

NUCLEAR TECHNOLOGY EDUCATION CONSORTIUM

N32

EXPERIMENTAL REACTOR PHYSICS

Summary

The module is based at the TRIGA low power research reactor facility of the Atomic Institute of the Austrian Universities in Vienna. Reactor neutronics and dynamics are demonstrated through experimental measurements of neutron fluxes, control rod calibrations, reactivity measurements and reactor power calibrations. An understanding and appreciation of the instrumentation and controls of a reactor are gained during the experiments and through hands-on operating experience at the reactor control panel. Safety aspects of reactor operation and fuel handling and inspection are emphasised.

On completion of this module students will be able to:

- Demonstrate a full understanding of the principles underpinning reactor operations, control of operating conditions and management of safety
- Analyse and interpret data from reactor physics and dynamics measurements, leading to an assessment of the reactor condition.
- Determine by measurement the reactor properties such as neutron flux, control rod calibration, reactivity, and reactor power calibrations. Students will have experience in starting and operating a low-power reactor
- Prepare and deliver a presentations of the protocols used in the experimental measurement. This involves some analysis and organisation of data obtained in the reactor experiment, in order to draw conclusions about the reactor properties.

Syllabus

- Measurement of the thermal neutron flux density in the reactor core
- Measurement of the fast neutron flux in the reactor core centre
- Control rod calibration and determination of the core excess reactivity
- Calibration of the shim rod in the sub-critical region
- Reactivity and reactor period
- Determination of the reactivity value of uranium fuel- and graphite elements in different core positions
- Correlation function and void coefficient
- Measurement of the absorption cross-section with the danger coefficient method
- Measurement of the background radiation around the reactor at full power
- Reactor power calibration and determination of the temperature coefficient of the reactivity
- Criticality experiments
- Demonstration of a reactor pulse with different reactivity insertion
- Introduction to Reactor Instrumentation
- Demonstration of Compensated Ionisation Chamber and SPND
- Mock up Fuel Inspection