Organizers: Hong Kong 香港科技園 Science & Technology Parks | LEXIWAVE Reinventing RFIC

Supporting Organization: Agilent Technologies

Courses on **Radio Frequency (RF) Design**

Venue: Meeting Room 8, 1/F, Enterprise Place, Hong Kong Science Park, Shatin

1) Course 1: RF Design Fundamentals
19-20 September, 2008 (Fri – Sat) / 9:30am – 5:00pm

2) Course 2: Advanced RF Circuit Design
17-18 October, 2008 (Fri – Sat) / 9:30am – 5:00pm

Introduction:

Shorter time-to-market for wireless communication products is needed to stay competitive in today's business environment. The know-how of RF design becomes crucial on the success of new development of any RF products.

The two-day training on RF Design Fundamentals (course 1) will provide students with a firm grounding in the fundamental principles of RF engineering. This class presents the theory of RF fundamentals including transmission line, Smith chart and Scattering parameters. Participants will also learn about Impedance matching and frequency selection, design of RF amplifier and network analyzer aided RF circuit design. Besides, the two-day training on Advanced RF Circuit Design (course 2) is aimed to provide an opportunity for participants to acquire advanced knowledge on RF design for receiver/transmitter, oscillators, PLL frequency synthesizers and Inter-circuit interference, protection, design verification and so on.

The courses will be conducted by RF experts with rich local and overseas industrial experience. Given the knowledge and information provided by the training, it is hoped that the participating engineers or managers can develop RF products with top performance but yet the fewest number of design iteration.

A letter of Completion will be issued to those participants who have successfully completed the course.

Who should attend:

RF designers, wireless product designers, field application engineers, business development engineers and managers, design managers, and related professionals.

Medium of Instruction: Cantonese (with English terminology)

Enquiry: 2144 2592 (Lexiwave Technology Ltd.) or 2629 6718 (HKSTP)

Transportation: http://www.hkstp.org/HKSTPC/en_html/en_corporation1_2.jsp

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Instructors:

Dr. C M Yuen received his B.Eng. and Ph.D degree in Electronic Engineering from the City University of Hong Kong. His research interest is mainly in the design of RF and Microwave circuits for low voltage and low power consumption wireless systems. He has more than twenty-one years of experience in RF product design and manufacturing in Hong Kong and Mainland China. Dr. Yuen is currently an advisory engineer in the field of HDTV and IPTV.

Mr. Henry Lau received his M.Sc. and MBA degrees from UK and US respectively. He has more than twenty-one years of experience in designing RF system, products and RFICs in both Hong Kong and US. He had worked for Motorola and Conexant in US as Principal Engineer on developing RFICs for cellular phone and silicon tuner applications. Mr. Lau holds five US patents and has one patent pending. He is currently running Lexiwave Technology Ltd., a fabless semiconductor company in Hong Kong and US designing and selling RFICs.

Course Content:

Course 1 : RF Design Fundamentals

Day 1 (19 Sep)

Morning - **RF Fundamentals**
- Transmission Line
- The Smith chart
- Two terminal z- and y- parameters
- Scattering parameters (S-parameters)

Afternoon - **Impedance matching and frequency selection**
- Impedance matching
  - Basic concept : maximum power transfer, minimum reflection
  - Basic application of Smith chart : impedance and admittance chart, low pass and high pass matching
- Frequency tuning
  - LC resonance circuit : parallel resonance circuit and series resonance circit
  - Selection of inductor : size, type and Q factor
- Filtering
  - LC, IF ceramic, IF crystal, IF SAW, RF SAW and dielectric; relation between filter performance and Q-factor in matching elements

Day 2 (20 Sep)

Morning - **RF Amplifier**
- Design of RF amplifier
  Types of RF amplifier; selection of active devices (example : transistor) ; harmonic suppression by gain-bandwidth limit ; utilization of permitted power limit
- Decoupling and noise blocking
  Circuit, selection of inductor, ferrite bead and capacitor; wide band decoupling
- Schematic diagram
  How to make proper presentation of circuit design
- Computer aided design and simulation

Afternoon - **Network analyzer aided RF circuit design**
- Role of a network analysiser in circuit design
- What can do and what cannot do
- Theory, calibration and measurement techniques of network analyzer
- How to cut a circuit into pieces for network analysis
- Measurement demonstration with expert from Agilent

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Course 2 : Advanced RF Circuit Design

Day 1 (17 Oct)

Morning - **Design of Oscillators and PLL Frequency Synthesizer**

- Crystal oscillator
  Frequency tolerance, temperature stability, case grounding, loading capacitance, trimming sensitivity, high order overtone crystal oscillator, diode switchable dual-frequency crystal oscillator
- RF oscillators
  Discrete LC, printed LC, dielectric oscillator
- PLL frequency synthesizer
  Type of PLL; design of PLL; voltage controlled oscillator (VCO); individual regulator for VCO
- Modulation sensitivity, utilization of permitted occupied bandwidth, phase noise

Afternoon - **Design of Transmitter**

- Block-by-block circuit design of transmitter
- Case study of completed transmitter circuits

Day 2 (18 Oct)

Morning - **Design of Receiver**

- Types of receiver
  advantages and disadvantages ; double conversion, single conversion, direction conversion, low IF
- Block-by-block circuit design of receiver
- Case study of completed receiver circuits

Afternoon - **Inter-circuit interference, protection, design verification**

- Design of power supply and power supply noise rejection
- ESD and surge protection
  IEC62000-4-2, IEC62000-4-5, selection of protector
- Design example
  ESD protection for open drain type RFIC
- Testing for design verification
  Setting of test points; local and global ground connection; test setup

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Note: Each participant will receive a souvenir from Agilent Technologies Hong Kong Ltd., supporting organization of this course.

This information is brought to you by Industry & University Collaboration, HK Science & Technology Parks Corp ("HKSTP"). HKSTP is a statutory body set up by the Government of the Hong Kong Special Administrative Region with the mission in leading the transformation of Hong Kong into Asia's hub for technology and innovation in the four focused clusters: Electronics, Biotechnology, Precision Engineering, Information Technology & Telecommunications.

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Registration Form

Courses on Radio Frequency (RF) Design

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19-20 September, 2008 (9:30am – 5:00pm)
Course Fee*: HK$ 2,000 / person (Standard)

Course 2: Advanced RF Circuit Design
17-18 October, 2008 (9:30am – 5:00pm)
Course Fee*: HK$ 2,000 / person (Standard)

Venue: Meeting Room 8, 1/F, Enterprise Place, Hong Kong Science Park, Shatin

Early bird offer: HK$ 1,800/ person/course for full payment received on or before 10 September 2008

**Reimbursement for 75% course fees from entitled Training Assistance Fund applicable for Science Park Tenants/Incubatees*

Return form with full payment on/before **12 September 2008** to
FAX: 2607-4040 or **EMAIL:** tifanni.fong@hkstp.org

Company:				**[ ] SP Tenant**	**[ ] Incubatee**
Address:					
Contact:				**Title :**	
Tel:		**Fax:**		**E-mail:**	

Note: Payment receipt will be mailed to above address and contact person

Name	Position	Course 1*	Course 2*	Email	Sub-Total
		[ ]	[ ]		
		[ ]	[ ]		
				Total:	

**Please tick as appropriate*

Payment

I shall pay for the Total Amount of HKD _____ by below marked payment method:

[ ] By Cheque
Payable to "Hong Kong Science and Technology Parks Corporation" with copy of this registration form to:

Hong Kong Science and Technology Parks Corp.
Unit 307, IC Development Centre, Hong Kong Science Park, Shatin
Attention: Training (RF)

[ ] By Credit Card ☐ VISA ☐ MasterCard

Card Number: _____-_____-_____-_____ Expiry Date: _____(MM)/_____(YY)

Name of Cardholder: _____ Signature: _____

Remarks: 1. First-come-first-served for registration completed with full payment. Substitutions allowed. Cancellations non-refundable.
2. Successful applicants will receive an e-mail notification of confirmation on 13 September 2008.
3. Class would be re-scheduled/cancelled (refundable) if registration below expected size.
4. Organizer reserves the right to amend program without prior notice.

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