Energy harvesting technologies are revolutionizing the way we harness and utilize ambient energy sources to power electronic devices and systems. This article delves into the latest advancements in energy harvesting, focusing on innovative methods for capturing and converting ambient energy—such as solar, thermal, vibrational, and radio frequency—into usable power. It explores emerging technologies and materials that enhance the efficiency and effectiveness of energy harvesting systems, including advances in nanotechnology, Micro Electro Mechanical Systems (MEMS), and flexible electronics. The article also examines real-world applications and case studies where energy harvesting is making a significant impact, from powering wearable devices and IoT sensors to supporting remote and off-grid installations. By addressing the challenges of scalability, integration, and energy storage, the article provides insights into how energy harvesting technologies are shaping the future of sustainable power solutions and driving innovation in various industries.

SAMYUKTHA PRITHYANKARA K
HARIKRISHNAN S
III BE ECE

THE ROLE OF ELECTRONICS IN SMART CITIES: INFRASTRUCTURE, COMMUNICATION, AND BEYOND

The Role of Electronics in Smart Cities: Infrastructure, Communication, and Beyond Electronics play a pivotal role in shaping the development and functionality of smart cities,

transforming urban living through advanced infrastructure and communication systems. This article explores the integration of electronic technologies in smart cities, focusing on their impact on infrastructure, communication, and beyond. Key areas of discussion include the deployment of sensors and IoT devices for real-time data collection and management, advancements in communication networks that enable seamless connectivity, and the use of electronics in enhancing public services and environmental monitoring. The article also examines how smart grids, intelligent transportation systems, and smart building technologies contribute to the efficiency, sustainability, and resilience of urban environments. By highlighting innovative solutions and case studies, the article provides a comprehensive overview of how electronics are driving the evolution of smart cities and addressing the challenges of modern urbanization.

THAILA UMA A
VAISHNAVIR
III BE ECE