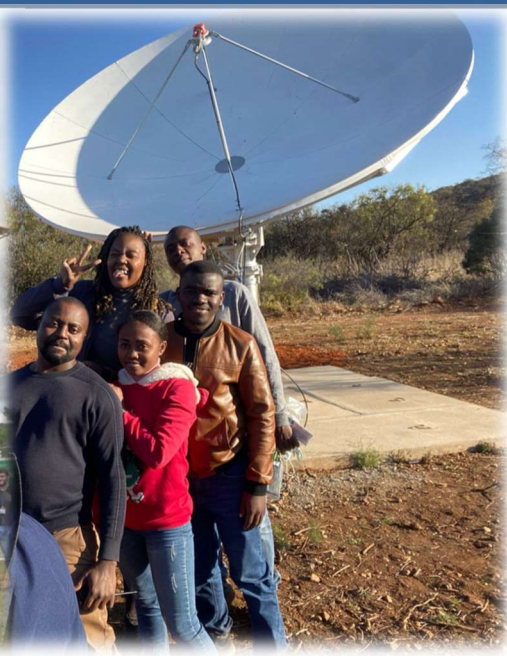
DARA Astronomy Basic Training Programme

Ghana



Introduction

Africa is becoming the focus for the world of astronomy. Construction is underway of the mid-frequency dishes of the Square Kilometre Array (SKA) – the next generation global radio astronomy facility in South Africa. There is an ambition to deploy further dishes in the eight SKA African Partner Countries (Ghana, Kenya, Zambia, Namibia, Botswana, Madagascar, Mozambique and Mauritius). South Africa also hosts the South African Large Telescope (SALT), which with its 10 m diameter mirror is one of the largest optical telescopes in the world.

To support the development of astronomy in Africa and ensure that opportunities in this area are open to African citizens the **Development in Africa with Radio Astronomy** project (DARA) is running a basic training programme, which offers the opportunity to become familiar with the basics of astrophysics and radio astronomy. Trainees will gain theoretical and practical experience in these skills, as well as advice on the industrial opportunities afforded by these new skills.

Training Programme

The basic training programme is **fully funded** by the University of Leeds, and therefore trainees will not have to pay a fee or any costs. The training package includes accommodation, meals and travel to the training venues in Ghana and Kenya. An out-of-pocket allowance will also be included to cover other incidental expenses.

The training will be delivered by experts from the UK, South Africa and the African Partner Countries (see above). Hands-on training in optical astronomy will take place at the Turkana Basin Institute in northern Kenya. Practical training in radio astronomy will take place at the Ghana Radio Astronomy Observatory in Accra. Computer skills training in Linux and Python will also be provided, as well as training in data analysis and reduction. The training will culminate in the DARA Annual Network Meeting, where trainees will get the opportunity to network with Astronomy researchers, as well as entrepreneurs from the commercial space sector.

On completion trainees will receive a certificate of completion and will then be in a position to apply for advanced training places in astronomy at Masters or PhD level, or use their new skills to aid the development of related high tech industries.

Eligibility

The programme is open to any suitably qualified Ghanaian national, who wants to undertake the training or to be re-trained in astronomy. No prior experience of astrophysics is required. Applicants would normally be expected to be graduates in physics or a related subject. Trainees who are currently studying or employed need to obtain a letter of permission from their Head of Department or line manager stating that they will be giving the time off to attend all the basic training programme elements - Please see the following pages for exact training dates.

How to Apply

Applicants should complete the online application form (link below) and ensure they upload the necessary supporting documents (details of required documents are on the application website).

https://www.dara-project.org/basic-program

If it is not possible to complete the online form, applicants can apply using a paper application form by contacting their African Partner contact, the Ghana Space Science and Technology Institute (GSSTI): gssti@gaec.gov.gh

Deadline for applications: 21st May 2025

Applications received after this date will not be considered.

If you have any issues with the application, please contact the DARA Project Manager Emma Smith (e.c.smith1@leeds.ac.uk).

The Training Programme

The training programme will consist of four elements spread over a year as well as the Annual Network Meeting.

Foundation Astrophysics Online Training

Prior to the commencement of the training, you will have the option to undertake online courses in astronomy and/or radio astronomy. Those with no prior experience of astrophysics are strongly advised to take the *DARA Foundation Astrophysics* course. This consists of 20 online lectures by Prof Melvin Hoare from the University of Leeds, covering the basis of astrophysics. Those with some prior experience of astrophysics should take the *DARA Radio Astrophysics* online course, which also consists of 20 online lectures by experts focussing on radio astronomy as well as workshop exercises.

For those taking the Foundation course it would be advisable to also complete the Radio Astrophysics prior to the practical radio astronomy training. Each online course will take about two weeks to complete in your own time.

Computer Training

This one-week course will take place betwee*n the* ***30th June and the 4th July 2025*** at the Ghana Space Science and Technology Institute (GSSTI).

This will introduce trainees to the Linux operating system and python scripting language that is widely used in astronomy as well as in industry and commerce. The course will be delivered remotely by experts from the Centre for High Performance Computing in South Africa together with local tutors. It will take place at Technical University of Kenya using the cluster of computers provided by the DARA project.

Practical Optical Astronomy Training

This two-week course will take place from ***25th August – 5th September 2025*** and will be delivered by trainers from the DARA team and Technical University of Kenya. It will be hosted at the Turkana Basin Institute in northern Kenya.

- Introduction to observational astronomy – coordinate systems, planning an observation
- Introduction to optical astronomy – telescopes and detectors, photometry, spectroscopy, time domain
- Practical sessions using the University of Edinburgh's 40 cm optical telescope and the DARA 20 cm telescope
- Introduction to radio astronomy and practical sessions using a small radio telescope and RFI monitoring device
- Reduction and analysis of the data taken

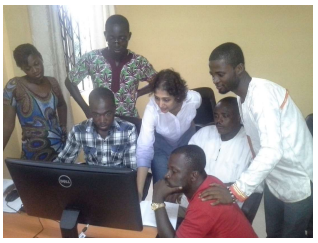
Practical Radio Astronomy Training

To take place over two-weeks from the ***3rd – 14th November 2025***, at the Ghana Radio Astronomy Observatory in Accra. This training will be taught using a mixture of lectures, workshops and hands-on training.

- Radio Telescopes – antenna systems, Radio Frequency Interference and mitigation procedures.
- Receiver Systems - feedhorn, amplifiers, cryogenics, downconverter, local oscillator, digital backend
- Single dish observations
- Interferometric observations
- VLBI Techniques - recording systems, e-VLBI, timing systems, hydrogen masers
- Geodesy

Data Reduction Training

This two-week course will take place in ***January 2026*** **(exact dates to be confirmed)** the Ghana Space Science and Technology Institute (GSSTI). It will be delivered by local tutors, using online material developed by the DARA Team. This course will be taught using a mixture of lectures and hands-on workshops with real data. Using the DARA computer suite, each trainee will use the python-based CASA software.



- Interferometric Data Reduction - flagging, fringe finding, flux calibration, phase calibration, polarization calibration, self calibration and imaging.
- Data Analysis - flux densities, source sizes, image fidelity.

DARA Annual Network Meeting

Between the ***2nd – 4th March 2026***, all 60 trainees from all the partner countries will attend a three-day annual network meeting in South Africa. Representatives from the DARA industrial partners will provide training on opportunities in related areas such as space science, satellite communications, remote sensing and space AI applications. There will also be a workshop on the use of astronomy for development from our partners at the IAU Office of Astronomy for Development (OAD). Your country cohort will be encouraged to submit a development proposal to the OAD's annual call. A CV workshop will allow you to discuss your potential future career opportunities with a panel of academics and industrial partners.