DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

RISE-MAGAZINE

Recent Innovations In Sophisticated Electronics

INSIDE THIS ISSUE:

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ECE

DEPARTMENT PROFILE

Electronics and Communication Engineering has emerged as the major driving force in the present day Information Technology revolution. It is acting as a bridge between different disciplines of engineering and technology. It has penetrated into other prominent sectors such as health care, instrumentation, agriculture, automation, signal processing, remote sensing etc.., The recent developments such as IoT, Artificial Intelligence and the mercurial advancements in the field of communication.

Vision

To be a focal centre for academic excellence in competing global standards and dynamics in the field of Electronics and Communication Engineering with research and services focusing on effective communication skills, entrepreneurial, ethical and social concern.

Mission

To impart quality technical education in Electronics and Communication Engineering with well established infrastructure, state- of- the art laboratories, core instructions and cognizant faculty.

To prepare the young and dynamic Electronics and Communication Engineers professionally deft and intellectually adept with knowledge, behaviour and information competency.

To enable the learners for changing trends in the field of Electronics and Communication Engineering with a focus on career guidance, placements and higher education by Industry-Institute relationship.

PROGRAM EDUCATIONAL OBJECTIVES

PEO 1. Graduates should be cognizant in basic science, fundamental engineering stream along with core related domains in ECE and Allied fields.

PEO 2. Graduates should understand issues related to design, problem solving, and intellectually adept with knowledge, behavior and information competency.

PEO 3. Graduates should demonstrate their technical, communication, research, aptitudes along with leadership skills in professional environment to empower employability, higher education and entrepreneurs successfully through industry-institute interaction.

PEO 4. Graduate should be motivated with high ethical, human values and team work towards development of the societ.

PROGRAM OUTCOMES

ENGINEERING KNOWLEDGE: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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.

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.

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.

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.

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.

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.

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

INDIVIDUAL AND TEAM WORK: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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.

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.

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

PSO 1. An ability to get an employment in Electronics and Communication Engineering field and related industries and to participate & succeed in competitive examinations like GRE, GATE,TOEFL, PSUs, etc.

PSO 2. Should be able to design and test various electronic systems that perform analog and digital processing functions.

Molecular Electronics

Will silicon technology become obsolete in future like the value technology done about 50 years ago? Scientists and technologists working in anew field of electronics, known as molecular electronics is a relatively new field, which emerged as an important area of research only in the 1980's. It was through the efforts of late professor Carter of the U.S.A that the field was born.

Conventional electronics technology is much indebted to the integrated circuit (IC) technology. IC technology is one of the important aspects that brought about a revolution in electronics. With the gradual increased scale of integration, electronics age has passed through SSI (small scale integration), MSI (medium scale integration), LSI (large scale integration), and ULSI (ultra large scale integration). These may be respectively classified as integration technology with 1-12 gates, 12-30 gates, 30-300 gates, 300-10000 gates, and beyond 10000 gates on a single chip.

The density of IC technology is increasing in pace with Famous Moore's law of 1965. Till date Moore's law about the doubling of the number of components in an I.C every year holds good. He wrote in his original paper entitled 'Cramming More Components Onto Integrated Circuit ', that, "the complexity for minimum component costs has increased at the rate of roughly a factor of 2 per year. Certainly, over the short term, this rate can be expected to continue, if not to increase. Over the longer term, the rate of increase is a bit more uncertain, although there is no reason to believe that it will not remain constant for at least ten more years.

It is now over 30 years since Moore talked of this so called technology-mantra. It is found that I.C's are following his law and there is a prediction that Moore's law shall remain valid till 2010.the prediction was based on a survey of industries and is believed to be correct with research of properties of semiconductors and production processes. But beyond ULSI, a new technology may become competitive to semiconductor technology.

This new technology is known as Molecular electronics. Semiconductor integration beyond ULSI, through conventional electronic technology is facing problems with fundamental physical limitations like quantum effects etc. Molecular based electronics can overcome the fundamental physical and economic issues limiting Silicon Technology.

For a scaling technology beyond ULSI, prof. Forest Carter put forward a novel idea. In digital electronics, 'YES' and 'NO' states are usually and respectively implemented and/or defined by 'ON' and 'OFF' conditions of a switching transistor. Prof. Carter postulated that instead using a transistor; a molecule (a single molecule or a small aggregate of molecule) might be used to represent the two states, namely YES & NO of digital electronics.

For e.g. one can use positive spin & negative spin of a molecule to represent respectively 'YES' & 'NO' states of binary logic. As in the new concept a molecule rather than a transistor is proposed to be used, the scaling technology may go to molecular scale.

It is therefore defined as MSE (molecular scale electronics). MSE is far beyond the ULSI technology in terms of scaling. In order to augment his postulation Prof. Carter conducted a number of international conferences on the subject. The outcome of these conferences has been to establish the field of molecular electronics. **----- 20BF1A04B0- K Hema**

Mobile IP

While Internet technologies largely succeed in overcoming the barriers of time and distance, existing Internet technologies have yet to fully accommodate the increasing mobile computer usage. A promising technology used to eliminate this current barrier is Mobile IP.

The emerging 3G mobile networks are set to make a huge difference to the international business community. 3G networks will provide sufficient bandwidth to run most of the business computer applications while still providing a reasonable user experience.

However, 3G networks are not based on only one standard, but a set of radio technology standards such as cdma2000, EDGE and WCDMA. It is easy to foresee that the mobile user from time to time also would like to connect to fixed broadband networks, wireless LANs and, mixtures of new technologies such as Bluetooth associated to e.g. cable TV and DSL access points.

In this light, a common macro mobility management framework is required in order to allow mobile users to roam between different access networks with little or no manual intervention. (Micro mobility issues such as radio specific mobility enhancements are supposed to be handled within the specific radio technology.) IETF has created the Mobile IP standard for this purpose.

Mobile IP is different compared to other efforts for doing mobility management in the sense that it is not tied to one specific access technology. In earlier mobile cellular standards, such as GSM, the radio resource and mobility management was integrated vertically into one system. The same is also true for mobile packet data standards such as CDPD, Cellular Digital Packet Data and the internal packet data mobility protocol (GTP/MAP) of GPRS/UMTS networks. This vertical mobility management property is also inherent for the increasingly popular 802.11 Wireless LAN standard.

Mobile IP can be seen as the least common mobility denominator - providing seamless macro mobility solutions among the diversity of accesses. Mobile IP is defining a Home Agent as an anchor point with which the mobile client always has a relationship, and a Foreign Agent, which acts as the local tunnel-endpoint at the access network where the mobile client is visiting. Depending on which network the mobile client is currently visiting; its point of attachment Foreign Agent) may change. At each point of attachment, Mobile IP either requires the availability of a standalone Foreign Agent or the usage of a Co-located care-of address in the mobile client itself.

The concept of "Mobility" or "packet data mobility", means different things depending on what context the word is used within. In a wireless or fixed environment, there are many different ways of implementing partial or full mobility and roaming services.

The most common ways of implementing mobility (discrete mobility or IP roaming service) support in today's IP networking environments includes simple "PPP dial-up" as well as company internal mobility solutions implemented by means of renewal of IP address at each new point of attachment. The most commonly deployed way of supporting remote access users in today's Internet is to utilize the public telephone network (fixed or mobile) and to use the PPP dial-up functionality. **----- 20BF1A04C3- N Nandini**

Line-Reflect-Reflect Technique

LRR- LINE REFLECT REFLECT is a new self-calibration procedure for the calibration of vector network analyzers (VNA). VNA measure the complex transmission and reflection characteristics of microwave devices. The analyzers have to be calibrated in order to eliminate systematic errors from the measurement results.

The LRR calibration circuits consist of partly unknown standards, where L symbolizes a line element and R represents a symmetrical reflection standard. The calibration circuits are all of equal mechanical length. The obstacle, a symmetrical-reciprocal network is placed at three consecutive positions. The network consists of reflections, which might show a transmission. The calibration structures can be realized very easily as etched structures in microstrip technology.

During the calibration [G], [H], which represents the systematic errors of the VNA is eliminated in order to determine the unknown line and obstacle parameters.

MICROWAVE DEVICES

Microwave devices are devices operating with a signal frequency range of 1-300GHz. A microwave circuit ordinarily consists of several microwave devices connected in some way to achieve the desired transmission of a microwave signal.

The various microwave solid state devices are,

*** Tunnel diodes**

These are also known as Esaki diodes. It is a specially made PN junction device which exhibits negative resistance over part of the forward bias characteristic. Both the P and the N regions are heavily doped. The tunneling effect is a majority carrier effect and is very fast. It is useful for oscillation and amplification purposes. Because of the thin junction and shot transit time, it is useful for microwave applications in fast switching circuits.

Transferred electron devices

These are all two terminal negative resistance solid state devices which has no PN junction. Gunn diode is one of the transferred electron devices and which works with the principle that there will be periodic fluctuations in the current passing through an n-type GaAs substrate when the applied voltage increases a critical value i.e. 2-4Kv/cm.

Intelligent reflecting surface (IRS) is an enabling technology to engineer the radio signal prorogation in wireless networks. By smartly tuning the signal reflection via a large number of low-cost passive reflecting elements, IRS is capable of dynamically altering wireless channels to enhance the communication performance. It is thus expected that the new IRS-aided hybrid wireless network comprising both active and passive components will be highly promising to achieve a sustainable capacity growth cost-effectively in the future. Despite its great potential, IRS faces new challenges to be efficiently integrated into wireless networks, such as reflection optimization, channel estimation, and deployment from communication design perspectives. In this paper, we provide a tutorial overview of IRS-aided wireless communication to address the above issues, and elaborate its reflection and channel models, hardware architecture and practical constraints, as well as various appealing applications in wireless networks. Moreover, we highlight important directions worthy of further investigation in future work.

----- 20BF5A0415- Shaik Ijaj Ahmed