



## Radar and Electronic Defence

Modules from a Masters Programme being offered to Continuing Professional Development students

### The Masters Programme

To address the growing need for skilled engineers and scientists in the challenging fields of Radar and Electronic Defence, the University of Cape Town (UCT) and the Council of Science and Industrial Research (CSIR), in conjunction with international partners and industrial sponsors, are establishing a Masters Degree in Engineering. Hosted in Cape Town, South Africa, students studying towards this degree will focus on relevant theory, technologies and applications with both coursework and project components. The programme had its first intake of students in February 2011.

Each course will typically contain a lecture component of 5 full days, followed by weekly seminars, tasks and a written examination, over a five week period after the first, intensive lecture session. The programme is designed to support students that cannot be in resident in Cape Town for the full duration to complete all courses, by using distance learning techniques during the follow up period after each course (after the one week intensive lecture period). All students will, however, have to be present in Cape Town for the one week lecture period for each course. Elements of continuous assessment (problem sets, short projects) and a written examination are utilised to assess the course.

For further information on the Masters Programme please refer to the website <http://sites.google.com/site/radarmasters>

### Continuing Professional Development

Modules of this Masters Programme are offered to Continuing Professional Development students as separate certificated courses from which a participant can obtain CPD credits as these courses are registered with ECSA. These CPD courses are attendance based, and a certificate of attendance is issued.

#### THE CPD COURSES INCLUDE:

##### **Microwave Filters: Technologies and Practical Design: 27 – 31 January 2014**

This intensive course presents a systematic progression of topics from specification and theoretical synthesis, CAD-assisted design and practical manufacturing techniques for microwave filters operating in the frequency ranges of typical radar systems.

*Presented by: Riana Geschke and Tinus Stander*

##### **Introduction to Radar: 3 – 7 February 2014**

Introduction to Radar, the range equation, radar detection in interference, propagation effects and mechanisms, characteristics of clutter, target reflectivity, target reflectivity fluctuations, Doppler processing, Radar antennas, transmitters and receivers, radar signal processing, radar remote sensing.

Textbook: *Principles of Modern Radar*, Scitech Publishers

*Presented by: Douglas Gray*

##### **Mathematics for Radar and Electronic Defence: 3 – 7 March 2014**

Course overview. Real and complex numbers, their functions, and integral and differential calculus in one dimension. Matrices, vectors, operators and eigenvalue problems, Functions of several variables, including vector calculus, functions of a complex variable and contour integration, and the calculus of variations, Integral transforms: Fourier, Laplace, Mellin, Hankel transforms, and the FFT. Course topics include: • Ordinary differential equations • Laplace transforms • Fourier analysis • Partial differential equations • Complex analysis • Vector calculus.

*Presented by: Pieter Uys*

##### **Introduction to Electronic Defence: 7 – 11 April 2014**

Electronic Defence: Threats, Requirements and Principles, Advanced Radar Threat, Modern Electronic Attach (EA) Systems—Architecture, Types, and Technology, EA against Modern Radar Systems, Digital Radio Frequency Memory, Electronic Defence Support, Expendables and Decoy Systems, Directed Energy Weapons and Stealth Technology, Applications of Electronic Defence.

*Presented by: Ferdie Potgieter*

##### **Radar Signal and Data Processing: 5 – 9 May 2014**

Fundamentals, threshold detection, constant false alarm rate detector (CFAR), Doppler processing, Radar measurements, Radar tracking algorithms, fundamentals of pulse compression, overview of radar imaging.

Textbook: *Principles of Modern Radar*, Scitech Publishers

*Presented by: Amit Mishra*

##### **Radar Systems Modelling: 9 – 13 June 2014**

A practical course which requires a sound knowledge of Radar Systems and Signal Processing, and teaches you how to use that knowledge to carry out system level calculations of radar systems. This skill is essential when involved with the design of a sensor, or evaluating the usefulness of a sensor for specific applications. Many different types of radar are considered: search radar, tracking radar, remote sensing (imaging) radar, and so on.

*Presented by: Mike Inggs, Willie Nel and Jaco de Witt*



# Continuing Professional Development Programme

## Faculty of Engineering & the Built Environment

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### Microwave Components and Antennas: 14 – 18 July 2014

This course describes the operation and design of microwave components used in radar and telecommunication systems including: transmission lines; microstrip, coaxial and waveguide circuits. Power sources/oscillators, amplifiers, noise in receivers and mixers, PIN diode switches and limiters. Antennas, including radar antennas and phased arrays.

*Presented by: Barry Downing*

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### COURSE INFORMATION FOR CPD PARTICIPANTS

#### **Programme Convenor:**

Prof Barry Downing, University of Cape Town

#### **Lecturers**

Jaco de Witt – CSIR

Riana Geschke - University of Cape Town

Douglas Gray - University of Adelaide

Mike Inggs – University of Cape Town

Amit Mishra – University of Cape Town

Willie Nel - CSIR

Ferdie Potgieter – CSIR

Tinus Stander - University of Pretoria

Pieter Uys- University of Cape Town

Barry Downing – University of Cape Town

#### **Who should attend?**

Attendees are responsible for ensuring they have the necessary experience and educational background to derive full benefit from the course.

#### **Format**

Each module is structured in the following way:

a week of intensive contact time at UCT, comprising formal lectures, class assignments and seminars/tutorials

#### **Cost**

The fee for each course is R10 000.00. The fee includes a comprehensive set of course notes. Recommended text books are for the student's account.

#### **Certificates and CPD Points**

A certificate of attendance will be awarded to CPD participants. Participants need to attend 80% of the lectures to qualify for an attendance certificate.

CPD participants can also request a formal university transcript, which will show this course as part of a Professional Development Career.

Please note: If you are interested in attending this course for credit purposes, you will need to register for the Masters Programme or as an occasional student. If you attend the course as a CPD participant, credit cannot be claimed in retrospect.

#### **Venue**

All lectures will take place in Cape Town. Information on the specific venue will be sent to you after your application has been approved.

#### **Application and Cancellation**

Registration forms are available on the website [www.cpd.uct.ac.za/applications/](http://www.cpd.uct.ac.za/applications/)

In order to ensure a place on the course applicants must complete and return a signed registration form to the course administrators: Heidi Tait or Sandra Jemaar:

Confirmation of acceptance will be sent on receipt of a registration form.

Registrations close one week before the start of each course

**Cancellations must be received one week before the start of a course, or the full course fee will be charged.**

#### **Administrators**

Heidi Tait or Sandra Jemaar:

CPD Programme, EBE Faculty Office, New Engineering Building, University of Cape Town

Phone: 021 650 5793

Fax: 021 650 3082

Email: [ebe-cpd@uct.ac.za](mailto:ebe-cpd@uct.ac.za)