PIERS 2014

Progress In Electromagnetics Research Symposium
August 25-28, 2014, Guangzhou, CHINA

Short Course Registration Form

Name	(Prof./Dr./Mr./Ms.)	
Email		
Affiliation		
Short Course Selection		**SC001: Metamaterials (Raj Mittra)** Date: August 24, afternoon (3 hours), Tuition Fee: **USD 150 / RMB 900**
		SC002: The Progress of Organic Solar Cells (Wallace C.H. Choy) Date: August 24, afternoon (3.5 hours), Tuition Fee: **USD 150/ RMB 900**
		SC003: Luminescent materials (Cees Ronda) Date: August 24, afternoon (4 hours), Tuition Fee: **USD 150/ RMB 900**
		SC004: Optical sensors (Wei Jin) Date: August 26, Evening (3 hours), Tuition Fee: **USD 150/ RMB 900**
		SC005: Glass-free 3D display (Jianying Zhou) Date: August 24, afternoon (3.5 hours), Tuition Fee: **USD 150/ RMB 900**

Total Amount:		
USD ( )	**or**	**RMB ( )**

Payment by: **( )**	**1. By Credit Card (USD)**		
	Card Type:		+Visa +MasterCard +American Express +Discover
	Credit Card Number:		
	Expiration Date:		
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	2. By Wire Transferring (USD) Please do send a copy of bank transfer receipt together with this registration form. Payment, identifying Presenting Author name, should be wired to the following PIERS bank account: **Swift Code: CAUPUS31** **Beneficiary Bank**: **Cambridge Trust Company** **Beneficiary Bank Address**: **1336 Massachusetts Avenue, Cambridge, MA 02138, USA** **ABA Routing No.: 011300595** **Beneficiary**: **The Electromagnetics Academy** **Beneficiary Address**: Suite 207, 777 Concord Avenue, Cambridge, MA 02138, USA **Account No.**: **39008901**		

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Any Request or Comments

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Short Course SC001
Transformation Electromagnetics, Cloaking and Metamaterials

Professor Raj Mittra
The Pennsylvania State University, USA
http://www.ee.psu.edu/ecrl

Tuition Fee: (USD 150)

Course Objective:

In this short course we will touch on several different topics, namely Metamaterials, Cloaking and Transformation Optics (TO), also known as Transformation Electromagnetics (T-EM). All of these are closely related to each other, and the course presentation will entail a synergistic coverage of the three. It will start by presenting some background materials for each one of these topics, to set the stage for follow-on discussion of their practical applications. We will identify the challenges we face in designing metamaterial (MTM) antennas and cloaks, whether or not they have been designed by using the TO.

Who Should Attend:

Students, postdocs and antenna engineers interested in learning about MTMs and Invisibility cloaks. Prior background, in the areas of either MTM or Cloaking, is not required.

Course Outline:

1. **Metamaterials**

a. Introduction to Metamaterials—Popular definitions of MTMs in terms of ε and μ. Classifications of MTMs into four categories, viz., ENG, MNG, DNG and DPS.
b. Realization of MTMs
c. Loss, Dispersion and Bandwidth issues
d. Integrating MTMs into antennas for performance enhancement
e. MTM lenses

2. **Transformation Optics (TO)**
   a. Basic principles of TO
   b. Illustrative examples of antennas and cloaks designed by using the TO
   c. Realization of Materials needed to fabricate TO-based antennas and cloak designs

3. **Cloaks**
   a. Invisibility cloaks
   b. Carpet cloaks
   c. Practical Realizations of Cloaks
   d. Metamaterials and Cloaks

4. **Field Transformation (FT)**
   a. Field Transformation as an alternative to Coordinate Transformation
   b. Fabry-Perot and Lens Antenna designs carried out by using the FT approach.
   c. Performance comparison of TO- and FT-based deigns of antennas and cloaks..

Instructor(s) Biography:

Raj Mittra is a Professor in the Electrical Engineering department of the Pennsylvania State University, where he is the Director of the Electromagnetic Communication Laboratory. Prior to joining Penn State he was a Professor in the Electrical and Computer Engineering at the University of Illinois in Urbana Champaign from 1957 through 1996, when he moved to his present position at the Penn State University. He is a Life Fellow of the IEEE, a Past-President of AP-S, and he has served as the Editor of the Transactions of the Antennas and Propagation Society. He won the Guggenheim Fellowship Award in 1965, the IEEE Centennial Medal in 1984, and the IEEE Millennium medal in 2000. Other honors include the IEEE/AP-S Distinguished Achievement Award in 2002, the Chen-To Tai Education Award in 2004, the IEEE Electromagnetics Award in 2006, and the IEEE James H. Mulligan Award in 2011. He has been a Visiting Professor at Oxford University, Oxford, England and at the Technical University of Denmark, Lyngby, Denmark.

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Short Course SC002

The Progress of Organic Solar Cells

Dr. Wallace C.H. Choy
Department of Electrical and Electronic Engineering, The University of Hong Kong

Tuition Fee: (USD 150)

Course Objective:

Photovoltaic technology has been attracting tremendous attention and under a rapid growth recently for the need of green energy sources. Organic solar cells with a number of interesting features have been considered as a potential candidate in the field of photovoltaics. The interesting features include environment friendly, low cost, low production energy consumption, mechanically flexible, compatible to a lot of substrate, etc. In this short course, a review of the organic solar cells from materials, device structure and physics, and light trapping schemes for light harvesting will be delivered.

Who Should Attend:

The course is designed for engineers and researchers who would like to expand the knowledge in organic solar cells.

Course Outline:

I. Introduction of Organic Materials
- Different types of organic materials how can organic materials function as semiconductor
- A brief review of organic materials used for organic solar cells.

II. Introduction of Organic Solar Cells
- Solar cells and photodiodes
- Single layer devices
- Heterojunction devices
- Blend-based devices

III. Electrical and Optical Properties of Organic Solar Cells
-light absorption and photocarrier generation
-carrier mobility
- carrier transport / conduction
- carrier extraction

IV. Light trapping schemes
- non-metal based light trapping schemes
- metal based light trapping schemes

Instructor(s) Biography:

Wallace C. H. Choy received his PhD Degree in Electronic Engineering from the University of Surrey, UK in 1999. His work at Surrey was supported by the Croucher Foundation Scholarship. He then joined National Research Council of Canada as a member of research staff to work on optical device structures of polarization independent optical amplifiers and modulators. He joined Fujitsu at San Jose, US in 2001 to develop real-time wavelength tunable lasers and optical transmitter modules. He is now an associate professor of Department of Electrical and Electronic Engineering, the University of Hong Kong (HKU). His current research interests are concerned with organic optoelectronic devices, plasmonic structures and nano-material devices, and optical and electrical properties of organics, metal nanomaterials and metal oxides. Dr. Choy has published over 120 internationally peer-reviewed journal papers, contributed to one book and five book chapters, as well as US and China patents. His work has been cited by 2672 times, H-index; 26 as on 5 May 2014. Details of publication can be found in

http://scholar.google.com.hk/citations?user=GEJf9dAAAAAJ.

He was the recipient of the Sir Edward Youde Memorial Fellowship, the Croucher Foundation Fellowship, and the Outstanding Achievement Award from National Research Council of Canada and HKU Research Output Prize. He has served as associate editor/ guest editor/ member of editor board of a number journal such as IEEE Photonics Journals, OSA Journal of Photonic Research, Journal of Optical Quantum Electronics on Numerical Simulation of Optoelectronic Devices and International Journal of Optics. He has delivered a number of invited talks and served as a committee member in internationally industrial and academic conferences organized by various organizations such as IEEE, OSA and Plastic Electronics Foundation. He is now a senior member of IEEE.

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Short Course SC003

Luminescence of Inorganic Compounds, Fundamentals and Applications

Prof. Dr. Cees Ronda
Philips Group Innovation-Research, Eindhoven, the Netherlands,
Zhejiang University, Hangzhou, China

Tuition Fee: (USD 150)

Course Objective:

In this short course, fundamentals and applications of inorganic luminescent materials will be dealt with. Starting at a fundamental level, the relevant theoretical background and spectroscopic tools will be treated. The course will end with a session on applications.

Who Should Attend:

The half day short course is designed for people entering this field, and also for people that want to refresh their knowledgein thisrapidly developing area. The course will also be very interesting for managers, steering this kind of research.

Course Outline:

1. **Luminescence fundamentals**
2. **Description of electronic states of transition metal ions and rare earth ions**
3. **Absorption and emission mechanisms**
4. **Spectroscopic tools**
5. **Applications**

PART I. Luminescence fundamentals

In this part, first the topic of luminescence will be introduced, using numerous examples from different application areas. Thereafter, term symbols will be derived enabling a general description of the electronic states involved in absorption- and emission processes. In this part, also optical selection rules will be introduced and discussed. The next part deals with mechanisms that generate luminescence and also mechanisms used to excite luminescence. It will be shown how different applications require different material properties and how the fundamentals treated before can be used to deal with this.

Part II. Characterization and applications

In the second part of the course first instrumentation will be dealt with. Clear relations will be established between spectroscopic tools and the information that can be derived using them. The course will end by reviewing a number of applications elucidating the close relation between material properties and device operation.

Instructor(s) Biography:

Cees Ronda, Professor, Ph.D., is a Research Fellow at the Philips Group Innovation Research Center in Eindhoven, the Netherlands. He also is associate Professor at Zhejiang University in Hangzhou, China and Fellow of Eindhoven Technical University. He has a background in optical materials.

The work of Ronda has contributed tomany different Philips product families, such as fluorescent lamps, LEDs, medical imaging equipment and also to ‘my reading light’. Recently, the scope of his interest has widened to sensors and air purification.

Ronda has more than 50 US patents and more than 70 peer reviewed publications. He also edited and contributed to a book on Luminescence (Luminescence: from theory to applications, VCH, 2007) and a next book is in preparation.

In 2005, he has been awarded the ‘Pannenborg’ award in view of his important contributions to Philips Research.

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Short Course SC004

Optical Sensors

Professor Wei Jin
The Hong Kong Polytechnic University, Hong Kong

Tuition Fee: (USD 150)

Course Objective:

The field of optical sensors has experienced rapid growth over the past two decades. Different types of sensors have been commercialized with a market growth rate of over 50% per year in recent years. At the same time, researches are continuing in developing photonic sensors with better performance, lower cost, smaller size and multiple functionalities. In this short course, an overview of various optical sensing technologies and applications will be presented and the state-of the-art as well as future techniques for higher-performance optical sensor systems will be introduced.

Who Should Attend:

The course is designed for graduate students and young researchers who are interested in optical sensors/instrumentation and for professionals who need to develop advanced methodologies for solving engineering problems.

Course Outline:

1. **Fundamentals of optical sensing methods**
2. **Active and passive components for optical sensors**
3. **Optical fiber sensors for physical and chemical measurands**
4. **Multiplexed and distributed sensors**
5. **Micro/nano structured optical sensors**
6. **Novel sensing methodologies for next-generation high performance sensors**
7. **Industrial application of optical sensors**

PART I. BASICS OF OPTICAL SENSORS

This section reviews the basic optical methods and components for optical sensors. An optical sensor typically consists of a light transmitter, a light receiver, and other optical components that deliver light to and collect light from the sensing region. Light-measurand interaction takes place in the sensing region and the properties of light is modulated via one of the optical effects such as length, refraction, absorption, fluorescence, electro-optic, magneto-optic, Doppler, and photothermal/photoacoustic. The modulated light signal is the demodulated and measurand information recovered at the receiver end. I will discuss, by use of examples of free-space systems, the various optical effects, the common optical components and demodulation techniques. This also forms the basis for the advanced sensors to be discussed in the next two parts.

PART II. OPTICAL FIBER SENSORS

Optical fiber sensors have evolved successfully from laboratory curiosities to practical sensing technologies. They have now been widely used in a number of industrial areas with a competing edge over the traditional electric sensors. This section discusses some popular and important types of optical fiber sensors, including optical fiber gyroscopes, fibre gratings, acoustic sensors, current sensors, and chemical and gas sensors. Their applications in aerospace, structural and environmental monitoring, and in railway and power industry will also be reported. Experiences and knowledge on design of various

fiber optic sensors, and on the use of alternative technologies to realize similar functionalities can be gained though the use of examples discussed in this section.

PART III. RECENT ADVANCES IN OPTICAL SENSING TECHNOLOGIES

This section will introduce some recent developments in optical sensors, including photonic crystal sensors, cavity ring down sensors, micro/nano resonator sensors, plasmonic sensors, and optofluidic sensors. These advanced sensing concepts are still in the stage of research and development but could become the enabling technologies for the next generation of high performance optical sensors. These novel sensors could provide ultra-sensitive means for detections at molecular and atomic levels and would find applications in future environmental and biological sensing.

Instructor(s) Biography:

Prof. Wei Jin received a PhD degree in optoelectronics from Strathclyde University, Scotland, in 1991. He joined the Department of Electrical Engineering, the Hong Kong Polytechnic University in 1996 and is currently a Professor and Director of the Photonic Sensors Research laboratory. Prof. Jin made several important contributions to the field of optical sensors including the first experimental demonstration of photonic crystal fiber (PCF) gas sensors, discovery of endlessly dual-mode operation of PCF, development of ultra-sensitive fiber-tip pressure/acoustic sensors, and fabrication of the first long period gratings in air-core PCFs. He edited 2 books, published 250 Journal papers and delivered >50 invited/plenary talks. His papers were cited >3000 times (SCI, excluding self-citations). He organized the 22nd International Conference on Optical Fiber Sensors (OFS-22) and served as the TPC chair. He received PolyU's President Award for Outstanding Research Performance and Scholarly Activities, PTeC's Award for Successful Technology Transfer, NSFC's Distinguished Young Scholar Award (Category-B), and the Chiang Jiang Guest Professor Award from Chinese Ministry of Education.

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Short Course SC005

Glass-free 3D display

Prof. Jianying Zhou
State Key Laboratory of Optoelectronic Materials and Technologies,
Sun Yat-Sen University, Guangzhou 510275, China
Tuition Fee: (USD 150)

Course Objective:

Following a massive technological and market upward advancement with glass-assisted 3D display in recent years, 3D display manufacturers and end users are now realistically checking the social and economic impact brought about by 3D display technology. While 3D display is mostly regarded as an additional function of the present flat display, there are signs that they are slowly transforming to a rigid demand for certain applications. It is widely regarded that glass-free 3D display would initiate fresh momentum to the 3D display industry.
This short course will start from an introduction to glass-free 3D display in general and to autostereoscopic display in particular. The participants will be exposed to the principles and techniques of various glass-free displays. With the emphasize on auto-stereoscopy, the main stream technologies, barrier- or lenticular based displays, will be introduced and analyzed comprehensively. The more recent technologies, including back-light illuminating 3D display and hybrid sequential and spatial 3D display, will be presented. We discuss the major constraints of the autostereoscopic display, including the reduced resolution, high crosstalk and restricted viewing volume. In this half day short course, we will present advanced techniques for an auto-stereoscopic display to achieve full or even ultra-high resolution, low crosstalk, large viewing volume and data compatibility with existing video data library. We also discuss the fresh ideas and technologies required to further transforming the 3D display from an additional function to a rigid demand. Future of the glass-free 3D display will be projected. Finally, participants will have an opportunity to attend an auto-stereoscopic display mini-exhibition specially prepared to show the state of the art of glass-free 3D displays, if permitted by the organizer and by lecture facility administrator.

Who Should Attend:

The course is designed for researchers, students, scientists and businessmen interested in 3D display technologies and business opportunities. Interaction between the participants, lecturer and exhibitor during the short course is encouraged.

Course Outline:

1. **General introduction to 3D displays**
2. **Fundamental principles and technical analysis of various autostereoscopic solutions**
3. **Time sequential autostereoscopic displays and directional backlight**
4. **High-quality autostereoscopic display with spatial and temporal hybrid control**
5. **Optimizing autostereoscopic displays with genetic algorithm**
6. **3D Interactive systems**
7. **Technique challenges and market outlook and opportunities.**

Instructor(s) Biography:

Jianying Zhou, Ph.D. in physics from Imperial College, London (1988). He joined the State Key Laboratory of Optoelectronic Materials & Technology, Sun Yat-Sen University, Guangzhou, China, in 1988, and has been a Full Professor in physics since 1992. His current research interests include 3-D display, super resolution imaging and ultrafast optoelectronic photonics.

Following scientists will be participating a mini-show for autostereoscopic display specially prepared for the participants:
Dr. Jiahui Wang, Sun Yat-Sen University
Mr. Hang Fan, Sun Yat-Sen University

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