



Dept. of Electrical Engineering | CPD courses

Radar and Electronic Defence

Masters Modules 2024



Introduction

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, including the King Abdulaziz City for Science and Technology (KACST), have established a master's degree in engineering (MSc, Eng and MEng) with specialisation in Radar and Electronic Defence. The Programme is hosted in Cape Town, South Africa and had its first intake of students in February 2011.

Each course typically contains a lecture component of 5 full days, followed by weekly online seminars and tasks culminating in a written examination, over a five-week period after the first, intensive lecture session. The programme is designed to facilitate students that cannot be 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, must be present in Cape Town for the one-week lecture period for each course.

For further information on the master's programme please visit:

<http://www.radarmasters.uct.ac.za/>

Degree Structure

A master's degree requires students to pass 180 credits of coursework and dissertation, with one credit requiring about 10 hours of work. Thus, the average time required to complete a master's degree is about 1800 hours of work.

The master's degree in Radar is offered with three different degree structures:

1. Professional Taught Master's Degree (MEng Radar):
This master's degree consists of 6 x 20 credit courses and a 60-credit mini dissertation. There are two core courses, viz. Introduction to Radar and Mathematics, plus four more specialized radar courses. We also offer a stream of Electronic Defence within this degree structure.
2. Research Master's Degree with Coursework (MSc (Eng) Electrical Engineering Specializing in Radar):
This master's degree consists of 3 x 20 credit courses and a 120-credit dissertation. The core course is Introduction to Radar, plus two more specialized radar courses.
3. Research Master's Degree by Dissertation (MSc (Eng) Electrical Engineering Specializing in Radar):

This master's degree requires a 180-credit research dissertation. This degree is intended for students with radar experience who would not benefit from the coursework, or students who wish to tackle a large research project.

Continuation or Upgrade to PhD

Students who complete and pass any of the three master's degrees can continue to study for a PhD. Alternatively, students who are registered for either of the MSc (Eng) Research master's degrees and who are progressing well with their studies, can upgrade to a PhD without completing the master's degree.

Occasional Postgraduate Registration

We offer the option of registering as an occasional postgraduate student for individual courses for nondegree purposes. For busy people who work in industry, but who would like to register for a master's degree, the option exists to pass some or all 6 courses over 2 or 3 years, whilst continuing to work in industry, and to complete the remaining courses and the minor dissertation in less than 1-year full time. The credits passed as an occasional student can be transferred into the degree.

Entry Requirements for a Radar Master's Degree

1. A 4-year Engineering Degree or Science Honours degree with at least 2 years of Mathematics.
2. A BTech Degree from a South African University of Technology with at least 5 years of experience in Radar or another relevant field.
3. A 3-year Bachelor of Science degree with at least 2 years of Mathematics and 5 years of experience in Radar or another relevant field.
4. A level of competence that has been attained in any other manner, which, in the opinion of Senate and on the recommendation of the faculty, is adequate for the purpose of admission as a candidate for the degree.

Please refer to the website www.radarmasters.uct.co.za/ for further information or contact the programme convenor at stephen.paine@uct.ac.za for additional information.

Continuing Professional Development (CPD) courses

Modules of this master's 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.

Who should attend?

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

Methods of Instruction

Each module is structured in the following way: a week of intensive contact time, comprising formal lectures, class assignments and seminars/tutorials.

Please note: Courses will be presented on campus. Venue details to be confirmed.

CPD Courses

Introduction to Radar Systems

EEE5119Z: 19 - 23 February 2024

The principal aim of this course is to introduce students to the fundamental principles underlying radar systems and to enable them to understand and apply these principles to generic radar systems. The subject is specifically structured around these aims. On successful completion of this course, students will be able to: Describe the main principles underlying radar systems, understand the role of each component of a radar system, use the radar equation to describe the performance of radar systems, understand how target and environmental characteristics affect the choice of system design parameters and describe and assess the relative advantages of different types of radars.

Presenters: Prof Mike Ingg

5 CPD points, ECSA course code: UCTREDITR24

Advanced Engineering Mathematics

EEE5108Z: 8 - 12 April 2024

This course provides a useful mathematical toolkit for the Radar and Electronic Defence Engineer. Emphasis is on practical calculation and useful 'tricks of the trade' rather than mathematical rigour. The textbook, *Advanced Engineering Mathematics*, E. Kreyszig (Wiley) (with many editions available but edition 9 preferred) is prescribed. Some notes are also made available to assist the student. *Specific course topics include* ordinary differential equations, laplace transforms, fourier analysis, partial differential equations and complex analysis.

Presenters: Dr Chayan Bhawal and Dr Kuntal Deka

5 CPD points, ECSA course code: UCTREDAEM24

Microwave Components and Antennas

EEE5121Z: 17 - 21 June 2024

This course aims to develop an understanding of: 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. Along with microwave components, this course also covers antenna fundamentals, dipole and monopole antennas, microstrip and patch antennas, yagi-antennas, dish antennas as well as phased arrays.

Presenters: Dr Francois Schonken and Dr Stephen Paine

5 CPD points, ECSA course code: UCTREDMDA24

Introduction to Electronic Defence

EEE5120Z: 15 – 19 July 2024

The course will assess the fundamentals of Electronic Defence, focusing on radar applications. Having successfully completed this course, students will have an understanding of Electronic Defence main concepts, understanding of electronic Support regarding its concepts and knowledge of ES measures and activities, understanding of Electronic Attack regarding its concepts and knowledge of EA measures and techniques, understanding of Electronic Protection regarding its concepts and knowledge of EP applications, understanding of Electronic Intelligence regarding its concepts and knowledge of ELINT activities and applications, understanding of the fundamentals of system architectures and basic signal processing techniques that are used in Electronic Defence

Presenters: CSIR

5 CPD points, ECSA course code: UCTREDIED24

Radar Signal and Data Processing

EEE5105Z: 5 – 9 August 2024

This course includes selected topics in signal processing in radar systems. Signal models and processing in radar (radar cross section; radar equation; swerling models; clutter modelling; noise modelling and signal-to noise ratio; jamming; doppler shift; cross-range; multipath; sampling in doppler and angle domains; quantization; I/Q modulation; radar; matched filtering; compression filtering; ambiguity function; pulse burst waveforms; frequency-modulated waveforms; phase modulated waveforms; doppler spectrum; moving target indication; pulse doppler processing; pulse pair processing) data processing; topics in radar (radar detection and hypothesis testing; threshold detection; binary integration; constant false alarm rate; cell-averaging CFAR; order statistic CFAR; spatial filtering; beam forming; space-time adaptive processing; and cognitive radar).

Presenters: Dr Mishra and Dr Gaffar

5 CPD points, ECSA course code: UCTREDRSDP24

Advanced Radar Technologies and Algorithms

EEE5132Z: 9 – 13 September 2024

This course is organized in three parts, which mainly cover aspects related to High Resolution Radar (HRR), Synthetic Aperture Radar (SAR) and Inverse Synthetic Aperture Radar (ISAR).

Having successfully completed this course, students will understand the concept behind high resolution radar SAR and ISAR, understand the techniques that are currently used in high resolution radar SAR and ISAR and be able to choose which ones are the most suitable for a given scenario, understand the significance of using SAR/ISAR images in a number of applications, be able to implement simple SAR/ISAR algorithms, understand the main differences between radar imaging of static scenes and non-cooperative moving targets, be able to predict radar imaging performance in some scenarios.

Presenters:

5 CPD points, ECSA course code: UCTREDARTA24

Overview

Programme	Radar and Electronic Defence Masters Modules
Modules and duration	Introduction to Radar Systems EEE5119Z: 19 – 23 February 2024 Advanced Mathematics EEE5108Z: 25 – 29 March 2024 Microwave Devices and Antennas EEE5121Z 17- 21 June 2024 Introduction to Electronic Defence EEE5120Z 15 – 19 July 2024 Radar Signal and Data Processing EEE5105Z: 5 9 August 2024 Advanced Radar Technology and Algorithms EEE5132Z: 9 – 13 September 2024
Venue	Upper Campus, University of Cape Town
CPD	CPD points and ECSA codes as indicated per module
Participants	Attendees are responsible for ensuring they have the necessary experience and educational background to derive full benefit from the course.
Fees per course	Standard fee: R16 500 UCT student fee: R8 250

Registration

Registration and Cancellation

- [Register online](#)
- Registration covers attendance of all sessions of the course and course material.
- Registrations close one week before the start of the course. Confirmation of acceptance will be sent on receipt of a registration form.
- **Cancellations must be received one week before the start of a course, or the full course fee will be charged.**
- For more information on application and registration procedures, please visit our website: <http://www.cpd.uct.ac.za/cpd/registration-policies>

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 master's programme or as an occasional student. If you attend the course as a CPD participant, credit cannot be claimed in retrospect.

Contact details:

For more information or details on CPD courses, visit our website or contact us.

Web: http://www.cpd.uct.ac.za	
E-mail: ebe-cpd@uct.ac.za	
Physical address CPD Programme Room 6.10, 6th Floor New Engineering Building Upper Campus University of Cape Town South Africa	Postal address CPD Programme EBE Faculty University of Cape Town Private Bag X3 Rondebosch 7701 South Africa
CPD course administrators Gillian Williams: +27 (0)21 650 7239 Sandra Jemaar: +27 (0)21 650 5793 Heidi Tait: +27 (0)21 650 4922	Programme Convenor Dr Stephen Paine Stephen.paine@uct.ac.za