



International Atomic Energy Agency
Department of Nuclear Sciences and Applications

**KOICA-KAERI-IAEA Joint Training Course on
Fundamentals of Radioisotopes and Radiation Technology: Principle of Electron
Accelerators and their Applications**

Prospectus

- Title:** Joint Training Course on Fundamentals of Radioisotopes and Radiation Technology: Principle of Electron Accelerators and their Applications
- Host Institutes:** Korea Atomic Energy Research Institute (KAERI)
- Date:** 23 November – 4 December 2020
- Deadline for Nominations:** 15 September 2020
- Organizers:** The Korea International Cooperation Agency (KOICA) in cooperation with the International Atomic Energy Agency (IAEA)
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Role of Administrator: The role of the administrator is to manage the e-learning course, inspect or check the participants' learning schedule, and implement a reaction evaluation. The reaction evaluation is closely linked to the degree to which participants find the training favourable, engaging, and relevant to their jobs.

Role of Tutor: The role of the tutor is to respond to the participants' questions, promote discussions closely linked to the e-learning course, make quizzes about each subject in the e-learning course, provide guidance and comments about the participants' country report activity and action plan activity in the e-learning course, and implement learning and behaviour evaluations for the participants.
The learning evaluation is closely linked to the degree to which the participants acquire the intended knowledge, skills, attitude, confidence, and commitment based on their participation in the training. The behaviour evaluation is closely linked to the degree to which the participants apply what they learn during the training when they are back on the job.

Place of Learning: It is strongly recommended that each participant prepares a place to be absorbed in his/her e-learning in the country (e.g. office, house, etc.). The place should cover equipment (e.g., web camera, headset, software, computer, Internet connection, etc.) necessary to participate in the e-learning course. In addition, the organizers do not provide the participants with any auxiliary devices (e.g. CD (Compact Disc), USB flash drive, etc.).

Type of Learning: The type of learning is based on e-learning. The e-learning is a type of learning that utilizes electronic technologies to access educational curriculum outside of a traditional classroom. The definition of e-learning is closely linked to courses that are specifically delivered via the Internet to somewhere other than the classroom where the professor is teaching. It is not a course delivered via a DVD or CD-ROM, videotape, or television channel. It is interactive in that the e-learning participants can also communicate with their

tutor or other students in their desired places. Sometimes the e-learning participants can “electronically” raise their hand and interact in real time, or they listen to a lecture that was pre-recorded. There is always a tutor interacting/communicating with the e-learning participants and grading their participation, country reports, and action plan reports.

Scope and Nature:

The e-learning course will take place over 2 weeks, including a kick-off meeting, closing meeting, lectures, Q&A, quizzes, country report activity, and action plan activity. The lectures will cover the following:

- Introduction to radiation theory
- Generation of the radiation
- Radiation diagnosis and applications
- Introduction to NDT and security inspection
- History of accelerator
- Radiation detection
- Radiation imaging
- Introduction to particle accelerators and the operating process of the system
- Industrial applications of the accelerators and accelerator facilities in Korea
- Understanding cargo inspection and NDT
- Status of CIS and NDT
- Simulation of the electromagnetic field and beam dynamics
- Basics of the radiation shielding simulation
- Set up the simulation conditions and calculations

Background Information:

Electron accelerators accelerate the electrons released from electron beam sources to dozens of MeV. They use direct current systems or an alternating current system-basis RF system as a power source to supply accelerating energy to electrons. The accelerator tube is mainly made of pure metals such as pure copper for normal conducting accelerators or niobium for superconducting accelerators. The electrons are accelerated under the conditions of an exhausted vacuum in the accelerator tube to prevent beam loss. In addition, the accelerated electrons are released from the accelerators, react with matter, or irradiated by converters to generate X-rays, neutrons, etc. The electron accelerator is likely to be utilized as part of a system, such as security inspections, non-destructive testing, radiotherapy, radiation treatment equipment, etc., and can be further utilized in the various fields.

Procedure of Learning:

The participants will be provided the purposes, contents, and quizzes about each subject in consecutive order when the participants “click” the subject in the e-learning website on the learning platform (<http://lms.anent.online>). The purposes, contents, and quizzes help the participants achieve the purpose of this e-learning course in the electron accelerators field. In particular, the purpose of these quizzes includes checking the extent to which the participants understand the contents of each subject.

Before taking the e-learning, all participants should log into the ANENT RLMS (<http://lms.anent.online>) and register as a “Learner”. After registering, the administrator will permit the participants’ registration as a “Learner”, and the participants should check the learning environment to take the e-learning (e.g. Internet connection, web camera, headset, etc.).

After taking an e-learning course, all participants can or should participate in

the following activities:

- Q&A
The participants can post their question about the topic in a separate section of the ANENT RLMS. After posting the question, the tutor will answer the question.
- Quiz
As soon as they receive the contents of each subject, all participants will be provided a quiz to check the extent to which they understand the contents of each subject.
- Country Report/Action Plan
The facilitator will post guidelines to describe the country report and action plan activities in the ANENT RLMS. All participants are requested to establish and upload their country report and action plan report in MS Word and PowerPoint format by the deadline. The facilitators and professionals will give their comments regarding it.
- Kick-off and Closing Meetings
The Kick-off and Closing Meetings are similar to an opening and wrap-up ceremony, respectively, in the classroom training. Before starting this e-learning course, all participants will be provided the precise time to participate in the opening and wrap-up ceremonies through e-mail.

Criterion of Completion:	Attendance (30%), country report (30%), and action plan report (40%)
Language:	English
Objective:	The main objective of this training course is to help attendees understand the principles of electron accelerators, which aim to accelerate electrons to dozens of MeV, and to upgrade knowledge and skills related to their use. The focus will be on the structure and development process for radiation-fusion systems, such as current or prospective security inspections, non-destructive testing, cancer treatment equipment, etc. This technology can be used in areas such as defense, security, industrial manufacturing, medical development, etc.
Participants' Qualifications & Experience:	The applicants should be employed by governmental authorities, organizations, R&D institutes, or regulatory bodies involved in radiation and nuclear technologies. Applicants should preferably be senior level employees involved in policy making and/or regulations and must have prior experience in radiation technology and applications. Applicants should have a good understanding of the English language and should not be older than 50 years of age.
Participation:	One to two persons per country from different areas: Governmental authorities, R&D institutions, users of radiation technologies, and regulatory bodies.
Target Countries:	IAEA Member States
Nomination Procedure:	Nominations for the training course should be submitted to the IAEA online through the Technical Cooperation Department's In Touch system (http://intouch.iaea.org). Should this not be possible, nominations may be submitted on the standard IAEA Nomination form for training courses (available on the IAEA website: http://www.iaea.org/). Completed forms

should be endorsed by relevant national authorities and returned to the Agency through the official channels, i.e., the designated National Liaison Office for IAEA Matters.

Applications must be received by the International Atomic Energy Agency, P.O. Box, A-1400 Vienna Austria, **no later than 15 September 2020.** Nominations received after this date or which have not been routed through the established official channels cannot be considered.

The final selection of course participants will be held jointly by the IAEA and communicated to KOICA and KAERI.

Advanced nominations by facsimile (+43-1-260007) or e-mail to (Official.Mail@iaea.org) are welcome. The facsimile/e-mail should contain the following basic information about the candidate(s): Name, age, gender, academic qualifications, and present position, including the exact nature of duties carried out, proficiency in English, and full working address (including telephone and fax numbers, as well as e-mail) to enable the IAEA to make a preliminary evaluation of, and communicate with, the candidates.

Administrative and Financial Arrangements: Nominated governments will be informed by the IAEA and, at that time, the selected participants will be given full details of the procedures to be followed with information regarding the administrative and financial matters.

The participants should cover all expenses (e.g., web camera, headset, software, computer, Internet connection, studio rental, etc.) necessary to participate in the e-learning course. In addition, the organizers do not provide the participants with any auxiliary devices (e.g., CD (Compact Disc), USB flash drive, etc.). The organizers do not accept liability for the payment of any cost or compensation that may arise from damage or loss of personal property, illness, injury, disability, or death of a participant while travelling to and from, or when attending, the course. It is also clearly understood that each organization, in nominating the participants, undertakes the responsibility for such coverage.