

Name of the Course	Joint M.Sc.-PhD in Medical Physics
Introduction	Cancer incidence is likely to reach epidemic proportions in India within the next decade. Cancer care involves the use of symptomatic care, emotional care along with evidence based high quality medical management. Medical intervention in the modern era, involves evidence based systemic therapy, surgical therapy and radiation therapy. Radiation therapy involves the use of high energy X-Rays, and charged particles to interact with living cells and cause preferential killing of cancer cells. This involves an in-depth knowledge of physics, radiobiology, and particle matter interaction to complement the medical knowledge of physicians. Such complimentary knowledge requires a) fast and thorough acquisition of the knowledge b) Appropriate and safe application of the knowledge and c) Innovative ways and means of improving the knowledge and technology to ensure better clinical outcomes. This forms the basis of the Medical Physics courses jointly structured by IIT-Kharagpur and Tata Medical Center, Kolkata (TMC-K).
Aim of the Course	To offer M.Sc. in Medical Physics (with accreditation of Atomic Energy Regulatory Board (AERB), Government of India) jointly by Indian Institute of Technology Kharagpur (IITKGP) and Tata Medical Center (TMC), Kolkata.
Objectives	<p>Indian Institute of Technology Kharagpur (IIT KGP) and Tata Medical Center (TMC), Kolkata, India jointly offers a Masters (M.Sc.) in Medical Physics to be affiliated to Atomic Energy Regulatory Board (AERB), Government of India. The objectives of which are to provide:</p> <ul style="list-style-type: none"> • A validated education and training framework for professional medical physicists. • To train and ensure a workforce with the core scope to practice clinical Medical Physics. • A means to achieve an affiliation with AERB as a radiation safety officer (RSO). • A means for Medical Physicists practicing outside of the above scopes to specialize in areas of academia, industrial physics, medical equipment designing and research.
Duration of program	<p>M.Sc.: 2 years*. <i>*To be professional Medical Physicists an additional mandatory 12-months internship in a relevant hospital setting is required.</i></p> <ul style="list-style-type: none"> • PhD: as per rule of IIT KGP (minimum 3 years; maximum: 8 years) • In addition to this, the candidates will have opportunity to work in Tata Medical Center between the first and second semesters on a compulsory basis without any credits.
Skill set to be developed	<ol style="list-style-type: none"> a) Be safe in the use of diagnostic and treatment radiation equipment b) Quality assure the radiation machines c) Quality assure radiation treatment planning d) Quality assure radiation treatment delivery e) Ensure that there is in-depth knowledge on the radiation machine structure and function f) Understand the principles and physical laws governing the biological effects of radiation g) Solve radiation therapy technology related problems h) Ensure that there is appropriate domain knowledge on areas that are clinically applicable i) Teach junior technicians in radiation therapy j) Teach trainee oncologist on the relevant aspects of medical physics k) Show a keen interest in research in the related field l) Pursue innovation in radiation therapy technology to enhance safety, improve efficacy and allow cost effective assurance of service
Additional comments	Non-credit training at TMC Kolkata: Three weeks non-credit training at TMC Kolkata to be familiar with medical physics related infrastructures, instrument functioning, patient care, etc. They will maintain daily work diary and will submit a report at the end of the training

M.Sc. Medical Physics Course Curriculum (Semester-wise):

Semester 1 Location: IIT KGP Minimum credit requirement: 26		Semester Credit:26; Cumulative credits:26 Depth – 22; Elective – 0; Lab – 4			Remarks
Subject Type	Subject Codes	Subject Name	L-T-P	Credit	
Depth	MM61501	Basic Human Anatomy-Physiology-Pathology	3-1-0	4	
Depth	MM61505	Physics & Instrumentation of Medical Imaging	3-1-0	4	
Depth	PH41015	Electronics for Physicists	3-0-0	3	
Depth	PH41013	Mathematical Methods I	3-1-0	4	
Depth	PH 60305	Principles of Radiation Detection & Measurements	3-0-0	3	
Depth	MM61511	Biostatistics	3-1-0	4	
Depth	PH49007	Electronics Lab.	0-0-3	2	
Depth	MM (New)	Numerical methods and computational techniques Lab.	0-0-3	2	
Non-credit training at TMC Kolkata: Three weeks non-credit training at TMC Kolkata to be familiar with medical physics related infrastructures, instrument functioning, patient care, etc. They will maintain daily work diary and will submit a report at the end of the training					
Semester 2 Location: IITKGP Minimum credit requirement: 25		Minimum Semester Credit:25; Cumulative credits: 51 Depth – 19; Elective: 4; Lab – 2			Remarks
Depth	PH (New)	Physics of Radiation Generators	3-0-0	3	
Depth	MM (New)	Fundamentals of Biochemistry and Cell Biology	3-0-0	3	
Depth	MM71326	Healthcare Management	3-1-0	4	
Depth	MM61312	Medical Imaging	3-1-0	4	
Lab	PH (New)	Radiation Detection and Measurement Lab	0-0-3	2	
Elective-I	EE60094	Biomedical Image Processing	3-1-0	4	
	EE61008	Medical Image Analysis	3-1-0	4	
	MM61504	Pattern Recognition and Machine Intelligence in Medicine	3-1-0	4	
	MM61210	Biomicrofluidics and Bio-MEMS	3-1-0	4	
	MA60050	File Organisation and Database Systems	3-1-0	4	
Depth	MM (New)	Viva Voce	0-0-0	2	
Depth	PH41016	Nuclear and Particle Physics - I	3-0-0	3	

Semester 3 Location: TMCK Minimum credit requirement: 26		Minimum Semester Credit:26; Cumulative credits:77 Depth – 19; Elective – 3; Lab – 4			Remarks
Depth	MM (New)	Radiation Treatment Planning	3-0-0	3	
Depth	MM (New)	Radiobiology	3-0-0	3	
Depth	MM (New)	Radiation Dosimetry and Protection	3-0-0	3	
Depth	MM (New)	Brachytherapy Physics and Treatment Planning	3-1-0	4	
Lab	MM (New)	Basic Treatment Planning Lab	0-0-3	2	
Lab	MM (New)	Radiation Dosimetry and Protection Lab	0-0-3	2	
Elective-II	MM (New)	Applications of <i>in vivo</i> Dosimetry	3-0-0	3	
	MM (New)	Motion Management Strategies	3-0-0	3	
	MM (New)	Adaptive Radiotherapy	3-0-0	3	
Depth	MM (New)	Project		6	
Semester 4 Location: TMCK Minimum credit requirement: 26		Minimum Semester Credit:26 Cumulative credits: 103 Depth – 22 Elective – 0 Lab – 4			Remarks
Depth	MM (New)	Quality Assurance	3-0-0	3	
Depth	MM (New)	Physics of Nuclear Medicine and Internal Dosimetry	3-0-0	3	
Depth	MM (New)	Project		12	
Depth	MM (New)	Seminar		2	
Depth	MM (New)	Comprehensive Viva		2	
Lab	MM (New)	Quality Assurance Lab	0-0-3	2	
Lab	MM (New)	Radiation Oncology Lab -Advanced Treatment Planning	0-0-3	2	