



## SAINTS@tlabs Course Framework

[S]outhern [A]frican [I]nstitute for [N]uclear [T]echnology and [S]ciences

*Empowerment through education, training and practice*

**10 – 13 June 2024**

**Course Title:** *Introduction to Advanced Analytical Techniques (AAT)*

**Course Code:** SC-AAT

**Lecturers/Facilitators:**

- [RB] Dr Remy Bucher, PhD (ETHZ), iThemba LABS NRF
- [ZK] Dr Zakhele Khumalo, PhD (UCT), iThemba LABS NRF
- [MM] Prof. Malik Maaza, PhD (university of Paris), iThemba LABS NRF/UNISA
- [MMa] Dr Morgan Madhuku, PhD (WITS), iThemba LABS NRF
- [NM] Dr Nametso Mongwaketsi, PhD (US), iThemba LABS NRF
- [MMs] Prof. Mandla Msimanga, PhD (UCT), iThemba LABS NRF/ Tshwane Univ. of Technology
- [CM] Dr Christopher Mtshali, PhD (UZ), iThemba LABS NRF
- [MN] Dr Mlungisi Nkosi, PhD (UWC), iThemba LABS NRF
- [PS] Dr Phillip Sehogela, PhD (UWC), iThemba LABS NRF
- [NK] Dr Ntombizonke Kheswa PhD (UWC), iThemba LABS NRF
- [LK] Dr Lebogang Kotsedi PhD (UWC), iThemba LABS NRF
- [MAM] Dr Mamogo Masenya PhD (UWC), iThemba LABS NRF

**Course Convener:** Dr Mlungisi Nkosi (e-mail: [m.nkosi@ilabs.nrf.ac.za](mailto:m.nkosi@ilabs.nrf.ac.za))

**Target group:** Masters/doctoral students, junior research staff working on projects involving materials science.

**No. of lectures:** ~ 8 (1-hour duration each)

**Practicals/demonstrations:**

**Course assessment method(s):** research project, individual presentation etc.

**Course certificate to be issued:**

- attendance (provided attendance > 90 %)
- successful completion (provided attendance > 90 %, > 75 % ave. in assessment(s))

**Presentation venue:** virtual (Zoom platform) The Zoom link will be sent after registration.

**Course dates/times: presentations [10 – 13 Jun 2024, 11h00 – 12h00 & 12h00 – 13h00]**

**Course registration deadline:** 08 June 2024

**Course registration link:** <https://indico.tlabs.ac.za/event/133/registrations/104/>

**Contact for queries on course:** Course Convener: [m.nkosi@ilabs.nrf.ac.za](mailto:m.nkosi@ilabs.nrf.ac.za)

**Contact for general queries:** SAINTS Co-ordinator, e-mail address: [saintsadmin@tlabs.ac.za](mailto:saintsadmin@tlabs.ac.za)



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## Course Outline

- **Thin film deposition (sputtering vs e-beam) – [NK] – Monday (10 June @11am)**
  - Introduction and basic principles of Thin film deposition
  - Physical Vapor Deposition Techniques
  - Typical Applications
- **Rutherford backscattering spectrometry (RBS) – [PS] – Monday (10 June @12pm)**
  - Introduction and basic principle of (RBS)
  - Experimental setup and detection of scattered particles
    - Normal and in-situ real-time RBS
  - Resulting spectrum properties
  - Typical application
- **Elastic recoil detection analysis (ERDA) – [MMs] – Tuesday (11 June @11am)**
  - Introduction and basic principle of ERDA
  - Experimental setup and detection of scattered particles
    - Conventional ERDA and HI-ToF ERDA
  - Resulting spectrum properties
  - Typical application
- **Particle induced x-ray emission (PIXE) – [CM], [NM] – Tuesday (11 June @12pm)**
  - Introduction and basic principle of PIXE
  - Experimental setup and detection of scattered particles
  - Resulting spectrum properties
  - Typical application
- **Low Temperature Magnetism ([LK] – Wednesday (12 June @11am)**
  - Introduction and basic principle of VSM
  - Experimental Set-up
  - Typical applications
- **Materials modification using charged particles – [MMa], [MAM] – Wednesday (12 June @12pm)**
  - Introduction and basic principle of ion irradiation/implantation
  - Experimental setup
  - Typical application
- **Nuclear Sciences & Techniques in Nanosciences & Nanotechnologies – [MM] – Thursday (13 June @11am)**
  - Introduction to nanosciences
  - Nanosystems by nuclear based radiations
  - Nanomaterials for neutron research reactors
- **X-ray diffraction (XRD) – [RB]– Thursday (13 June @12pm)**
  - Introduction and basic principle of XRD
  - Experimental setup and detection of x-rays particles
  - Resulting spectrum properties



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iThemba  
LABS  
Laboratory for Accelerator  
Based Sciences

➤ Typical application



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