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CHRIST
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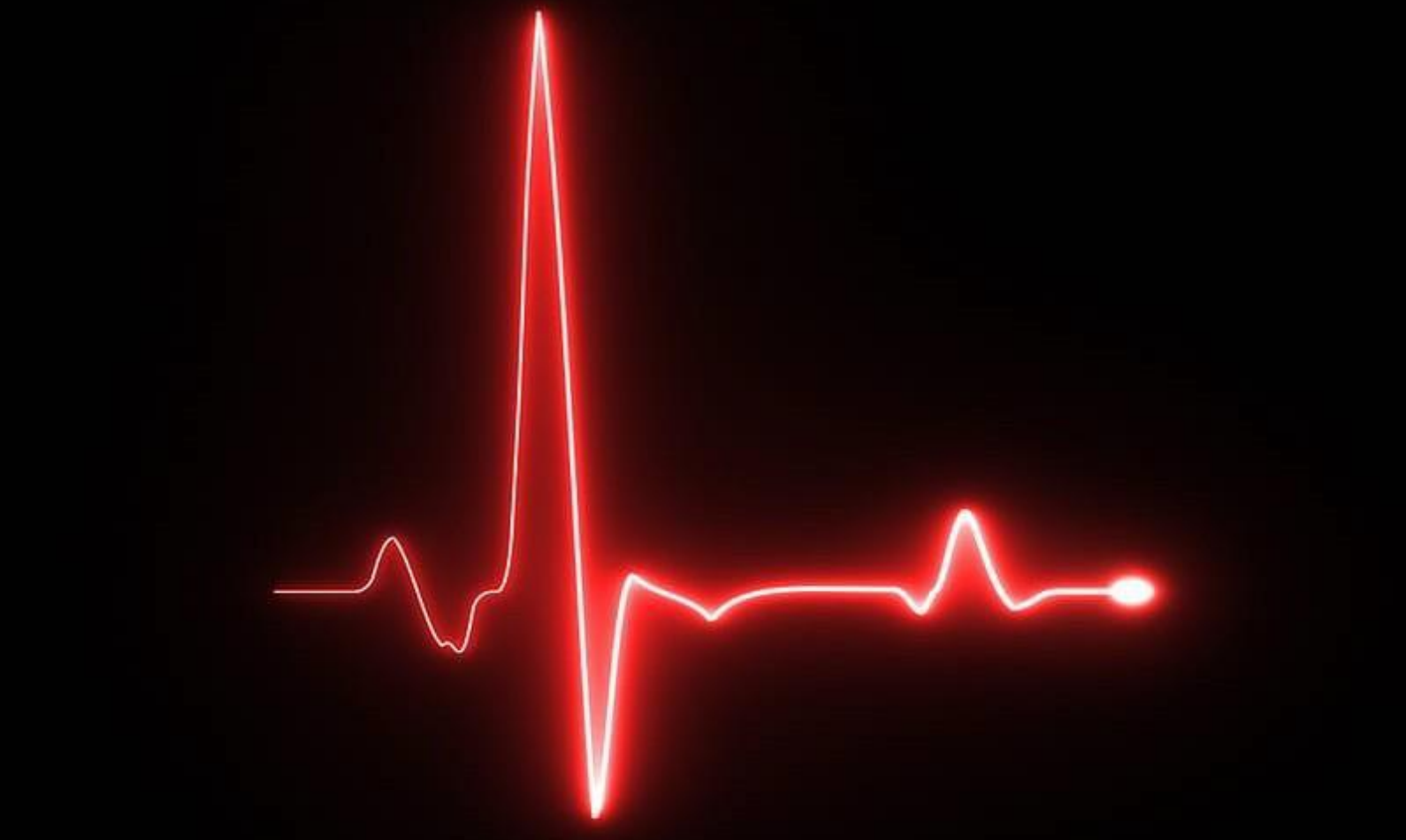
THE PULSE

NEWSLETTER
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING



Vision

To emerge as a centre of academic excellence in the field of Electronics & Communication Engineering to address the dynamic needs of the industry upholding moral values.

Mission

- Impart in-depth knowledge in Electronics & Communication Engineering to achieve academic excellence.
- Develop an environment of research to meet the demands of evolving technology.
- Inculcate ethical values to promote team work and leadership qualities befitting societal requirements
- Provide adaptability skills for sustaining in the dynamic environment

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Memristor – The Fourth Fundamental Element

Memristor (an abbreviation of MEMory ResISTOR), is the fourth fundamental circuit element (joining the resistor, the capacitor and the inductor), to postulate the missing link between flux and charge (as shown in Fig.). It is a passive two-terminal electronic device whose behaviour is described by a nonlinear constitutive relation between the voltage drop at its terminal and the current flowing through the device. Memristor is substantially different from the other fundamental circuit elements as when the applied voltage is turned off, it still remembers how much voltage was applied before and for how long; thus, presenting memory of its past. This innovative device attracted most of attention worldwide only after 2008 when its practical implementation was announced by Hewlett-Packard (HP), originating intense research activity ever since.

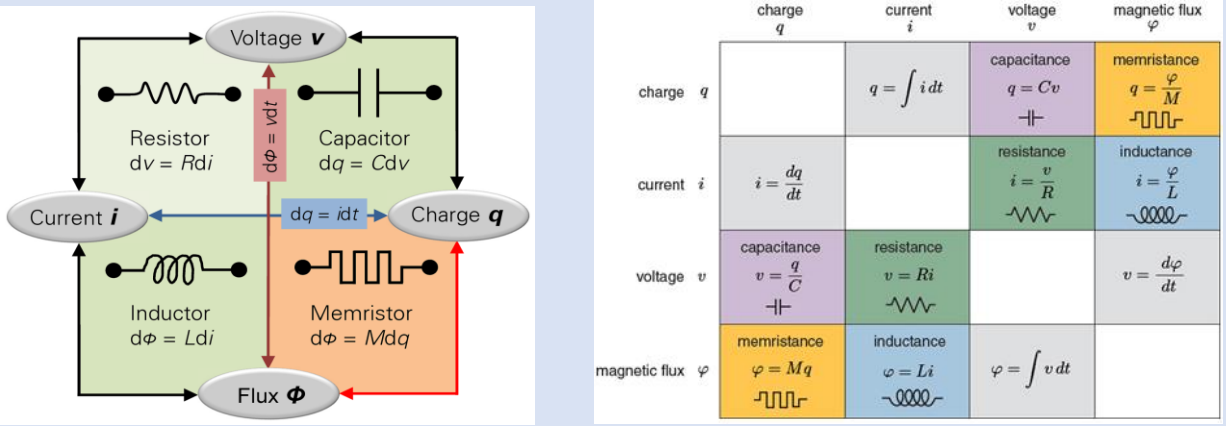

Fig. Relation between fundamental circuit elements.

Properties of Memristors

A memristor is characterized by its memristance, a fundamental property that links the charge (Q) and magnetic flux (Φ) across the device. Unlike conventional resistors, which have a fixed resistance value, the memristor's resistance depends on the history of the charge passing through it. As more charge is accumulated, the memristor's resistance changes accordingly, making it an ideal candidate for memory storage and synaptic-like behaviour.

Applications of Memristors

Memristors are a promising new technology with a wide range of potential applications. As research into memristors continues, it is likely that we will see even more innovative and exciting applications for this technology in the future.

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Here are some of the current and potential applications of memristors:

1. Non-Volatile Memory: Memristors are promising candidates for next-generation non-volatile memory devices. They can efficiently retain data even without a continuous power supply. This property opens up new avenues for developing faster, energy-efficient, and high-density memory technologies, like resistive random-access memory (ReRAM).

2. Neuromorphic Computing: Inspired by the brain's neural networks, neuromorphic computing aims to mimic human brain functionalities. Memristors are particularly suited for this application due to their ability to emulate synaptic behavior, enabling the creation of artificial neural networks with lower power consumption and improved learning capabilities.

3. Analog Computing: Memristors can be utilized in analog computing systems, which excel at solving complex differential equations and optimization problems. These systems offer high computational efficiency for specific tasks and have potential applications in fields such as optimization, control systems, and machine learning.

4. Reconfigurable Circuits: Memristors can be used to create reconfigurable circuits that adapt their functionalities based on past experiences. Such circuits find applications in adaptive systems, where the component behaviour can change dynamically in response to varying conditions or tasks.

5. Energy Storage and Harvesting: Memristors can be employed as energy storage elements in electronic circuits, allowing for efficient energy harvesting and storage systems in various portable devices and renewable energy systems.

6. Hardware Security: Memristors offer a unique platform for hardware-based security applications. Their ability to retain data even when power is off can be exploited to design secure and tamper-resistant memory and cryptographic devices.

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Concluding Remarks

The memory-resistor devices show promise in revolutionizing computing architectures, memory technologies, and artificial intelligence systems. While some applications are already being explored, there are undoubtedly many more innovative and transformative uses for memristors yet to be discovered. As researchers continue to explore and optimize this novel technology, the full extent of memristor applications will likely become increasingly evident, ushering in a new era of electronics and computing.

- Dr. Vikash Kumar

Assistant Professor
ECE department

EVENTS

Highlights of the Month

- Organized Departmental level orientation session for the academic year 2023-2024 for 3rd and 5th semester students, held on 24-06-2023
- Organized Strategic Planning(SP) for the academic year 2023-2024 in the departmental level, held on 27-06-2023.
- Eight students from the department undergone vocational training at 515 Army Base Workshop, Bengaluru during 17 May 2023 to 16 June 2023.
- Department Faculty meeting with the primary agenda on academic related matters for held on 16-06-2023.
- Prof. Arunraja A., Dr. Jyotirmoy Pathak, and Prof. Senthilnathan S. are appointed as Assistant Professor in the Department of ECE during the academic year 2022-2023.
- Dr. Jesuwanth Sugesh R. G. published an article titled “Design and performance analysis of eight channel demultiplexer using 2D photonic crystal with trapezium cavity” in Journal of Optics, June 2023.

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Kindly share your thoughts and research experiences via e-mail to our team, and be featured in next month's is