



# Fundamentals of Radar

1-3 June 2009

Presenter: Mr Robert T. Hill

Melbourne

## Teaching Arrangements:

The courses 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\$1980 (including GST)

**Early bird rates:** AU\$1683 (incl. GST) **register before 15<sup>th</sup> Feb 2009**

Group and PhD student discounts available. Please enquire.

## How to Register

To register fill out the registration form (overleaf) and

- fax it to +61-8-8302-3115
- 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 Fundamentals of Radar

This **three-day** course covering the basics of radar is taught in a manner for true understanding of the fundamentals, even for the complete newcomer. Covered are electromagnetic waves, frequency bands, the natural phenomena of scattering and propagation, radar performance calculations and other tools used in radar work, and a "walk through" the four principal subsystems – the transmitter, the antenna, the receiver and signal processor, and the control and interface apparatus – covering in each the underlying principle and componentry. A few simple exercises reinforce the student's understanding. Both surface based and airborne radars are addressed.

The course is intended for those who are entering the radar field, engineers, scientists, technicians and others, of military or civil employment. Managers who need a sound understanding of basics will also find the course extremely valuable.

## Brief Course Outline

**Introduction:** Basic nature of radar and its applications, military and civil; Radiative physics, the radar range equation, the statistical nature of detection; Electromagnetic waves, constituent fields and vector representation; Radar "timing", general nature, block diagrams, typical characteristics;

**Natural Phenomena: Scattering and Propagation:** Rayleigh point scattering, target fluctuation models, the nature of clutter; Earth surface multi-path atmospheric refraction and "ducting", atmospheric attenuation; Other tools: the decibel, etc. (a dB exercise);

**Workshop:** An example radar and performance calculations, with variations.

**Introduction to the Subsystems:** Overview; Transmitter: basics of power conversion, power supplies, modulations, rf devices (tubes and solid state); Antenna: basic principle, microwave optics and pattern formation, weighting, sidelobe concerns, sum and difference patterns, introduction to phase array.

**Subsystems continued:** Receiver: pre-amplification, conversion, heterodyne operation "image" frequencies and double conversion; Signal processing: pulse compression, Doppler-sensitive processing; Airborne radar – the absolute necessity of Doppler processing.

**Subsystems: Control and Interface Apparatus:** Automatic detection and constant false-alarm rate (CFAR) techniques of threshold control; Automatic tracking: exponential track filters; Multi-radar fusion (briefly).

## Concluding Discussion, Course Review.

## About the Presenter



**Mr. Robert T. Hill** received the BS (Iowa State University) and the MS (University of Maryland), both in EE, in 1957 and 1967. In 1960, after working in industry and as an Air Force officer, he began government civilian service, retiring in 1988, in the development of naval radar.

Mr. Hill is a distinguished lecturer for the IEEE, being also a member of its Radar Systems Panel and, formerly, of its Aerospace and Electronic Systems Society Board of Governors for many years. He has published numerous conference papers, magazine articles and chapters of books,

and is the author of the radar, monopulse radar, airborne radar and synthetic aperture radar articles in the McGraw-Hill Encyclopedia of Science and Technology and of the radar entries in their technical dictionary. He is a Fellow of the IEEE.

## 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 +61-8-8302-3115 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: +61-8-8302-3928  
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 Radar 1-3 June 2009.**

PLEASE PRINT

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

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

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

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

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

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

Course Fees:  Early bird fees: AU\$1683 (incl. GST)  
(Please register by **Feb 15<sup>th</sup>**.)

Full fees: AU\$1980 (incl. GST)  
(Please register by **May 20<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, SPRI Bld, Mawson Lakes Boulevard, 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	010609

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- Phone NICTA's Industry Education Manager on +61 8 8302 3928.