SAINTS@ilabs Course Framework

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

Empowerment through education, training and experience

2024

Course Title: *Radiation Interactions and Detection*
Course Code: SC-RID
Lecturer/Facilitators:
[PJ] Dr Pete Jones, PhD (Liverpool), iThemba LABS NRF
[RTN] Dr Richard Newman, PhD (Cape Town), iThemba LABS NRF
Course Co-ordinator: Dr Richard Newman (e-mail: rt.newman@ilabs.nrf.ac.za)
Target group: masters/doctoral students, junior research staff working on projects involving ionizing radiation and detection
No. of lectures: ~ 10 (1 hour duration each)
Course assessment method(s): none
Course certificate to be issued:

- attendance (provided attendance 100 %)

Presentation venue: virtual (Zoom platform)
Course dates/times: 30 Sep – 4 Oct 2024, 11h00 to 13h00
Course registration deadline: 23 Sep 2024
Course registration link: https://tinyurl.com/reg-rid-2024
Contact for queries on course: Course Co-ordinator
Contact for general queries: SAINTS Administrator, e-mail address: saintsadmin@tlabs.ac.za
Course Outline

- Fundamental particles and forces (1 lecture) [RTN]
  (brief overview of standard model of particle physics, conservation laws, energy units)
- Foundational concepts (1 lecture) [RTN]
  (isotopes, isotones, isobars, radionuclides, chart of nuclides, nuclear decay, nuclear reactions, q-value, cross-section, luminosity, kinematics)
- Charged particle interactions with matter (1 lecture) [RTN]
  (sources, stopping power, range, brehmsstrahlung, energy loss, Bragg curve)
- X-ray and gamma-ray interactions with matter (2 lectures) [RTN]
  (sources, photoelectric effect, Compton scattering, pair production, attenuation)
- Neutron interactions with matter (1 lecture) [RTN]

- Radiation Detectors and associated electronics (4 lectures) [PJ]
  (Detector types: Photon detectors - scintillation detectors, photomultipliers, efficiencies; Semiconductor detectors for particle and photon detection - Si, Ge, efficiency timing, energy resolution.

  Electronics: analogue signal processing and pulse shaping; pre-amplification.

  Digital electronics for instrumentation: ADC, DAC, Flash ADC,

  Digitization of detectors signals: FPGA, DSP, Signal deconvolution)

Useful link				
www.tlabs.ac.za			wwwtlabs.ac.za/saints	
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