

Nuclear Capacity Building

based on research reactors

Distance Training:
Internet Reactor
Laboratory



Basic Training:
Regional Research
Reactor Schools



Intermediate Training:
EERRI Group Fellowship
Course



Advanced Training at
International Centres
Based on Research
Reactors (ICERRs)



IAEA

60 Years

Atoms for Peace and Development

The IAEA has developed a set of services to support building of nuclear competence using research reactors. These services are available, upon request, to Member States interested in using research reactors as a primary facility to develop national nuclear science and technology programmes, including as a supporting step to embark on a national nuclear power programme. The IAEA currently offers four complementary instruments, each of them targeting specific objectives and audience.

Distance Training: Internet Reactor Laboratory (IRL)

IRL connects an operating host research reactor to guest institutions, usually Universities within the same region of the world. It provides live connection, via the Internet, with a research reactor and enables participants to interact with the reactor team and be actively engaged in performing reactor physics experiments. Intended for participants from Member States without a research reactor, the objective is to complement theoretical lectures by a practical insight into reactor physics as well as research reactor safe operation and applications.

Five to six half-day sessions are broadcasted every year, within the framework of an agreement signed between the IAEA, the host research reactor and the guest institutions. Reactor experiments include neutron flux monitoring, criticality experiments, reactor start-up, control rod calibration, temperature coefficient measurement, and study of the reactivity effects of devices/materials inserted in the reactor core.

The IRL sessions are mainly intended for students of nuclear engineering and nuclear physics. They can also be extended to other audiences, such as nuclear professionals, offering tailored experiments or demonstration exercises.



Basic Training: Regional Research Reactor Schools

Regional Research Reactor Schools provide basic knowledge and hands-on-training on reactor physics and research reactor operation and utilization. They provide a unique on-site training experience at different research reactors of the region. The objective is to assist Member States build and further develop nuclear competence, by providing basic background and technical skills for safe and sustainable operation of research reactors, including their efficient utilization.

The school combines theoretical classes and hands-on experimental activities. Topics include reactor physics, reactor kinetics and dynamics, basic concepts of safety, security and safeguards, radiation protection, neutron and gamma detection, research reactor operation as well as various research reactor applications. The practical part of the school includes facility walkthrough and extensive hands-on reactor experiments. In general, the two week school takes place successively at two different reactor facilities, located in two different countries of the region.

The school is intended for young professionals with a technical degree in nuclear engineering, nuclear physics or related fields. Their current or future assignment is generally linked to existing research reactor facilities or reactors in advanced planning stage. Participants from Member States planning to embark or embarking on a nuclear power programme, can also gain benefit from attending these schools.



Intermediate Training: EERRI Group Fellowship Course

The Eastern Europe Research Reactor Initiative (EERRI) was established with the IAEA's support in 2009 and further strengthened through Practical Arrangements between the IAEA and the EERRI partner organizations in 2016. The EERRI fellowship training course offers an extensive hands-on-training in at least two different research reactors of EERRI partner organizations: Technische Universität Wien – Atominstitut (Austria); Czech Technical University – Faculty of Nuclear Sciences and Physical Engineering (Czech Republic); Jozef Stefan Institute (Slovenia); and Budapest University of Technology and Economics – Institute of Nuclear Techniques (Hungary). The objective is to support Member States in building their nuclear competence at large and providing research reactor based hands-on-training. The course also offers a learning opportunity to support activities related to planning, commissioning, operation and effective utilization of research reactors.

The course includes theoretical classes, facility walkthrough and hands-on experiments. It covers a broad range of topics related to reactor physics, kinetics and thermal-hydraulics, research reactor operation, maintenance and utilization, nuclear safety, security and safeguards considerations, radiation protection as well as introduction to nuclear power plants. Throughout the course, participants undergo tests and evaluations, and they receive an attendance certificate upon the completion of the course.

The training is intended for young professionals with degrees in engineering and science and preferably with some experience in the nuclear field. Participants' current or future assignment is generally linked to a national research reactor or nuclear power programme. The course can be adapted and modified into a train-the-trainers course for professors or experienced research reactor staff who wish to improve their training skills.



Advanced Training at International Centers based on Research Reactors (ICERR)

The IAEA designated ICERRs are intended to help Member States gain access to state-of-the-art research reactor facilities and related infrastructure to achieve their nuclear research and development and capacity building objectives. Member States wishing to gain access to an ICERR have to become an Affiliate by signing a bilateral agreement with the ICERR. The IAEA facilitates this process, also through the sharing of the information on the capabilities offered by the ICERRs.

ICERRs can provide a range of services to support nuclear capacity building, such as:

- basic to specialized training for professionals in nuclear science and engineering (e.g. reactor laboratories, development of joint projects);
- hands-on-training related to specific activities of research reactors (e.g. irradiation and testing services) or their ancillary facilities (e.g. operation of hot cells or analytical laboratories);
- on-the-job training for research reactor and hot cells operators, maintenance personnel, radioprotection specialists or regulators.

The main objective of these types of trainings is to foster knowledge, rules- and skill-based behaviors, as well as to develop the nuclear safety culture. Duration of the training can range from a few weeks to a few months, depending on needs and training objectives. ICERR and its Affiliate institute are expected to jointly prepare the detailed content of the training programme.

Training at ICERRs is particularly well suited for professionals with some experience in research reactor operation, maintenance and utilization. It can also be used for initial education and training.

“Thanks to the IAEA nuclear education and training programme I gained experience and knowledge which will help me in my work and in particular in our project for the implementation of sub-critical reactor in Tunisia.”

Kamel Harzli, Energy Engineer, Centre National des Sciences et Technologies Nucléaires, Tunisia

Overview of the IAEA training programmes based on research reactors

Targeted Audience	Distance training: Internet Reactor Laboratory (IRL)	Basic Training: Regional Research Reactor Schools	Intermediate Training: EERRI Group Fellowship Course	Advanced training: International Centers based on Research Reactors (ICERR)
Undergraduate and Graduate Students (Nuclear engineering or related fields)	5 to 6 half-day sessions <i>Agreement to be signed with the IAEA to become a Guest institution</i> <i>IAEA may provide financial support to the Guest institutions for the procurement of the necessary equipment.</i> <i>Laboratories are broadcasted free of charge for the Guest Institutions (1 set of sessions per year for a maximum of 5 years)</i>	2 weeks	6 weeks	A few weeks to a few months
Young professionals (Nuclear engineering or related fields)	<i>Bilateral arrangement to be made between a Host reactor and a Guest institution</i> <i>IAEA acts only as a facilitator</i>	<i>Schools held by the hosting organizations, in cooperation with the IAEA</i> <i>Funding might be provided through established mechanisms (e.g. under relevant TC projects or extra budgetary contributions)</i>	<i>EERRI Course held by the hosting organizations, in cooperation with the IAEA</i> <i>Funding might be provided through established mechanisms (e.g. under relevant TC projects or extra budgetary contributions)</i>	<i>Bilateral arrangement to be made between the ICERR and an Affiliate institution</i> <i>IAEA act as a facilitator but, if applicable, funding might be provided through established mechanisms (e.g. under relevant TC projects or extra budgetary contributions)</i>
Professionals seeking advanced and specific training				<i>Bilateral arrangement to be made between the ICERR and an Affiliate institution</i> <i>IAEA acts as a facilitator but, if applicable, funding might be provided through established mechanisms (e.g. under relevant TC projects or extra budgetary contributions)</i>

Note: [Trainers](#), university professors or reactor staff who wish to improve their skills in developing and delivering hands-on-training courses at their national facilities, [may also join the distance IRL training](#), [hands-on-training at the Regional Research Reactor Schools](#), or attend part of the EERRI hands-on-training Group Fellowship Course (e.g. for 2 weeks) to get an insight into the content and pedagogical approach (train-the-trainers approach).

Department of Nuclear Energy

International Atomic Energy Agency
 Vienna International Centre, PO Box 100, 1400 Vienna, Austria
 Telephone: +43 1 2600-0; Fax: +43 1 2600-7
Research-Reactor-Section.Contact-Point@iaea.org

<http://www.iaea.org/ne>