



SAINTS Short Course: *Radiation Interaction and Detection (SC-RID)*

02 – 06 October 2023

Facilitators:

- [PJ] Dr Pete Jones, PhD (Liverpool University), iThemba LABS NRF
[RN] Prof Richard Newman PhD (University of Cape Town), Stellenbosch University

An **ONLINE** short-course on Radiation Interaction and Detection offered over five days on specialized topics tailored to suit post-graduate students (Honors – PhD), and junior research staff working on projects involving ionizing radiation and detection. A total of 10 lectures will be offered in six sessions, with each session lasting an hour.

Course Co-ordinator: Dr Pete Jones (e-mail: pm.jones@ilabs.nrf.ac.za)

Target group: Honors/masters/doctoral students, junior research staff working on projects involving ionizing radiation and detection

No. of lectures/contact sessions: 10 (1 hour each)

Course certificate to be issued:

- Attendance (provided attendance > 90 %)

Presentation venue: virtual (Zoom platform: *Link to be sent to registered participants*)

Course dates/times: 02 – 06 October 2023, (11h00 to 13h00)

Course registration deadline: 30 September 2023

Course registration link: <https://indico.tlabs.ac.za/event/125/registrations/95/>

Contact for queries on course: Course Co-ordinator: jones@ilabs.nrf.ac.za

Contact for general queries: SAINTS Co-ordinator, e-mail address: saintsadmin@tlabs.ac.za

Course Outline:

Ten lecture sessions on specialized topics in ionizing radiation and interaction, 1-hours per lecture session

- **Session 1: Fundamental particles and forces (1 lecture) [RTN]**
A brief overview of standard model of particle physics, conservation laws, energy units)
- **Session 2: Foundational concepts (1 lecture) [RTN]**
Fundamental concepts of isotopes, isotones, isobars, radionuclides, chart of nuclides, nuclear decay, nuclear reactions, q-value, cross-section, luminosity, kinematics)



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- **Session 3: Charged particle interactions with matter (1 lecture) [RTN]**
Radiation sources, stopping power, range, brehmsstrahlung, energy loss, Bragg curve
- **Session 4: Charged particle interactions with matter (1 lecture) [RTN]**
Radiation sources, photoelectric effect, Compton scattering, pair production, attenuation
- **Session 5: Neutron Interactions with matter (1 lecture) [RTN]**
- **Session 6: Radiation Detectors and associated electronics (5 lectures) [PJ]**
Introduction to different types of detectors: 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)



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