



## Fundamentals of RF System Design and Simulation

19–20 March 2009

Presenter: Dr Rowan Gilmore

Technology Park Conference Centre  
Mawson Lakes SA

### Teaching Arrangements:

The course will be conducted from 9.00am to 5.00pm. Morning tea will be available at approximately 10.00am to 10.30am, lunch from 12.30pm to 1.30pm and afternoon tea at approximately 3.00pm to 3.30pm.

**Registration Fee:**  
AU\$1320 (including GST)

Group and PhD student discounts available. Please enquire.

### How to Register

To register fill out the registration form (overleaf) and

- fax it to +61-8-8343-8711
- or
- scan and email it to [industryeducation@nicta.com.au](mailto:industryeducation@nicta.com.au)

### Cancellation Policy

At least **4 weeks** notice is required for cancellation of a place in a short course for full reimbursement. If cancellation is later than 4 weeks then the place can either be given to another person or the registrant can be provided with a credit towards other NICTA training.

For details of further courses please see our web site: [www.nicta.com.au/short\\_courses](http://www.nicta.com.au/short_courses) or contact the NICTA Industry Education Manager.

### About this Course

This **2-day** short course will focus on tradeoffs in designing wireless systems, and show how to seamlessly move between both the circuit and system level in radio transceivers and other RF systems. We do this by looking at typical radio architectures, exploring the design tradeoffs, and simulating at both the circuit and system level. The course treats digitally coded signals in RF and IF components, and explores the compromises that are inherent in the design of a radio transceiver. From the RF perspective, the need to minimize interference from nearby unwanted stronger signals and to allow detection of a desired signal in noise is critical. Avoiding corruption of other signals sharing the spectrum is equally critical. Achieving both together is not so simple! In wireless LAN for instance, tradeoffs made to solve one problem, like multi-path reception, have placed tight constraints on other parts of the system, such as the linearity of the power amplifier.

We will interactively simulate a double super-heterodyne, dual-band radio receiver, as well as multiple components. This provides the opportunity to explore 'what if?' scenarios. **To benefit most, bring your own laptop computer and, prior to attending, obtain a free trial license of the Visual Systems Simulator (VSS) from Applied Wave Research at [www.appwave.com](http://www.appwave.com).**

### Brief Course Outline

**Introduction to Radio Systems and Digital Communications:** Revision of Coding and Modulation Formats; Baseband Filtering; Typical Receiver System Architectures: Direct conversion, super-heterodyne, dual conversion super-heterodyne.

**Characterization and Measurement of Receivers:** Noise in Receivers; Selectivity, Sensitivity and Minimum Detectable Signal; Nonlinearities and Third-Order Intermodulation Distortion; Reception in the Presence of Interferers; Dynamic Range and How to Improve It With AGC.

**Characterization and Measurement of Transmitters:** Power and Harmonic Distortion; Spurious Products; ACPR, Spectral Regrowth and Linearity; Efficiency.

**Simulation of a Dual-band Superhet Radio Receiver:** Spreadsheet-based Linear Systems Analysis; Calculation of Sensitivity and Dynamic Range; Systems Simulation; AGC to Increase the Dynamic Range; Effect of Changing the Gain, Intercept Point, and Filtering.

**System considerations for Amplifiers, Mixers, and Oscillators:** Design Tradeoffs between Linearity, Power, and Efficiency; Classes of Amplifier Operation; Simulation of Spectral Regrowth with Different Modulation Formats; Phase Noise in Oscillators; Calculating Allowable Phase Noise from System Specifications; I-Q Modulators and the importance of quadrature.

### About the Presenter



**Dr. Gilmore** is a Chartered Engineer and Senior Member of the IEEE. He has published more than thirty articles in the field of microwave systems and circuit design, and has served on the editorial boards of the IEEE Transactions on Microwave Theory and Techniques, and of Wiley's International Journal of RF and Microwave Computer-Aided Engineering. He has been active in the education of graduate engineers in industry, having taught courses around the world to nearly fifteen hundred practicing RF and microwave engineers for the over a decade. With Dr. Les Besser, he is co-author of the widely read two-volume textbook '*Practical RF Circuit Design for Modern Wireless Systems*'. For the past four years, as the Chief Executive Officer of the Australian Institute for Commercialisation, located in Brisbane, Australia, he has worked on establishing liaisons and facilitating technology transfer between universities and industry. He also holds appointments as Adjunct Professor of Electrical Engineering, and in the School of Business, at the University of Queensland.

## About NICTA and Short Course Program

National ICT Australia (NICTA) is Australia's ICT Centre of Excellence and was established to drive innovation through high quality research, research training and technology transfer. As a world-class research institute NICTA uniquely combines excellence in research, education, commercialisation and collaboration. We are working to ensure that Australia is well placed to benefit from the significant opportunities that ICT research delivers.

NICTA is funded by the Australian Government as represented by the Department of Communications, Information Technology and the Arts and the Australian Research Council through *Backing Australia's Ability* and the ICT Centre of Excellence program. NICTA members are the Australian Capital Territory Government, the New South Wales Government, the University of New South Wales and the Australian National University.

NICTA short courses offer scientists, engineers and managers technical training with a leading edge in areas such as telecommunications, transport, security, defence, logistics, e-government, mining, finance and biotechnology.

There will be ample opportunities for discussion and questions and answers. Morning and afternoon tea/coffee and a light lunch will be provided. Extensive workshop materials will be made available to participants.

### How to register

Please complete the registration form below and

- Fax it to +61-8-8343-8711 or
- Scan and email it to [industryeducation@nicta.com.au](mailto:industryeducation@nicta.com.au).

**Send the form as soon as possible to secure your place.**

For further information please contact  
Anne-Marie Eliseo  
Industry Education Manager  
Telephone: +61-8-8343-8710  
Email: [anne-marie.eliseo@nicta.com.au](mailto:anne-marie.eliseo@nicta.com.au)

## Registration Form and Tax Invoice\* ABN 62 102 206 173

\*Upon completion of this form, including the relevant payment, this form will become a Tax Invoice.

**Please register me for Fundamentals of RF System Design and Simulation on 19-20 March 2009.**

PLEASE PRINT

Date: \_\_\_\_\_

Title: \_\_\_\_\_ First Name: \_\_\_\_\_ Surname: \_\_\_\_\_

Position: \_\_\_\_\_ Organisation/Division: \_\_\_\_\_

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

Telephone No: \_\_\_\_\_ Facsimile No: \_\_\_\_\_ Email: \_\_\_\_\_

Dietary preference: \_\_\_\_\_

Course Fees:  Full fees: AU\$1320 (incl. GST)  
(Please register by **Mar 5<sup>th</sup>**.)

### Method of Payment (please tick below):

Cheque (payable to National ICT Australia Ltd)

Please forward the cheque and a copy of THIS registration form to:

Anne-Marie Eliseo, Industry Education Manager, NICTA, Innovation House, First Avenue, Mawson Lakes SA 5095, Australia.

Credit Card: \_\_\_\_\_ Credit Card No.: \_\_\_\_\_ Expiry Date: \_\_\_\_\_

Visa  Master Card \_\_\_\_\_ Name on card: \_\_\_\_\_

Amount: AU\$ \_\_\_\_\_ Signature: \_\_\_\_\_  Tick if receipt required

Email address of card holder: \_\_\_\_\_

Electronic Funds Transfer

Please advise by email to **Annette Van Bramer**

[annette.vanbramer@nicta.com.au](mailto:annette.vanbramer@nicta.com.au)

when payment is made

|                  |                                |
|------------------|--------------------------------|
| BANK             | Commonwealth Bank of Australia |
| ACCOUNT NAME     | National ICT Australia Limited |
| BSB              | 062 900                        |
| ACCOUNT NUMBER   | 1032 4576                      |
| REFERENCE NUMBER | 190309                         |

**FAX the form to + 61 - 8 - 8343 8711 or EMAIL it to [industryeducation@nicta.com.au](mailto:industryeducation@nicta.com.au)**

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- Phone NICTA's Industry Education Manager on +61 8 8343 8710.