Goverment of India
Atomic Energy Regulatory Board
Radiological Safety Division

Date: June 30, 2018

Medical Physicist Courses in India

Contents

1 Minimum qualification for Medical Physicist/RSO

The minimum qualifications stipulated for Medical Physicist/Radiation Physicist/Radiological Physicist and RSO (Radiological Safety Officer) in AERB safety code on Radiation Therapy Sources, Equipment and Installations, AERB/RF-SC/MED-1 (rev.1), 2011 are as follows:

1.1 Medical Physicists

(i) A post graduate degree in Physics from a recognized university;
(ii) A Post M.Sc. diploma in radiological/medical physics from a recognized university;

&

(iii) An internship of minimum 12 months in a recognized well-equipped radiation therapy department.

OR

(i) A basic degree in science from a recognized university, with Physics as one of the main subjects;
(ii) A post graduate degree in radiological/medical physics from a recognized university;

&

(iii) An internship of minimum 12 months in a recognized well-equipped radiation therapy department.

1.2 Radiological Safety Officer (RSO)

(i) Minimum qualifications required for a Medical Physicist/Radiation Physicist/ Radiological Physicist as mentioned above;

&

(ii) An approval from the competent authority to function as Radiological Safety Officer.

1.3 List of Medical Physics Courses

List of the institutions whose Medical Physics course is in accordance with AERB requirements as on June 30, 2018 is enclosed as Annexure-1: List of Medical Physics Course

1.4 Important Note for Medical Physics Courses

- Only those candidates who successfully complete the Medical Physics course from the institutions listed in annexure-1 and undergo one year internship in a well equipped radiotherapy centre meeting the internship criteria are eligible to work as Medical Physicist in the country. They are also eligible to appear for Radiological Safety Officer (RSO) examination conducted by Radiological Physics & Advisiory Division (RP&AD), Bhabha Atomic Research Centre, Mumbai on succesful completion of which they become eligible to work as RSO in Medical Institutions and can function as RSO with prior approval from AERB.
- It is advised that candidates must verify the status of the Medical Physics course with the course conducting institutions and enroll themselves only in those institutions whose course is in line with AERB requirements as listed in Annexure-I. **Candidates completing the course from any other institutions will not be considered eligible to**

work as Medical Physicist in radiotherapy facilities in the country and wil not be permitted to appear for RSO (Medical) examination.

- Institutions who are interested to start Medical Physics course are advised to approach AERB for assessment of their course in line with AERB requirements, failing to which candidates completed their course will not be considered eligible to work as Medical Physicist in the country and the **institutions will be solely responsible for unemployment or career of the candidates, those have been admitted by the institutions without obtaining conccurence letter from AERB.** Therefore, institutions are advised not to admit the candidates until their course is in line with AERB requirements.

2 Guidelines for Medical Physics Internship Programme

2.1 General Information

As per revised AERB safety code on Radiation Therapy Sources, Equipment and Installations, 2011 [Code No. AERB/ RF-MED/SC-1(Rev. 1)], minimum 12 months internship in a recognised well-equipped radiation therapy department has been specified as a mandatory requirement for a qualified Medical Physicist and Radiological Safety Officer. To fullfill this requirement, all the Medical Physics candidates passing out from different Institutions/Universities in the country, the courses of which are in-line with AERB requirements, should undergo Medical Physics internship under the supervision of a qualified and adequately experienced Medical Physicist for a duration not less than 12 months at a recognised well-equipped radiotherapy centres in the country, as described below:

2.2 Well equipped radiotherapy centre

A radiotherapy centre which is having at least following facilities is considered as well equipped radiotherapy centre for internship program:

2.2.1 Radiotherapy Equipments

- One Linear Accelerator (with photon and electron beams)
- One HDR Brachytherapy Unit
- One Simulator/ CT-Simulator
- One Treatment Planning System
- Adequate dosimetry and monitoring instruments

2.2.2 Availability of experienced Medical Physicist

- At least one Medical Physicist with minimum 5 years of experience

2.2.3 Eligibility for Internship Supervisor

The internship supervisor is a medical physicist with at least 3 years of working experience in a Radiotherapy Department subject to availability of at least one Medical Physicist having minimum 5 years of working experience.

2.2.3.1 Ratio of Internship Supervisor to Medical Physics Intern

a) The ratio of Medical Physics Internship Supervisor to Medical Physics intern shall be 1:1 in case the supervisor is having working experience of at least 3 years but less than 5 years.
b) The ratio of Medical Physics Internship Supervisor to Medical Physics intern shall be 1:2 in case the supervisor is having working experience of 5 years or more.

2.3 Evaluation and certification procedure

The competency of conducting a clinical task by the intern should be evaluated at regular intervals by the internship supervisor. While doing this evaluation the internship supervisor should ensure that the intern is capable of conducting the desired task unsupervised. It is also important that the intern should prepare a comprehensive report of the work done during the 12 months period of the internship. The report so prepared should jointly be authenticated by the internship supervisor and the Head of Radiotherapy Department of the institute.

2.4 Certificate format

The internship completion certificate should be issued on the letterhead of the institution in the following format:

Ref. No. and date of issuing the certificate

This is to certify that Dr./Mr/Ms ..... of ..... University/ Institution has underwent the medical physics internship at the department of radiotherapy under the supervision of ..... (name of the internship supervisor) from (date) ..... to (date) ..... It is also certified that the candidate has obtained the full competency in the following components

- Radiotherapy equipment (treatment and imaging) and QA
- Beam calibration and dosimetry
- External beam treatment planning
- Brachytherapy dosimetry and treatment planning
- In-vivo dosimetry and patient dose verification
- Radiation Protection and Safety

and has acquired sufficient knowledge in

- Clinical Orientation
- Professional skill development and career planning

(Signature with date) (Name) Head of the Institution Office Seal	(Signature with date) (Name) Head, Medical Physics Department Or Chief /Sr. Medical Physicist Office Seal	(Signature with date) (Name) Internship Supervisor Office Seal

2.5 Syllabus for Internship

2.5.1 Part – I: Core Components

2.5.1.1 CC1. Radiotherapy Equipment (treatment and imaging) and QA

Specifications, operation and use of telecobalt unit and its accessories such as wedges, breast cone, trays (if available), medical LINAC and its accessories (MLC, EPID, Electron applicators, etc), radiotherapy simulator and its accessories; remote after-loading brachytherapy equipment and its accessories (connectors, guide tubes, applicators, needles, etc), and radiotherapy treatment planning system (RTPS), Familiarization with networking and Record and Verify systems (if available).

Purchase document preparation, tendering and selection of equipments; Acceptance testing, commissioning measurements and Quality assurance (QA) of radiotherapy treatment and imaging equipments, maintenance of QA records.

2.5.1.2 CC2. Beam Calibration and Dosimetry

Dosimeters, phantoms and protocols (e.g. IAEA TRS 398/TG-51) for reference dosimetry; output measurements in reference conditions of telecobalt gamma ray beams, high energy x-ray and electron beams from medical LINACs; Familiarization with radiation field analyser (RFA); Measurements of relative dosimetry parameters and factors such as PDD,TPR, TMR, Scatter factors, Wedge factor, Tray transmission factor, electron applicator output factor; Measurement of beam profiles and evaluation of flatness, symmetry and beam penumbra. Uncertainty analysis and testing the authenticity of measured data; Verification of measured data by alternate techniques such as film dosimetry; Quality assurance and up-keeping of dosimetry systems.

2.5.1.3 CC3. External Beam Treatment Planning

Customization and creation of beam library in the RTPS; Capabilities and limitations of the RTPS, Forward and inverse planning - algorithms; Definition and localization of PTV, CTV, ITV, Organ at risks (OARs), Time and monitor unit calculations for simple treatments, time dose fractionation and gap correction; Steps of treatment planning and treatment planning procedures – patient data acquisition, contouring, immobilization, mould preparation; optimization and evaluation – DVH/ TCP/ NTCP; Planning of common treatment cases; Execution of treatment plans and supervision. Practice with conventional planning, 3D CRT, SRS/SRT, IMRT/IGRT; Acceptance testing and quality assurance of RTPS.

2.5.1.4 CC4. Brachytherapy Dosimetry and Treatment Planning

Dosimeters for source strength measurements, source strength measurement methods and protocols; dosimetry formalisms, measurement of dosimetry parameters, Definition of reference points of dose calculation, applicator placements, image acquisition, planning procedures, optimization, evaluation; Brachytherapy treatment protocols and recommendations; Practice of planning with clinical cases of intracavitary, intraluminal and interstitial brachytherapy. Execution and supervision of brachytherapy treatments.

2.5.1.5 CC5. In-Vivo Dosimetry and Patient Dose Verification

Objectives of patient in-vivo dosimetry and dose verification; Understanding the use of different dosimeters in such measurements e.g. ionization chambers, TLD, diodes, MOSFET, films; Selection criteria for the dosimeter; In-vivo dosimetry measurements in gamma rays, x-rays and electron beams; Familiarization with national/ international protocols/ procedures of in-vivo dosimetry and patient dose verification.

2.5.1.6 CC6. Radiation Protection and Safety

Familiarization with regulatory requirements - safety codes and guides; Responsibilities and duties of a Medical Physicist and radiological safety officer (RSO) in radiotherapy; Working out room layout and shielding calculations for external beam, brachytherapy and simulator (Physical/CT) installations; Submission of safety status report to AERB – ASR, Unusual occurrences, source loss etc. Maintenance of records – QA, calibration certificates of equipments, source inventory, personnel dose records, protection survey

Radiation safety requirements for radiotherapy equipments; Radiation protection survey of equipment and installations; Analysis of survey data and assessing the safety status of equipment and installations; Familiarization with national regulation pertaining to procurement, use and decommissioning of radiotherapy equipment and sources; Safety of radioactive sources; Experience in handling emergency situations. Safety requirements for

occupational, medical and public exposures; Understanding the methods for minimizing the dose to critical sites of the patients. Orientation for RSO certification examination.

2.5.2 Part – II: Auxiliary Components

2.5.2.1 AC1. Clinical Orientation

Surface and cross sectional anatomy with reference to radiotherapy, identify key anatomical features on x-ray/ CT images, role of radiotherapy in cancer treatment, benign and malignant tumours, primary and secondary tumours, metastasis and routes of metastases, tumour stage and grading, common cancer sites, identification of abnormal size of organs due to primary tumours and metastases on radiological images, identification of organs at risk surrounding the tumours, palliative and curative therapy, time dose fractionation, accuracy requirement in radiotherapy, tissue tolerances, therapeutic gain, clinical targets, anatomical and physiological changes due to radiotherapy treatment, Patient related clinical experiences. Familiarisation with different professionals/ departments involved directly or indirectly with radiation treatment of cancer.

2.5.2.2 AC2. Professional Skill Development and Career Planning

Ethics in medical use of ionizing radiation; Development of research and teaching skills; Planning research and development on a given topic related to development of dosimetry methods, development of dosimeters, development of QA tools and methods, development of treatment devices and accessories, etc. Training to work as effective educator and mentor in radiation oncology physics.

2.6 Important Note for internship

1. The institutions fulfilling the **above mentioned guidelines** for Medical Physics Internship Programme and **desirous of conducting the internship programme** are allowed to take Medical physics interns and **no separate permission is required** from AERB for carrying out the internship programme. However, the institution providing internship are advised to **ensure that the candidates have undergone their Medical Physics Course from an institution who's Course has been assessed by AERB (Ref: Annexure-1).**
2. The co-ordinator the medical physics course conducting institution/candidates are advised to ensure that the institution where the internship is sought by them is meeting the guidelines for Medical Physics Internship Programme laid down by AERB as mentioned above.
3. After successful completion of 12 months internship, intern and supervisor need to fill an internship declaration form (Annnexure-2), which is required to be attached by the intern along with the internship certificate for obtaining radiation professional registration from AERB through e-LORA.

Annexure-1: List of Medical Physics Course(As on June 30, 2018)

Sr. No.	Name of the Institute	Affiliated by	Course Name	Duration
1.	Osmania University **Hyderabad** *{Andhra Pradesh}*	Osmania University, Hyderabad	Post M.Sc. Diploma Course in Radiological Physics (Dip. R. P.)	1 Year
2.	Dr. B. Borooah Cancer Institute, **Guwahati**{Assam}	Gauhati University, Guwahati	M.Sc. (Radiological Physics)	2 Years
3.	Mahavir Cancer Sansthan **Patna** *{Bihar}* *[Presently course is stopped]*	Aryabhatta Knowledge University, Patna	Post M.Sc. Diploma in Medical Physics	1 Year
4.	Pt. J. N. M. Medical College & Dr. B.R. Ambedkar Memorial Hospital **Raipur** *{Chattisgarh}* *[Presently course is stopped]*	AYUSH and Health Sciences University of Chhattisgarh, Raipur	Post M.Sc. Diploma Course in Radiological Physics (Dip. R.P.)	1 Year
5.	Guru Gobind Singh Indraprastha University **New Delhi** *{Delhi}*	Guru Gobind Singh Indraprastha University, New Delhi	Post M.Sc. Diploma Course in Radiological Physics (Dip. R.P.)	1 Year
6.	Vydehi Institute of Medical Sciences **Bangalore** *{karnataka}*	Rajiv Gandhi University of Health Sciences, Bangalore	M.Sc.(Radiation Physics)	2 Years
7.	Manipal University **Manipal** *{karnataka}*	Manipal University, Manipal, Karnataka	M.Sc.(Medical Radiation Physics)	2 Years
8.	Kidwai Memorial Institute of Oncology **Bangalore** *{Karnataka}*	Rajiv Gandhi University of Health Sciences, Bangalore	M.Sc.(Radiation Physics)	2 Years
9.	Regional Cancer Center **Thiruvananthapuram** *{Kerala}*	Kerala University of Health Sciences, Thrissur	Post M.Sc. Diploma Course in Radiological Physics (Dip. R. P.)	1 Year
10.	Calicut University **Calicut** *{Kerala}*	Calicut University, Calicut	M.Sc.(Radiation Physics)	3 Years
11.	Amrita Institute of Medical Science & Research Center **Kochi** *{Kerala}*	Amrita Vishwa Vidyapeetham, Coimbatore	Post Graduate Diploma in Medical Radiological Sciences(PG DMRP)	1 Year

Sr. No.	Name of the Institute	Affiliated by	Course Name	Duration
12.	Radiological Physics & Advisory Division, Bhabha Atomic Reseraach Centre **Mumbai** *{Maharashtra}*	Homi Bhabha National Institute, Mumbai	Post M.Sc. Diploma Course in Radiological Physics (Dip. R. P.)	1 Year
13.	Panjab University **Chandigarh** *{Punjab}*	Panjab University, Chandigarh	M.Sc.(Medical Physics)	2 Years
14.	PSG College of Technology **Coimbatore** *{Tamil Nadu}* *[conducted for first batch(2007) only and thereafter course was stopped by the institute]*	Anna University, Chennai	M.Sc.(Medical Physics)	2 Years
15.	Christan Medical College **Vellore** *{Tamil Nadu}*	The Tamil Nadu Dr M. G. R. Medical University, Chennai	M.Sc.(Medical Physics)	2 Years
16.	Bharthiar University **Coimbatore** *{Tamil Nadu}*	Bharthiar University, Coimbatore	M.Sc.(Medical Physics)	2 Years
17.	Anna University **Chennai** *{Tamil Nadu}*	Anna University, Chennai	M.Sc.(Medical Physics)	2 Years
18.	Jadavpur University **Kolkata** *{West Bengal}*	Jadavpur University, Kolkata	Post M.Sc. Diploma in Medical Physics	1 Year
19.	Dr. N.G.P. Arts & Science College, **Coimbatore** *{Tamil Nadu}*	Bharthiar University, Coimbatore	M.Sc.(Medical Physics)	2 Years
20.	D.Y. Patil University, **Kolhapur** *{Maharastra}*	D.Y.Patil University, Kolhapur	M.Sc.(Medical Physics)	2 Years
21.	Bharathidasan University **Tiruchirapalli** *{Tamilnadu}*	Bharathidasan University Tiruchirapalli	M.Sc.(Medical Physics)	2 Years

In addition to the above, candidates admitted in 2009 & 2014 for M.Sc. Medical Physics course at Government Arignar Anna Memorial Cancer Hospital & Research Institute, Kanchipuram, Tamil Nadu and successfully completed the same are permitted to work as a Medical Physicist.

Annexure-2: Internship Declaration Proforma

AERB/RSD/RT/Med Phys- Intern/Decl-Form

DECLARATION FOR MEDICAL PHYSICS INTERNSHIP PROGRAMME
(To be filled in by the institution conducting internship)

1. Name and address of the Institution:
2. Institution e-LORA ID :
3. Name of the Head, Medical Physics Department or Chief/Senior Medical Physicist:

   Email :

   Contact number/Mobile number:
4. Number of Medical Physicists available in the institution having working experience of at least 3 years but less than 5 years:
5. Number of Medical Physicists available in the institution having working experience of 5 years or more:
6. Total number of Intern Medical Physicists admitted during the period from …..to….. :
7. Number of functional Radiotherapy equipments and associated accessories:

   a) Medical Linear Accelerator (with both photon and electron beams)

      i) Photon Beam Energy(ies) :

      ii) Electron Beam Energy(ies):

   b) HDR Brachytherapy Unit :

   c) CT-Simulator/Simulator :

   d) Treatment Planning System :

   e) Radiation Field Analyzer (RFA) :

   f) Appropriate dosimeters for Medical Accelerator :

g) Appropriate dosimeter for HDR Brachytherapy :

h) Appropriate radiation protection instrument(s) :

8. Details of **<u>All the Intern Medical Physicists admitted</u>** and their respective supervisors:

Sr. No.	Name of the intern medical physicist(s) admitted	Name of the course undergone (e.g. M.Sc.(MP/MRP)/ Post Dip.R.P./Post Dip.M.P. etc.)	Name of the College	Name of the University	Year of passing	Name of the supervisor(s)*	Period of supervision	Experience of the supervisor(s) at the time of intern admitted	Signature of the supervisor
						i). ii).	……. ……		

**** In case a candidate has undergone internship under multiple supervisors, name of the supervisors and the period of supervision shall explicitly be indicated***

Signature of Head, Medical Physics Department Or Chief/Senior Medical Physicist:

Name:

Signature of Head, Radiotherapy Department:

Name:

Signature of Head of the Institution:

Name:

Date: Place

……..xxxxxxxx……..