

Organisers:



## Course on RF and Analog IC Design

Date	13 – 14 Jan 2011 (Thu – Fri)
Fee*	HK\$ 2,500.- per person Early bird: HK\$2,250.- per person (before 30 Nov) Full time student: HK\$2,000.- per person^
Time	9:30am – 6:00pm
Venue	Conference Hall 3, 1/F, Core Bldg 1, HKSP
Speakers	Dr KW KWAN, CEO, Smart Design Mr Henry LAU, CEO, Lexiwave
Language	Cantonese with English terminology

\* Reimbursement for up to 75% of course fees from entitled HKSTPC fund applicable to HKSTPC Tenants/Incubatees

^ Please submit the document copy showing the validity period of full-time studentship with the registration

This course aims at providing an opportunity for participants to acquire technical insights on some of the vital aspects of RF Integrated Circuit Design (building block and sub system) from industry perspective. **The first module will cover the vital aspect and design considerations on integrated radio sub systems – analog IF filter and phase locked loop design.** Demonstration circuits will be presented to the participants to gain insight to integral perspective. **The second module will provide an overview of the design flow of RFIC.** Specific issues pertaining to RFIC design will be highlighted for discussion. Practical design issues and tips on some critical RF building block such as LNA, Mixer, VCO and Biasing circuits will be presented. Both modules will be conducted by experienced RF experts from the industry with local and overseas working experience.

### About the speakers

**Dr KW Kwan** obtained BSc in Physics from CUHK and PhD in Electronics from Southampton University, UK. He worked briefly in the semiconductor manufacturing industry in Hong Kong (82-85, process manager, Elcap Electronics) developing CMOS fabrication process for the 74HC series and custom application products. Since 1988, Dr Kwan had worked in the area of RF integrated circuit design and had been involved in the Silicon RFIC development for 1st generation of GSM handset and DECT European coreless telephone (Orbitel Mobile Communications UK, Pacific Communication System Incooperation UK, and Matsuhita Communication UK). Starting from 2001, KW worked as an independent designer/consultant for radio integrated circuits and concentrated on the feasibility of designing a fully integrated radio tuner for the digital broadcast system DRM, which occupied the traditional AM frequency bands. Prototype BICMOS integrated circuits was designed and manufactured to verify the design concepts needed to implement a fully integrated multi-band radio tuner circuit.

**Mr Henry Lau** received his MSc and MBA degrees from UK and US respectively. He has experience of more than 21 years in designing RF system, products and RFICs in both Hong Kong and US. He has worked for Motorola and Conexant in US as Principal Engineer in developing RFICs for cellular phone and silicon tuner applications. Mr Lau holds five US patents and has one patent pending. He is currently the CEO of Lexiwave Technology Ltd, a fabless semiconductor company in Hong Kong and US designing and selling of RFICs, RF modules and solutions.

## Course content

### DAY 1

### Integrated Modules in RFIC

#### Overview of Radio Receiver Architecture

- Consideration of system integration and multi-mode operation

#### Analog IF Filter

- Concept of positive frequency and negative frequency signals and the relation to quadrature I/Q paths
- Analog technique of filtering for positive/negative frequency components and application to mixed down signals
- Complex filter synthesis
- Design considerations and demonstration example

#### Frequency synthesizing employing PLL

- Traditional technique of PLL and mathematical formulation of 3<sup>rd</sup> order loop
- Relation of loop bandwidth and stability
- Another angle to analysis PLL – D to A
- Synthesis frequency of fraction of reference
- Design consideration, simulation and demonstration example

### DAY 2

### RFIC Design

#### Basics of RFIC Design

- Methodology and considerations
- Process technology: Bipolar, CMOS, BiCMOS, SiGe BiCMOS
- Transceiver Topologies

#### RFIC Building Block Design

- Low Noise Amplifier (LNA): topology and design considerations
- Mixer: topology and design considerations
- VCO: topology and design considerations
- Voltage and Current Biasing: bandgap, PTAT, startup circuitry

#### RFIC Layout

- Critical components Structure
- Routing and placement considerations and techniques

#### RFIC Design Flow and CAD Tools

- RF and Analog and Design Flows
- Simulation and Layout Tools: Cadence, ADS, TopSpice, Tanner

## Who should attend

IC designers, wireless product designers, field application engineers, business development engineers and managers, design managers

## What you will learn

- Basics of RF IC design, building blocks and integrated systems
- Process technology and CAD tools for RFIC design
- Critical issues and design tips on critical RF and Analog building blocks



Yes, I would like to enrol in:

Enrolment Form

# Course on RF & Analog IC Design

**Date:** 13 – 14 January 2011 (Thursday – Friday)

**Time:** 0930 - 1800

**Venue:** Conference Hall 3, 1/F, Core Building 1, Hong Kong Science Park, Shatin

**Fee\*:** HK\$2,500.- per head | Early bird: HK\$2,250.- per person (before 30 Nov)  
Full time student^: HK\$2,000.- per person

*\*Incubation companies/tenants may apply for maximum 75 % reimbursement of the course fee from HKSTPC fund (up to the limit of the balance in incubatees'/tenants' funding account) after the course completion.*

*^Please submit the document copy showing the validity period of full-time studentship with the registration.*

For registration, please return this form with full payment on / before 21 December 2010 (Tuesday).

**Note:** The payment receipt(s) will be mailed to the address you provided below.

Company Name : \_\_\_\_\_ [  ] SP Tenant [  ] Incubatee

Address: \_\_\_\_\_

Contact person: \_\_\_\_\_ Job Title : \_\_\_\_\_

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_

\*Delete as inappropriate

Salutation*	Full Name in English	Job Title	Email	Sub-Total
Mr/Ms/Dr/ Prof				
Mr/Ms/Dr/ Prof				
Mr/Ms/Dr/ Prof				
<b>Total:</b>				

## Payment: (By Cheque only)

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

**Address:** Industry & University Collaboration  
Hong Kong Science and Technology Parks Corporation  
Unit 307, 3/F, IC Development Centre  
Hong Kong Science Park, Shatin

**Attention:** Training (RFIC)

Remarks:

1. First-come-first-served for registration completed with full payment.
2. Fees paid are not refundable regardless of whether participant has attended classes or not. Substitutions are allowed. If the course cannot be run due to adverse weather or unforeseen circumstances, there is no refund while make-up class will be arranged whenever possible.
3. Class would be re-scheduled/cancelled (refundable) if registration below expected size.
4. Organizer reserves the right to amend program without prior notice.
5. An email confirmation will be sent to participants before the course commencement.
6. Receipt will be sent to participants around 6 weeks after the course commencement date. If you do not receive the receipt, please check with the organizer.

**Inquiry:** Katrina YEUNG

**Tel:** 2629 6718

**Fax:** 2607 4040

**Email:** [seminar.iuc@hkstp.org](mailto:seminar.iuc@hkstp.org)

If you would like to know more about our upcoming events, please visit our website: [www.hkstp.org](http://www.hkstp.org) and click on "Upcoming Events".