GOVERNMENT OF INDIA
ATOMIC ENERGY REGULATORY BOARD
NIYAMAK BHAVAN, ANUSHAKTINAGAR,
MUMBAI-400 094

AERB/RSD/DR Course

APPLICATION FOR ASSESSMENT OF MEDICAL DIAGNOSTIC X-RAY TECHNOLOGIST COURSE

- Course conducting institution is requested to first register its institute in AERB's electronic licensing system (e-LORA) in Diagnostic Radiology Practice.
- Guidelines for Institute Registration https://elora.aerb.gov.in/ELORA/PDFs/Guidelines%20for%20Institute%20Registration.pdf
- Application can be submitted in e-LORA system by following the path: Regulatory Forms>> Medical Diagnostic Radiology>>Adhoc application.
- Attach extra sheets, if required.
- Application will be considered only if all the details and attachments mentioned below are submitted by institution.

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1. Name & address of the Institution :

2. Name and Designation of the Head of the Institution :

3. Name and Designation of the person coordinating the: Course

   (a) Telephone No.(with STD Code) :

   (b) Fax No. :

   (c) E-mail ID

   (d) Mobile No. :

4. Name of the Training Course in full :
   (In capital letters)

5. Abbreviation of the Training Course, if any :
   [Like B.Sc. (MIT), B.Sc. (DR)]

6. Since how long the Training Course is being conducted :

7. Name of Institution / Education Board / University to which it is affiliated :
   (Please attach copy of the Affiliation Certificate or Approval from the competent authority of the Institution/ Education Board/University for latest academic year)

8. Maximum Intake of trainees for the Course :

9. Basic Qualification for admission to the Course :
(Pl. ✓ for applicable)

Matriculate ☐
10+2 in Science ☐
10+2 in any discipline ☐
Graduate in Science ☐
Graduate in any discipline ☐
Any other specify: ____

10. Duration of the Course :

1 year ☐
2 years ☐
3 years ☐

11. Subjects included in the Syllabus : Diagnostic Radiology ☐ /_____%
(Give percentage-wise subject covered) Any other specify:_____/_____%

12. Whether enclosed syllabus on radiation safety is covered in the training programme : Yes ☐ No ☐
If No, list the topics of syllabus not covered in a separate sheet.
(Full syllabus should not be sent for verification)

13. Qualifying Institution / Board / University examination includes:

Sr. No.	Title of the Paper	Total Marks	Pass Marks
THEORY			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
PRACTICALS			
1.			
2.			
3.			

Total marks of the course (Theory) :
(Practical :
Passing Criteria of Institution/Board/University :

14. Availability of X-ray equipment in the institute & duration of in-field training provided:
(*Kindly provide information in below table, attach extra sheet, if required)*

Type of X-ray Equipment	No. Of Units	Period allotted for Training (In months)	Make	Model	Date of issuance of Licence / Registration	Remarks
Computed Tomography (CT)						
Interventional Radiology (IR)						
Radiography (Fixed)						
Radiography and Fluoroscopy (Fixed)						
Radiography (Mobile)						
Mammography						
C-Arm						
Bone Mineral Densitometer (BMD)						
Dental Orthopan Tomography (OPG)						
Dental Cone Beam Computed Tomography (CBCT)						
Dental (Intra-oral)						
Any other (Please Specify)						

15. Whether all the above x-ray equipment are available in your institute : Yes ☐ No ☐
(If "No" pl. attach MoU with the institution where in-field training will be provided)

16. Whether above x-ray equipment are being used clinically in your institute: Yes ☐ No ☐

17. Whether your institute has obtained Licence / Registration from AERB for operation of above x-ray equipment : Yes ☐ No ☐

18. On successful completion of the training programme, trainees are eligible to work in :

Sr. No.	Type of X-ray Equipment	Pl. ✓ for applicable
1.	Radiography (Fixed)	Yes ☐ No ☐
2.	Radiography (Mobile)	Yes ☐ No ☐
3.	Radiography and Fluoroscopy (Fixed)	Yes ☐ No ☐
4.	Computed Tomography (CT)	Yes ☐ No ☐
5.	Interventional Radiology (IR)	Yes ☐ No ☐
6.	C-Arm	Yes ☐ No ☐
7.	Mammography	Yes ☐ No ☐
8.	Dental (Intra-oral)	Yes ☐ No ☐
9.	Dental (OPG)	Yes ☐ No ☐
10.	Dental (CBCT)	Yes ☐ No ☐

19. Whether the certificate / marks sheet of above course indicates the name of course conducting institution : Yes ☐ No ☐

20. Attach teaching faculty details with their qualifications and affiliation to the institute :

21. Any other information :

Enclosures:

Sr. No.	Attachment	Pl. ✓ for applicable
1	Affiliation Certificate or Approval from the Competent Authority of the Institution / Education Board / University for the latest academic year	Yes ☐ No ☐
2	List of faculty with their qualifications and affiliation to the institute including faculty delivering lectures of radiation safety	Yes ☐ No ☐
3	MoU with the institution where in-field training will be provided, if applicable	Yes ☐ No ☐

Place :

Date:

Signature of the person coordinating the Course:

Name:

Designation:

Signature of the Head of the Institution:

Name:

Designation:

(Seal of the Institution)

Minimum syllabus pertaining to radiation safety requirements for medical diagnostic X-ray Technologist Course

Minimum of 50 hours for standalone course on diagnostic radiology should be devoted to Radiation Safety. This should cover both theory as well as practical demonstration during the training.

1.1 Basic Radiation Physics

Atomic structure, atomic number, mass number, bound and free electrons, binding energy, ionization, excitation, fluorescence, characteristic x-ray, stability of nucleus, isotopes, radioisotopes, types of radioactive disintegration, directly and indirectly ionizing radiations, x-rays and gamma rays, energy of ionizing radiation, half-life, effective half-life and production of radioisotopes.

1.2 Production of X-rays

Interaction of accelerated electrons with target atoms, conversion of kinetic energy of electrons into x- rays, Bremsstrahlung and characteristic x-rays, x-ray spectrum, types of x-ray tubes (anode, cathode, inherent filters, focal spot), heat production in the anode and cooling mechanism, quality and quantity of x-rays (effect of kV, mA).

1.3 Interaction of Radiation with Matter

Interaction of electrons with matter, Bremsstrahlung, interaction of photon with matter (photoelectric, compton and pair production), influence of photoelectric effect and compton effect on image quality and patient dose, absorption, scattering and attenuation of photons, Half Value Thickness (HVT) and Tenth Value Thickness (TVT), beam hardening, importance of x-ray beam filtration in diagnostic radiology

1.4 Radiation Quantities and Units

Activity (Becquerel & Curie), energy, exposure(C/kg &Roentgen), air kerma, absorbed dose (Gray & Rad), radiation weighting factors (WR), tissue weighting factors(WT), equivalent dose (Sievert & rem), effective dose (Sievert & rem).

1.5 Biological Effects of Radiation

Interaction of radiation with cell, direct and indirect interactions, effect of radiation on living cells, chromosomal aberration, somatic and genetic effects, deterministic and stochastic (probabilistic) effects, effects of partial and whole body exposures.

1.6 Operational Limits

Introduction to natural background radiation, concept of occupational risk, philosophy of radiation protection, system of dose limitation, ALARA, dose limits to radiation workers and general public, AERB/ICRP recommendations, guidance level for patient dose reduction in radio-diagnosis, dose constraints for comforters of patients.

1.7 Radiation Detection and Measurement

Principle of radiation detection, gas detectors (ionization chamber, proportional counter and GM counter), solid state detectors {Scintillator, semiconductors and Thermo luminescent Dosimeter (TLD)}, radiation monitoring instruments, personnel monitoring, area monitoring, survey meters, direct reading devices, calibration and response of radiation monitoring instruments.

1.8 Radiation Hazard, Evaluation and Control

External hazard and their perspective, evaluation and control of hazard due to external radiation: individual and workplace monitoring, application of time, distance and shielding; shielding calculation, requirement of filters with respect to kV of the machine, leakage radiation assessment by workload consideration, radiation protection in diagnostic radiology and radiation protection accessories.

1.9 Principles of Diagnostic Radiology

Fundamentals of diagnostic radiology, physical principle of image formation, limitations of conventional x-ray imaging, image contrast, contrast media, intensifying screens, optical density, characteristics of x-ray film, fluoroscopic screens, image intensified fluoroscopy, methods to reduce scattered radiation, Bucky grids and image quality.

1.10 X-ray Imaging Techniques

Radiography and fluoroscopy, CT scanning, digital subtraction angiography (DSA), mammography, interventional radiology, digital radiology, bone densitometry, dental radiology.

1.11 Planning of Diagnostic X-ray Installation

General principles of planning of diagnostic installations, site selection, workload, shielding material, openings and ventilation, illumination control, X-ray installation layout, control panel, patient waiting area, warning light and placard, model layouts of diagnostic radiology installations.

1.12 Quality Assurance in Diagnostic Radiology

Importance of QA in Diagnostic radiology, test parameters and test procedures for congruence of optical and radiation fields, central beam alignment, effective focal spot size, exposure time, applied tube potential, total filtration, table top transmission, linearity of timer loading station, linearity of mA loading station, consistency of radiation output, low and high contrast resolution, table top dose rate, radiation leakage though tube housing and collimator, dark room procedures, QA procedures for CT scanner and mammography.

1.13 Regulatory Aspects for Diagnostic Radiology

Regulations with respect to diagnostic radiology, relevant regulatory documents such as Act, Rules, Code, Standards and Guides, responsibilities of employer, licensee, Radiological Safety Officer (RSO), radiologist and Medical Radiographer (Technician); regulatory requirements for import, procurement, installation, commissioning, operation, transfer, dismantling and decommissioning of diagnostic equipment, Radiation Protection Programme (RPP).

1.14 Radiation Incidents and Case Studies

Radiation incidents involving X-ray equipment, over-exposure investigation and case studies.

1.15 Operational Safety Aspects

Proper use of modality specific radiation protection devices (lead protective barrier, lead aprons, ceiling suspended lead screen, couch-hanging lead rubber flaps etc.), Proper use and storage of TLD badges, Use of modality specific operational safety guidelines for minimizing occupational exposure in diagnostic radiology.

2. Practical Demonstrations:

2.1 Radiation protection survey of a diagnostic x-ray installation

2.2 Quality assurance (QA) of medical diagnostic x-ray equipment

Note: The syllabus for the training associated with medical /clinical subjects such as anatomy and physiology, patient preparation and positioning procedures etc. as deemed fit need to be included in addition to the safety part of the syllabus, mentioned above, shall be approved by the Board / University affiliating the training course.