



Medical Education Programs

TMC IIT-KGP MSc PhD Integrated Courses

Point of Contact from TMC & IIT-KGP

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I. Molecular Medical Microbiology (MMM): Integrated MSc-PhD course

TMC MMM Course Coordinator: Dr Sanjay Bhattacharya

IIT KGP MMM Course Coordinator: Prof Gayetree Mukherjee

The molecular age has brought about dramatic changes in medical microbiology, and great leaps in our understanding of the mechanisms of infectious disease. Though the molecular aspect of microbiology has long been recognized, it has greatly expanded in recent years. The molecular study of medical microbiology reveals conceptual insights and technical approaches that have advanced the subject almost beyond recognition. This course aims to train microbiologists in molecular diagnosis of diseases, who can work in hospitals and contribute to the decision making process along with the core medical practitioners. Also they can contribute greatly as scientists in industries and academia. Additionally, the course aims to train medical doctors in molecular diagnosis of both communicable and non communicable diseases.

The objectives of this course

- To train microbiologists in molecular diagnosis of infectious diseases

Career plan: diagnostic technologists, scientists, R&D work, industry

- To train medical doctors with interests in molecular biology and infection management in molecular diagnosis of infectious diseases
- Hospital based or stand alone diagnostic laboratories involved in diagnosis/development and interpretation of molecular tests in infectious diseases

The objectives of this course for the students

At the end of the Molecular Medical Microbiology course the student should be able to:

- Work independently and do problem solving in Molecular Medical Microbiology
- Innovate in Molecular Medical Microbiology with regard to diagnostic tests and reagents
- Learn independently Molecular Medical Microbiology techniques and processes

Eligibility:

- B.Sc. Microbiology/ Biochemistry/Life Sciences (Physiology/ Zoology/Botany)
- B. Tech Biotechnology
- MBBS (cut-off marks 55%)
- BDS (cut-off marks 60%)

Number of seats per year: 8



Beginning of session: July of every year

Course duration:

- MSc: 2 years (no stipend)
- PhD: x years (minimum 3 years; max: 8 years; no stipend after 6 years)

Admission:

- Through written examination (helped by GATE/JAM office of IIT-KGP)

Age limit: None

Semester-wise break up between IIT and TMC

- SEMESTER 1: IIT KHARAGPUR (IIT-KGP)
- SEMESTER 2: Tata Medical Center, Kolkata (TMC)
- SEMESTER 3 : IIT-KGP (electives II and III) + Project (joint with TMC)
- SEMESTER 4: TMC [elective IV and V (theory and lab-based+ Project continuation)]

- **2018 : 8 students**
- **2019 : 8 students**
- **2020 : 9 students**

II. Molecular Nuclear Medicine (MNM): Integrated MSc-PhD course

TMC MNM Course Co-ordinator: Dr Soumendranath Ray

IIT KGP MNM Course Coordinator: Dr Santanu Dhara

The Indian Institute of Technology (IIT), Kharagpur and Tata Medical Center (TMC), Kolkata, India offers a Masters (MSc) in Nuclear Medicine Technology affiliated to Atomic Energy Regulatory Board (AERB), Government of India.

The unmet need

Practice of state of the art medicine and oncology is not possible today without Nuclear Medicine. There is significant dearth of Nuclear Medicine Technologists in India. A good number of Nuclear Medicine units --diagnostic and therapeutic are being established all over the country but there is lack of facility of trained manpower. Some of those departments are not functioning due to non-availability of trained technologists.

Nuclear Medicine Technologists also play important roles in clinical research and drug development laboratories, cyclotron units, imaging equipment and pharmaceutical industries apart from their most important role in diagnostic and therapeutic Nuclear Medicine departments of the hospitals. In addition they can also perform the duties of Radiation Safety Officer and Medical Physicist.

This joint effort of IIT Kharagpur & Tata Medical Center will train bright students to address the unmet need of skilled manpower in this field.

Aims:

The aims of this course are to provide:

- To address the issue of non availability of trained manpower in this field, especially in this part of the country.



- To train and ensure a workforce with the principal aim to practice Nuclear Medicine in clinical establishments.
- An opportunity in addition to the above scopes to specialize in areas of instrumentation, medical equipment designing, radio pharmacy, drug development laboratories, cyclotron units and other related fields.
- To groom them as future research scientists in this field who will identify problems and find ways to solve them.

The structure of the course

It will be a combination of

- Standard teaching
- Problem based learning
- Applications

The course will be a process of continuous learning and skill development but the focus will remain on the ability to innovate using that skill.

It will not be just another course in Nuclear Medicine in addition to the existing programme.

Course Background:

Nuclear Medicine is the branch of medical science which utilizes radioisotopes for the diagnosis and management of different disorders including cancers. Nuclear Imaging is the principal modality of functional and molecular imaging. Radioisotope therapy is an essential component for the management of Thyroid cancers, Thyrotoxicosis, Neuroendocrine Tumors, Prostate Cancer, Painful bone metastases, Hepatocellular Carcinoma, Lymphoma and many other disorders. Newer Radiopharmaceuticals are being developed and newer indications are listed. This is a field of medicine which demands the involvement of all basic sciences ranging from Mathematics, Physics, Chemistry, Biology to Statistics and Computer science and amalgamates all with Clinical Medicine. The combination of IIT, Kharagpur and Tata Medical Center is going to be the best possible combination and the most ideal platform for structured and practical application based learning in this field.

The candidate after completing the course is likely to have the following skill sets:

- Be safe in the use of Radioisotopes
- Quality assurance of the imaging equipment , radio pharmaceuticals and all diagnostic and therapeutic procedures
- Learning and application of Basic and advanced image processing including multiparametric and multimodality image fusion.
- Radiation safety and radiation protection of patients, caregivers, staff and general population.
- Solve subject related problems
- Ensure that there is appropriate domain knowledge on areas that are clinically applicable
- Teach junior technologists.
- Teach trainee oncologist on the relevant aspects of Nuclear Medicine
- Development of interest in research and learn the basics of research methodologies.
- Innovation

Details of training plan:



Semester duration: 6 months

- Start of session: July of each year
- Number of weeks of teaching classes per session: 13-16 weeks/semester
- Number of hours of teaching sessions per week: 27 hours/week
- Teaching schedule per week:
- Theory: 4 hours per day (one 2 hour class in the morning session and one in the afternoon)
- Practical: two 3 hour sessions per week
- Exams:
- Mid- semester exam: 2 hours (30% weight age)

End semester exam: 3 hours (50% weight age)

Internal assessment: 20% weight age

- **2018 : 7 students**
- **2019 : 4 students**
- **2020 : 5 students**

III. Medical Physics (MP): Integrated MSc-PhD course

TMC MP Course Coordinator: Dr Rimpa Basu Achari

IIT KGP MP Course Coordinator: Dr Soumen Das

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

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:

- 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

M.Sc.: 2 years*

*To be professional Medical Physicists an additional mandatory 12-months internship in a relevant hospital setting is required.

- 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

- Be safe in the use of diagnostic and treatment radiation equipment
- Quality assure the radiation machines
- Quality assure radiation treatment planning
- Quality assure radiation treatment delivery
- Ensure that there is in-depth knowledge on the radiation machine structure and function
- Understand the principles and physical laws governing the biological effects of radiation
- Solve radiation therapy technology related problems
- Ensure that there is appropriate domain knowledge on areas that are clinically applicable
- Teach junior technicians in radiation therapy
- Teach trainee oncologist on the relevant aspects of medical physics
- Show a keen interest in research in the related field
- 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.

- **2018 : 7 interns**
- **2019 : 5 students**
- **2020 : 5 students**

IV. Advanced Specialization Certificate in Clinical Oncology

TMC Course Coordinator: Dr Santam Chakrabarty

It is a unique course offered by Tata Medical Center in partnership with Indian Institute of Technology, Kharagpur. The course aims to train radiation oncologists in the nuances of clinical oncology as well as giving a systematic initial experience in translational scientific research. The certificate course will encompass three years. During these three years, trainees will undergo credentialed training in Clinical Oncology as well as training in translational research.

The program is designed to provide a credentialed and standardized clinical oncology training to so that trainees can provide safe and effective care for cancer patients. In addition, they will gain practical



experience in conducting translational and interdisciplinary clinical oncology research. The certificate programme is also expected to result in a series of well planned research projects which will be jointly spearheaded by the two centers. It is likely that the trainees will evolve into future thought leaders and clinician scientists, who will have clinical expertise, in addition to knowledge and expertise in translational research. Also, the current graduate and post-graduate students of IIT-Kharagpur will have an unprecedented opportunity to work in clinically relevant and cutting-edge research projects which will be conducted as a part of this certificate programme.

3 years course

- **Certificate Course in Clinical Oncology**
 - **2018 : 6 fellows**
 - **2019 : 1 fellows**
 - **2020: 2 fellows**

