A Global Initiative of Academic Networks (GIAN)

A one week short term course on

Advanced Electromagnetic Engineering

Sponsored by Ministry of Human Resource Development (MHRD), Govt. of India
Under the Scheme 'GIAN'

(02nd November 2017 to 08th November 2017) @ Dept. of ECE
University College of Engineering, Osmania University, Hyderabad, Telangana- 500 007

Overview

Electromagnetic Engineering is a branch of electrical engineering with innumerable applications in commercial and defense industries. Hence, it is a fundamental and classical subject in the electrical engineering education and requires a thorough understanding to design practical systems. Although the subject is introduced in every undergraduate electrical engineering curriculum, it is only done at a very basic level and not sufficient for handling practical applications. Hence, an advanced course is often required to become a successful engineer and work in the related electromagnetic engineering fields.

Many developments in the past 50 years in electromagnetic engineering is focused on generating and implementing computational tools to accurately predict the radar cross section, antenna radiation field, and other important parameters. Again, a thorough knowledge of these tools is a minimum pre-requisite for the practicing engineer.

In view of the importance electromagnetic engineering for present day applications, an advanced course is proposed and can be made available for students/engineers with a bachelor's degree in electrical engineering to become proficient in this area.

Objectives

The primary objectives of the course are as follows:

1. Exposing participants to the advanced concepts in electromagnetic theory.
2. Building in confidence and capability to solve complex problems related to this area.
3. Providing exposure to practical problems and their solutions by introducing two very important numerical tools viz. Finite Difference Time Domain (FDTD) method and Method of Moments (MOM).

Course Details	Day 1: 02nd November 2017 **Lectures 1 & 2** - Duration 2 hrs: SMR Thorough review of Electromagnetic fundamentals. **Lecture 3** – Duration 1hr: SMR Introduction to Potential theory and general solution of electromagnetic field problems **Lecture 4** - Duration 1 hrs: SMR An introduction to Finite Difference Time Domain (FDTD) method – One dimension Problems. Day 2: 03rd November 2017 **Lecture 5** – Duration 1 hrs: SMR Some fundamental concepts and Theorems **Lecture 6 & 7** – Duration 2 hrs: SMR Guidance of Waves in Rectangular Cross section - Rectangular Wave guides, partially filled waveguides, dielectric slab waveguide

	Lecture 8 - Duration1 hrs: SMR An introduction to Finite Difference Time Domain (FDTD) method – Two and Three dimensional Problems. **Day 3: 04th November 2017** **Lectures 9 & 10** - Duration 2 hrs: SMR Guidance of Waves in Circular Cross section- Circular and radial waveguides **Lecture 11** – Duration 1 hr: SMR Scattering by conducting cylinders. **Lecture 12** - Duration1 hrs: SMR An introduction to method of moments. **Day 4: 06th November 2017** **Lecture 13 &14** – Duration 2 hrs: SMR Scattering by dielectric cylinder and introduction spherical wave functions. **Lecture 15**: - Duration1 hrs: SMR Scattering by conducting sphere. **Lecture 16** - Duration1 hrs: SMR Method of moments applied to two-dimensional problems. **Day 5: 07th November 2017** **Lecture 17** – Duration 1 hrs: SMR Scattering by dielectric sphere. **Lecture 18** – Duration 1hrs: SMR Method of moments applied to wire antenna problems and three-dimensional problems. **Tutorial 1** – Duration 1 hrs: SMR Developing and testing a computer program for one-dimensional FDTD problems. **Tutorial 2** - Duration1 hrs: SMR Developing and testing a computer program for Two-dimensional FDTD problems. **Day 6: 08th November 2017** **Tutorial 3 & 4** – Duration 2 hrs: SMR Developing and testing a computer program for Method of moments wire problems. **Tutorial 5 & 6** - Duration 2 hrs: SMR Developing and testing a computer program for Three-dimensional problems using method of moments.
Who Should Attend	Engineers and researchers from manufacturing service and government organizations including R&D laboratories. Student at all levels (BTech/MSc/M.Tech/PhD) or Faculty from academic institutions and technical institutions.
Fees	The participation fees for taking the course is as follows: **Participants from Abroad : US $500** **Industry/ Research Organizations: Rs. 6,000 /-** **Faculty from Academic Institutions: Rs. 3,000 /-** **Student Participants: Rs. 1,000/-** The above fee includes all instructional materials, tutorials, assignments and internet facility. On request, accommodation will be provided for few participants (on first come first basis) in the campus on payment.
How To Register	**Stage1:** Web (Portal) Registration: Visit GIAN Website at the link: http://www.gian.iitkgp.ac.in/GREGN/index and create login user ID and Password. Fill up blank registration form and do web registration by paying **Rs. 500**/- on line through Net Banking/ Debit/ Credit Card. This provides the user with life time registration to enroll in any no. of GIAN courses offered. **Stage2:** Course Registration (Through GIAN Portal): Log in to the GIAN portal with the user ID and Password created. Click on "Course Registration" option given at the top of the registration form. Select the Course title "Advanced Electromagnetic Engineering" from the list and click on "Save"

	option. Confirm your registration by Clicking on "Confirm Course". Only Selected Candidates will be intimated through E-mail by the Course Coordinator. They have to remit the necessary course fee in the form of DD drawn in favor of "**PRINCIPAL UCE OU COORDINATOR GIAN"** payable at SBI, University College of Engineering, Osmania University, Hyderabad-500 007. OR through NEFT/RTGS: Name of the Beneficiary: The Principal UCE , OU Account Name: **PRINCIPAL UCE OU COORDINATOR GIAN** Name of The Bank: State Bank of India, Osmania University, Hyderabad Beneficiary A/C No: 37072716197 Bank MICR Code: 500002342 IFSC Code: SBIN0020071

Dr. Sadasiva M. Rao: Course Faculty (SMR)

Dr. Rao is well known in the electromagnetic engineering community and included in the Thomson Scientifics' *Highly Cited Researchers List*. This is a rare honor bestowed on the 250 most cited researchers in the world and is considered the most significant award given by any non-partisan group for contributions to a field of research (For details, see the website http://isihighlycited.com/isi_copy/howweidentify.htm). Furthermore, he received the prestigious Best Paper research award from the **SUMMA** foundation, awarded only once every three years for published research. He is the first individual to develop the triangular patch modeling technique that allows for the very accurate numerical solutions of several difficult electromagnetic scattering problems for the first time. These problems include the electromagnetic scattering from arbitrarily shaped conducting, dielectric and composite structures in the frequency domain and time domain.

Dr. Rao is the lead author in the classical 1982 paper on triangular patch modeling of arbitrary bodies. In this work, he developed a set of special basis functions to solve electrodynamics problem, which are popularly known throughout the world as RWG (Rao-Wilton-Glisson, the authors of the paper) functions. A casual Google search of RWG functions result in around 250,000 hits as of now. This paper established the now-standard method for calculating the radar cross section of complex conducting objects. Over the years, he continued to work with RWG functions in conjunction with triangular patch modeling techniques to solve frequency-domain dielectric body problems (1986), frequency-domain composite body problems (1991), time-domain conducting body problems (1991, 1992, 1998), time-domain dielectric body problems (1994, 1999), and cavity-backed aperture problems (1998). His most recent research has focused on using RWG basis functions and Genetic Algorithms to solve electromagnetic optimization problems (2007) and developing alternate techniques to address very large complex electromagnetic problems (2011, 2012).

The impact of Dr. Rao's research on electromagnetic community and industry has been tremendous. Because of his efforts, the methodology of design and analysis of several critical systems, both in defense and commercial sectors and in many areas of research have completely changed. In a recent compilation, RWG functions have been used in more than 30 different and diverse fields. His algorithms enable the working engineer to design, evaluate, and test the product on the computer before fabrication. Furthermore, recent triangular patch modeling techniques are finding new applications. The well-known and troublesome

instability problem associated with the time domain integral equation solutions have now been solved using an implicit solution method in conjunction with RWG functions.

Dr. Rao has been teaching electromagnetic theory, communication systems, electrical circuits, and other related course at the undergraduate and graduate level for the past 30 years at various institutions. Moreover, he has actively participated in several departmental/college level activities via various committees.

Dr.D.Rama Krishna: Course Coordinator

Dr.D.Rama Krishna received his Bachelor of Technology (B.Tech) in Electronics and Communications Engineering from Sri Krishna Devaraya University, Ananthapur, Andhra Pradesh, India and obtained his Master of Engineering (M.E) and Doctor of Philosophy (Ph.D) in Electronics and Communication Engineering from Osmania University, Hyderabad, Telangana, India. He joined as an Assistant Professor in the department of ECE, University college of Engineering, Osmania University in the year 2007, presently he is working as Associate Professor and Chairperson Board of Studies (Autonomous) for the Department of ECE, University College of Engineering, Osmania University, he has taught several undergraduate and graduate courses in Communication Engineering area and supervised nearly 20 UG and 50 PG student projects in the area of RF and Microwave communication systems. Dr. Rama Krishna successfully completed 03 sponsored research projects in the area of RF and Microwave Engineering and published 25 research papers in International Journals/ Conference Proceedings. His research areas of interest include Multifunction Antennas & Antenna Systems and Microwave & millimeter Wave Integrated Circuits.

He is a Life Member of Institution of Engineers (IE), Institution of Electronics and Telecommunication Engineers (IETE), Indian Society for Technical Education (ISTE), Indian Society of Systems for Science and Engineering (ISSE), Institute of Smart Structures and Systems (ISSS) and Member of Institute of Electrical and Electronics Engineers (IEEE), USA. He served as Secretary/Treasurer for the MTT/AP/EMC Society Joint Chapter of IEEE Hyderabad Section from January 2013 to December 2016.

For further details Contact

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