



IMPULSE

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Smart Grid and Communications Infrastructure

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India an emerging economic power house with a population in excess of a billion people is the fourth largest electricity producing country with the anticipated generation capacity exceeding 2,25,029 MW annually. However, its per capita energy consumption of 500kwh is rather low according to the UN human development index as a function of the annual per capita energy usage. With rapid economic growth, this per capita energy consumption is projected to grow multifold and India is in a position to provide sustainable energy for all. India's Accelerated power Development & restructuring Program (APDRP) promoted in 2003 with a mission to reduce Accumulated Technical & Commercial

losses up to 15% every five year period has not achieved its intended goal [1]. The main draw-back is an inefficient distribution network with poor accountability. India can become energy secure if the power grid were to become smart with expected changes in our energy generation, distribution and utilization. This need for energy security will see an explosive and indigenous growth for the domestic power industry, communication industry and information technology industry.

What is the present status of our Power Grid?

The utility of today uses mostly outdate electro-mechanical switches on the distribution side



Fig 1. Modern Electric Grid with limited real-time monitoring and control capability

with heavy usage of old radio technologies, very few sensors to track the status or health of the grid and very limited automation. The modern electric grid has shown in figure 1 has very limited real-time monitoring and control capability.

What is Smart grid though?

Smart grid when truly implemented and becomes fully operational should be able to incorporate measurements and diagnostics to monitor health of the grid and provide feedback to the grid operators, re-route power flow to respond to changing energy demands, enable distributed energy providers including renewable energy to connect to the grid and enable the load, detect and in real-time self-heal with emerging grid problems, and use modern infrastructure (power transmission, communication infrastructure, smart electronics and appliances, and

Advanced Metering Infrastructure (AMI)) to stay connected with the end user including industrial, Commercial and Residential customers.

Smart grid and advanced metering infrastructure are capable of going far beyond the traditional meter-to-cash applications to data mining metered data for demand prediction; improve the operation and management of the electric distribution grid, health monitoring of electrical infrastructure and communication infrastructure, integrated renewable energy in to the grid, storage of excess energy at consumer end, microgrids for better utilization of locally generated distributed power, and consumer choice on power utilization based on differential pricing.

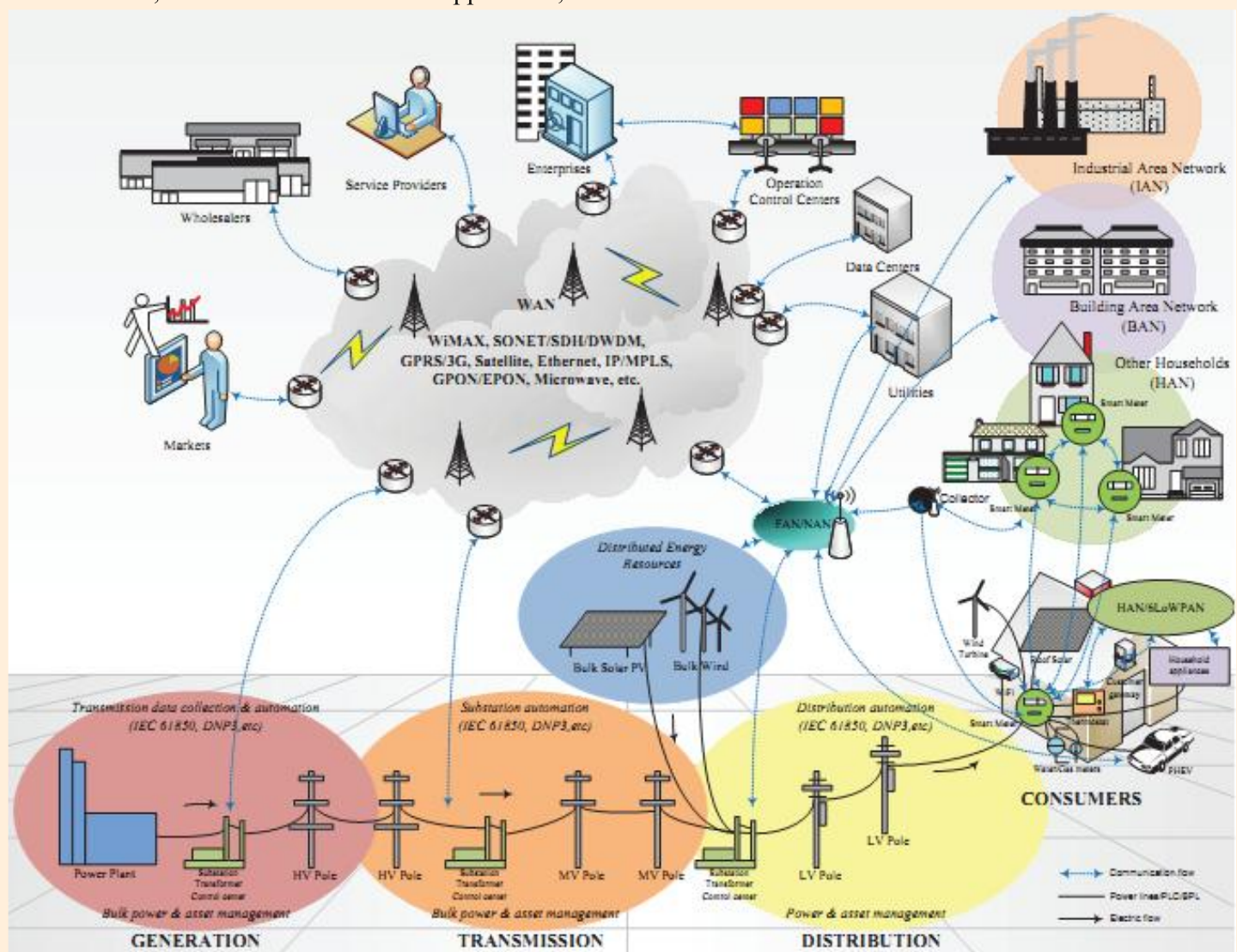


Fig 2. Smart Grid Communication Infrastructure [2]

Where is Communication Infrastructure relevant for Smart Grid?

Smart grids heavily depend on communication infrastructure to coordinate the generation, distribution, and consumption of energy. With precedence given to aggregating power from renewable energy sources and distributed power plants to form a virtual power plant, the dependence on communication infrastructure becomes even more pronounced as shown in figure 2. Every single virtual power plant in a given area for its existence and operation will require appropriate control strategies and appropriate communication infrastructure to exchange information and coordinate the actions of the participants.

During power distribution, the load peaks generated by consumers during the day are a critical issue because they demand the existence of quick and available power reserves. These peak loads can be generated by commercial and residential customers as industrial users have a pre-defined energy budget. Hence, predicting energy utilization, measure real-time energy utilization, and monitor and control the distribution network according to power flow becomes critical.

Distribution side requires reliable communication between smart energy meters, substation controllers, power plant control rooms, and data acquisition centers for predicting demand and aggregating billing. Demand Side Management (DSM) Systems are burdened with providing seamless

connectivity between the communication partners: the customers, utility companies providing the energy, and grid operators. Figure 3 depicts the physical layers, communication and control systems that are part of a smart grid.

Even though there is an understanding of the technology enablers for smart grid, there is no one communication standard or equipment or algorithm that is seen to be the Holy Grail to conquer smart grid. Communication topologies investigated included peer-to-peer (relevant for low-level demand side management), and multiclient/multiserver scenario infrastructure to retrieve and update data on diverse and distributed clients.

Expected features for the communication infrastructure for enabling smart grid include

- High reliability and availability for almost all communication systems used
- Density of coverage and distance of transmission
- Service and very high density of communication nodes (end customer with smart meter each)
- Quality-of-service for all classes of data including metering, control and critical advisories
- Network robustness and security to prevent sabotage, maintain grid integrity and secure grid and client data
- Deployment and maintenance of distributed communication infrastructure
- Efficient management of redundant infrastructure that which was installed for time-critical and exceptional situations

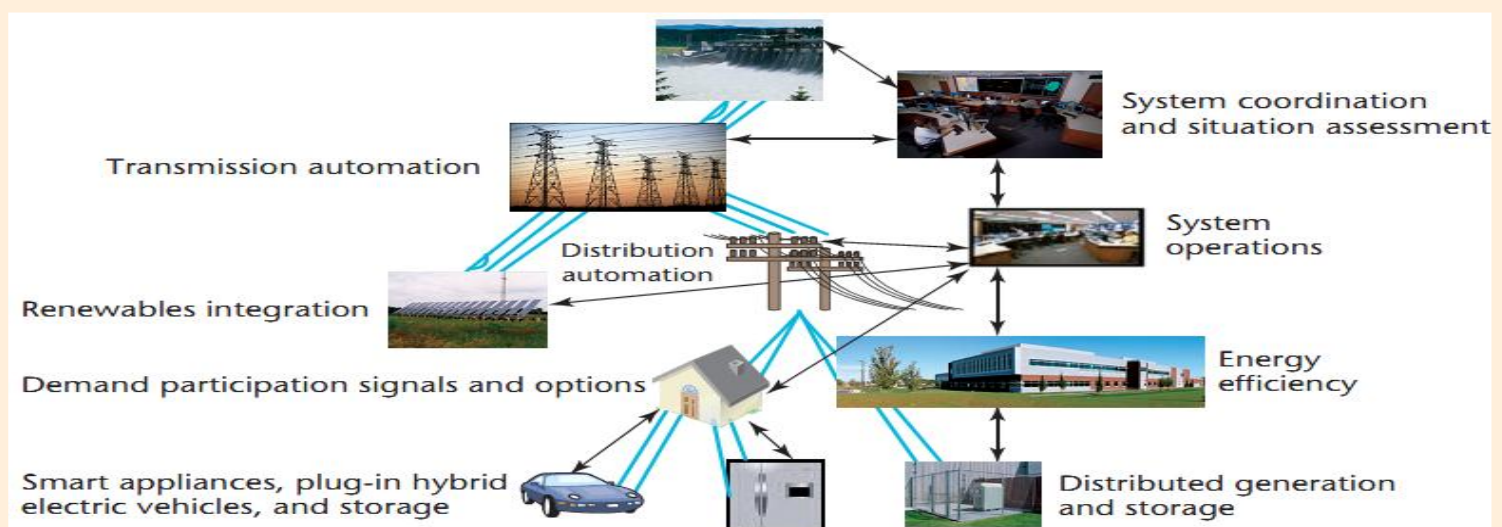


Fig 3. Smart Grid: Physical Layers, Communication and Control Systems [3]

Driver and Challenges for Smart Grid

The main challenges can be classified broadly as aging infrastructure and adapting to advanced technologies. The drivers are of course the achieve/integrate policy decision of a country. Then the challenges apart from the above two will now include regulatory changes, cost, complexity of the system and achieving projected target within the requisite timeline. Figure 4 gives an elaborate picture of all the characteristics and requirements envisioned for it to be efficient in every way possible.

Strategies for Building smart grid

If any country is willing to implement smart grid for managing its power from generation to distribution, they would definitely need to strategize on their priorities, policies and technology enablers listed below,

- Finalize on inter-operable standards that can be adopted for both power network and communications network
- Advancement of electric power technologies and assets
- Adequacy of communications technologies adoption, especially for distribution automation and management
- Smart metering and home energy management systems
- Effective and secure communications
- Development and integration of renewable energy sources and distributed generation
- Smart practical and ancillary data and control management

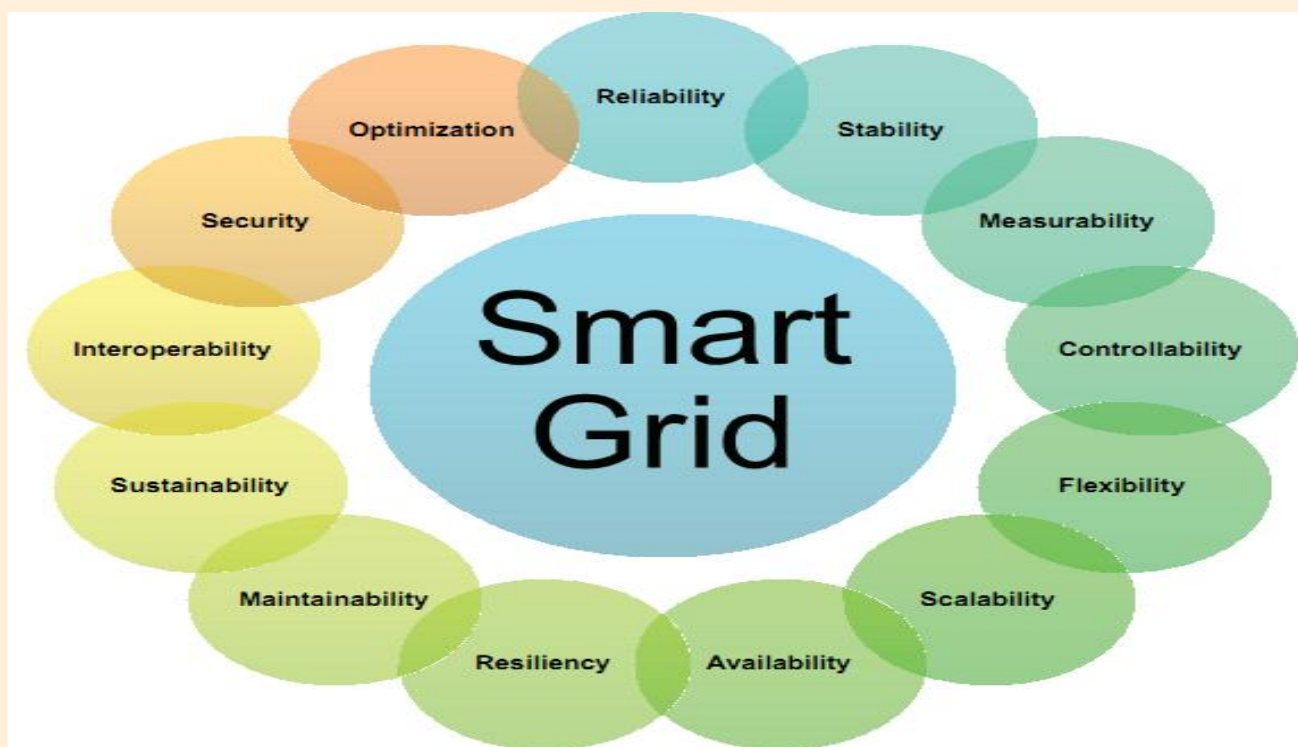


Fig 4. Smart grid Characteristics and requirements [3]

References

1. Restructured Accelerated Power Development and Reforms Programme, An initiative of Ministry of Power, Govt. of India, URL: <http://www.apdrp.gov.in/>
2. Chun Hao, Nirwan Ansari (2012), "The progressive smart grid system from both power and communications aspects", IEEE Communications Surveys & Tutorials, vol. 14, no. 3, pp. 799-821
3. Himanshu Khurana, Mark Hadley, Ning Lu, Deborah A. Frincke (Jan.-Feb. 2010), "Smart-Grid Security Issues," IEEE Security & Privacy, vol. 8, no. 1, pp. 81-85

FACULTY NEWS

RESEARCH NEWS

Research is inevitable for any nations' development. Energetic minds of our departments are continuously contributing for research. Following are the highlights of our department research activities.

Dr. S. Radha, Professor & Head, and Mr. S. Sakthivel Murugan, Asst. Professor, successfully completed the project funded by NIOT and delivered the hardware developed on "Adaptive filter to improve SNR due to wind driven ambient noise in shallow water" to Ocean Acoustics Department on 7th Feb. 2013.

To further motivate research among students and faculty members, Dr. C. P. Ravikumar, Technical Director, Texas Instruments University Program, India visited our campus under university programme scheme and delivered a lecture on "High-performance and Low-cost Embedded Systems using TI Embedded Processors and Analog" on 24th April 2013. In continuation to this, TI India University Program jointly with Cranes Software International Ltd., has signed Memorandum of Understanding with SSN College of Engineering to setup a "Texas Instruments Embedded Systems Lab" and "Texas Instruments Analog Systems Lab" and provided hardware and software with worth Rs. 2,00,000.

To impart good quality higher education for conducting advanced research, our department has applied for Department of Science and Technology - Fund for Improvement of Science & Technology Infrastructure (DST - FIST) in Higher Educational Institution Scheme, to get higher end research equipments.

Dr. R. Kishore, Associate Professor, recognized as a supervisor (Ref. No. 21.04.09) for guiding PhD and MS scholars of Anna University under the faculty of Information and Communication

Engineering. His area of specialization is Security issues in Wireless Sensor Networks.

Dr. A. Jawahar, Professor, recognized as a supervisor (Ref. No. 21.04.47) for guiding PhD and MS scholars of Anna University under the faculty of Information and Communication Engineering. His area of specialization is Wireless Sensor Networks.

Ms. N. Edna Elizabeth, Associate Professor, submitted her Ph. D Thesis titled "Studies on Multiple Attacks and Secure Routing for Mobile AD HOC Networks" for evaluation and the award of Ph. D. degree.

TECHNICAL INTERACTION WITH INDUSTRY

To bridge the gap between the industrial technical requirement and student curriculum, our department continuously interacts with industries in terms of technical lectures and industrial visits. To list a few:

- Mr. S. Rajagoplan, Design Engineer, GE Health Care delivered a lecture on "Introduction to MRI and Current Trends" on 15th Feb. 2013.
- Mr. Ganesh Balasubramanian, Manager, Amphenol Antenna solutions, interacted with students on "Importance of antenna design in base station wireless infrastructure" on 27th Feb. 2013.
- Mr. Gurjeet Singh, Managing Director, Gill Instruments, gave a speech on "Embedded Systems Designs Using System on Chip (MSP430)" on 14th Mar. 2013.
- Ms. Sheela Mangalam, an independent RF consultant delivered a talk on "Reconfigurable Radio Systems" on 14th Mar. 2013.
- Dr. S. Radha, Dr. R. Jayaparvathy, Dr. R. Kishore and Mr. S. Joseph Gladwin visited Tata Elxsi, Chennai and interacted with Mr. Jeyandran and Mr. P. Karthikeyan for research opportunity on 1st Apr. 2013.

TECHNICAL PRESENTATIONS

Apart from the regular teaching and tutoring, our faculty members actively took part in many technical events in other institutions. Our department faculty members presented technical articles, gave invited talks etc. To name a few:

- Dr. Premanand Chandramani, Professor, delivered a lecture titled "Reconfigurable Architectures" as a part of 3-day faculty development program on "Recent Advances in Computer Architecture" on 16th Feb. 2013 organized by Department of CSE, SSNCE. He also delivered a seminar on "Recent Trends in Electronics Engineering" on 27th Feb. 2013 at Sri Lakshmi Ammal Engineering College, Chennai.
- Dr. R. Jayaparvathy, Professor, gave an expert lecture on "Modelling of wireless systems" in TEQIP sponsored faculty development program conducted by Govt. College of Technology, Coimbatore on 18th Feb. 2013.
- Mr. S. Sakthivel Murugan, Asst. Professor, delivered a guest lecture on "Underwater Acoustic Communications" at Anna College of Engineering and Technology, Panruti on 18th Feb. 2013.
- Dr. K. T. Selvan, Professor, delivered a talk entitled "The road to writing better papers" in the National Conference on "Emerging Trends in Information and Communication Technologies" organized by the Department of ECE, SSNCE on 10th Apr. 2013.
- Dr. S. Radha, Professor, delivered a invited lecture titled "Cyber Physical System : Application and Challenges" on second National Conference on "Communication and Technologies" on 5th Mar. 2013 at Sathyabama University, Chennai.
- Dr. Premanand Chandramani, Professor, delivered a special talk titled "Is smart grid the solution for today's power woes in India?" as chief guest for the second National Conference on "Emerging trends in Electrical and Electronics Engineering" on 8th Mar.

2013 organized by Dhanalakshmi Srinivasan College of Engineering & Technology.

- Dr. N. Venkateswaran, Professor, chaired a Conference session at the International Conference on Bio-signals, Images and Instrumentation on 14th Mar. 2013 conducted by the Department of Biomedical Engineering, SSNCE.
- Dr. R. Kishore, Associate Professor, delivered a speech on "Security Issues in Wireless Sensor Networks" in two day National level seminar on "Advances in Wireless Communication" organized by Department of ECE, SSNCE on 16th Mar. 2013.
- Mr. N. Prabagarane, Asst. Professor, delivered a speech on "Transmitter pre-processing for MIMO and Challenges in Wireless Communication" in two day National level seminar on "Advances in Wireless Communication" organized by Department of ECE, SSNCE on 16th Mar. 2013.
- Dr. M. Ramakrishnan, Professor, served as the guest of honour for the conference on "Wireless Communications & Networking" and delivered a talk on "Importance of Wireless Communication" at Dhanalakshmi Srinivasan College of Engineering & Technology, Mahabalipuram on 13th Mar. 2013.

CONFERENCES, WORKSHOPS & SHORT TERM COURSES

As a part of continuing education programme, our department has organized many workshops, seminars, and short term courses to the faculty members and student community. For the benefit of researchers our department organized one day seminar on "RF Technologies, Measurements and Applications" on 3rd Jan. 2013 in association with Agilent Technologies and Elmac Engineering.

Two day seminar on "Advances in Wireless Communication" was organized by our department during 15th and 16th Mar. 2013. Dr. V. Prithivraj, Former Principal, Pondicherry Engineering College delivered a lecture on "Diversity Techniques in

Broadband Wireless Communication Systems". Mr. P. D. Selvam, Telecom Paris Tech, Eurocom, France, delivered a lecture on "Co-existence of LTE and DVB". Dr. M. D. Selvaraj, Asst. Professor, IIIT D&M-Chennai, delivered a technical talk on "Cooperative Communications".

Our department organized a National Conference on "Emerging Trends in Information and Communication Technologies (NCETICT2K13)" on 10th Apr. 2013. Dr. A. Jawahar and Mr. C. Thiruvankatesan coordinated the conference.

The conference was presided by Col (Retd) K. Shakravarthi, Chairman, Chennai Centre, IETE and delivered an inaugural address titled "Recent trends in communication technologies". Prof. K. T. Selvan and Prof. Premanand Chandramani presented a keynote address on "The Road to writing better papers" and "Communication Infrastructure for Smart Grid" respectively. Nearly, 100 papers were received from all over the state in various areas of Communication Engineering. After thorough review process only 33 quality papers were accepted for presentation.

AWARDS & ACHIEVEMENTS

Congratulations to **Dr. P. Vijayalakshmi**, Professor, ECE Department, who has been elected as "Fellow, The Institution of Electronics and Telecommunication Engineers" (India) in the year 2013.



Congratulations to **Dr. K. T. Selvan** Professor, ECE Department, who has been elected as the founding Chair of IEEE Antennas and Propagation Society, Madras Chapter.

WELCOME OUR NEW FACULTY

M. Gulam Nabi Alsath has joined as Asst. Professor in the ECE department in June 2013. He obtained his B.E., and M.E., degree from Anna University, Chennai with University 3rd rank in UG and Gold Medal in PG. Prior to SSN, he was working with Dhaanish Ahmed College of Engineering, Chennai for two years. He is currently working towards his Ph.D in the area of Antenna Engineering. His research interests include UWB systems, Microwave components and Circuits, Antennas, Signal integrity in Planar Transmission Lines, Frequency Selective Surfaces and RFID systems. He has filed a patent titled "Dual Band Notched Dielectric Resonator Reflectarray for C/X Bands" through Center for Intellectual Property Rights, Anna University, Chennai in the year 2012. He has authored 4 international journals and received acknowledgements in research articles published in IEEE and PIER.



FACULTY RESEARCH HIGHLIGHTED ON JOURNAL COVERS

Our faculty members and research scholars jointly published their research work in various refereed National & International journals and conference proceedings.

- S.Ganesh, and R. Amutha," have published their research work titled "Application of wireless sensor network through efficient and secure routing protocol" in i-manager's journal of wireless communication network, Vol. 1, No.3, Dec. 2012.



- K.R. Jaya Kumar, and S. Hanis have published a paper titled "Speckle Noise Reduction of SAR Images using Hybrid GMAP- Median Filter" in International Journal of Advanced and Innovative Research, Vol.2, Issue 3, Mar. 2013.

- D. Godwin Jacob, and S. Karthika, have published their research work titled "Performance analysis of MAC protocols in underwater communication by using optimum packet size" in International Journal of Advanced and Innovative Research, IJAIR 2013, Vol.2, Issue 3, pp.584-590, Mar. 2013.

- M. Kamesh and S. Karthika, published a paper titled "Performance improvement in underwater wireless sensor networks using MFBR technique with error control coding" in International Journal of Advanced and Innovative Research, IJAIR 2013, Vol. 2, Issue 3, pp. 602-606, Mar. 2013.



- K. Muthumeenakshi and S. Radha have published their research work titled, "Distributed Cognitive Radio Spectrum Access with Imperfect Sensing Using CTMC," in International Journal of Distributed Sensor Networks, Vol. 2013, Article ID 257801, 11 pages, doi:10.1155/2013/257801 Apr. 2013.

STUDENTS' CORNER

The young minds of our department are always encouraged, inspired and mentored by our faculty members to show their talents in various fields. They bring laurels to the department and to the institution as well. Three cheers to all our young achievers!!!

TECHNICAL ACHIEVEMENTS

A project exhibition displaying the projects executed by final year B. E. was organized in our department on 18th Apr. 2013. The expenses for the exhibition were covered under the AICTE grant - Industry-Institute Partnership Cell Scheme. Dr. Bama, Project Engineer, Tata Elxsi Limited, evaluated the displayed projects and the following projects are short-listed for cash awards. **Congratulations to all the winners**

Cash Award	Project Title	Students	Project Guide
First Prize Rs 4,000	Detection of Glaucoma using Retinal Fundus Images	Jaison Moses.W GowriShankar.V Jeevanantham.K	Mr.I.Nelson
Second Prize Rs 2,000	GPS-GPRS based vehicle tracking and security system	Abinaya.M Ganesan.M Divya.S	Dr.E.Janarthanan
Third Prize Rs 1,000	Design of autonomous surveillance system	Akshay Ramachandran Srinath T.M	Dr.Premanand Chandramani Dr.N.Venkateswaran

- SSN - IETE - Students Forum was formed in the Department of Electronics and Communication Engineering with the membership strength of 70. This Forum was formally inaugurated by Col (Retd) K. Shakravarthi, Chairman, Chennai Centre, IETE, New Delhi on 10th Apr. 2013.



- P. Mangala Kader, III year ECE as a part of NSS activity, participated in the Techfest green campus challenge organized by IIT Bombay between 3rd and 5th of Jan. 2013. He presented the green campus challenge activities of our college and won cash prize of Rs. 13,000.
- Arvindhan sayapathy, Deepak Raj, Ishwarya varshini, Karthik M G, Niranjana Swaminathan, Sudharsana R, and Mangala Kader P of III year ECE students were selected for the CTS summer internship program.
- R. Dhanusuya, T N S Namitha, C Lakshmi, M Lekha, Maribel Monica, and M Madhuryamay of III year ECE were selected for Tata Elxsi - SSN Project Guidance Program for the year 2013-14.
- Abhishek Narendra, and Nithin Krishna of III year ECE have been selected for summer internship at IISc Bangalore and IIT Hyderabad respectively through Indian Academy of Science.
- Nanda kishore P, III year ECE got selected for summer internship at IIT Madras.

All the best to the interns for their successful completion of internship

SPORTS ACHIEVEMENTS

- N. Shankar, Final year ECE, secured gold medals in Hammer throw event in the Anna University Inter Zone-3 Athletic meet held at Kongu Engineering college during 5th - 7th Jan. 2013.
- Susmitha, I year ECE, won silver medal in the 50m free style swimming event in the Chief Minister Trophy organized by Sports Development Authority of Tamilnadu on 20th Jan. 2013 She received a cash prize of Rs. 75,000/-.
- K. Suneri, final year ECE, participated in the senior national ranking badminton tournament held at Hyderabad during 24th - 27th Jan. 2013.
- R. Bharath, I year ECE, participated in the 11th Delhi International Chess open Tournament held at Delhi during 4th - 13th Jan. 2013.
- Gokula Lakshmi, I year ECE, as part of Anna University Badminton team, participated in the south zone inter University tournament at Kakinada during 8th - 12th Jan. 2013.

SERVICE TO THE COMMUNITY

- Ms. P. Kaythry, Asst. Professor, and Mr. W. Jino Hans, Asst. Professor, organized NSS annual special camp between 28th Jan. and 3rd Feb. 2013 at Echengadu village near Thiruporur. Fifty NSS volunteers participated and organized free medical camps, veteniary camp, tree plantation programme , etc.
- Mr. S. Joseph Gladwin, Asst. Professor conducted a three day YRC village camp at siruthavur village between 29th and 31st Jan., 2013. YRC volunteers organized AIDS awareness programme and free eye camp to the villagers.

PLACEMENT RECORDS

The Department of ECE has got an excellent placement record. In batch 2009-13, out of 133 UG students 91 are placed in highly reputed companies such as Exeter, Ericsson, Ford Tech, Lister Tech, Infosys, Zoho, CTS, etc. The salary package for the students ranges between Rs 3,00,000/- and Rs 7,00,000/- PA. The remaining students opted to pursue higher studies in leading universities in India and abroad. Out of 76 PG students in the batch 2011-13, 22 students are placed in companies like CTS, Infosys, HCL and L&T. The remaining students are interested to join as faculty members in various engineering colleges.

FORTH COMING EVENTS

- Two day National Workshop on "Trends & Developments in Signal Processing and its Application" will be conducted between 19th and 20th August, 2013.
- Three Day Faculty Development Program on "Futuristic Wireless Technologies" will be conducted in the month of August/September 2013.
- AICTE Sponsored faculty development program on "Next Generation Wireless Networks & Standards" will be conducted between 9th and 20th Dec. 2013.

This newsletter is produced by the Department of Electronics and Communication Engineering.
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