PG Curriculum
Diploma in Medical Radiotherapy (DMRT)
Index

PG Curriculum
Diploma in Medical Radiotherapy (DMRT)

The infrastructure and faculty of the department of Radio-Therapy will be as per MCI guidelines.

1. Goals

A postgraduate specialist having undergone the required training should be able to recognize health needs of community should be competent to handle effectively the medical problems should aware of the recent advances pertaining to his speciality. The PG student should acquire the basic skills in teaching of medical/paramedical students. He/she is also expected to know the principals of research and methodology and modes of consulting library.

2. Objectives

A candidate upon successfully qualifying in the Diploma in Radiotherapy (DMRT) examinations should be able to:

- Practice his speciality ethically
- Demonstrate sufficient understanding of basic sciences related to his specialty
- Diagnose and manage majority of conditions in his speciality (clinically and with the help of relevant investigations)
- Plan and advise measures of prevention and rehabilitation of patients belonging to his speciality.
- Play and assigned role in the implementation of National Health Programmes.
- Demonstrate competence in the basic concepts of research methodology.
- Develop good teaching skills
- Specific Learning Objectives:

a) Theoretical knowledge: A student should have fair knowledge of basic sciences (Anatomy, Physiology, Pathology & Hematology, Pharmacology, Radio diagnosis, Radiation Physics , Radiobiology, Radiological Protection & Computer Sciences) as applied to his speciality. He/she should be fully conversant with the bedside procedures (diagnostic and therapeutic) and having knowledge of latest diagnostics and therapeutics available.

b) Clinical/Practical skills: A student be expert in good history taking, physical examination, providing basic life support and common procedures like FNAC, Biopsy, aspiration from serous cavities, various Interstitial and Intracavitary Brachytherapy procedures. He should be well versed with Radiation therapy treatment planning both in Teletherapy and Brachytherapy and should have done independently a good number of patients. He should be able to choose the

required investigations and treatment methodology. He should be well versed with communication skills and palliative care.

c) Research: He /she should know basic concepts of Research Methodology plan a research project and should know how to consult Library. Basic knowledge of statistics is also required.

d) Teaching: Should learn the basic methodology and develop competence in teaching medical/paramedical students.

3. Syllabus

3.1 Theory

❖ **Medical Physics**

a) Orientation to Radiation Oncology
b) Introduction to physical aspects of radiation therapy and treatment planning.
c) Radiation sources in the Department
d) Radiation protection

❖ **General Physics and Mathematics**

- Review of basic mathematics.
- Review of basic physics
  - ✶ Work and energy
  - ✶ Structure of matter
  - ✶ Properties of electro magnetic radiation.
  - ✶ Production of penetrating radiation.

❖ **Radiation Physics**

- Absorption of radiation
- Radiation chemistry
- Survival curves-theory and experiment
- Oxygen effect
- Chemical modifiers of Radiation damage
- L.E.T and R. B.E
- Cell cycle dependence of radiosensitivity
- Repair phenomena
- Dose Rate effects
- Solid tumor radiobiology
- Cell and tumor kinetics
- Tissue radiosenstivity
- Acute and late effects, Partial and Whole Body Radiation
- Time, Dose & Fractionation relationships

- Biology of Hyperthermia

❖ **Clinical Radiation Oncology**

- Principles of Oncology
- Principles of Molecular Biology and Genetics
- Principles of Carcinogenesis
- Principles of Cancer Prevention
- Epidemiology of Cancer
- Principals of Surgical Oncology
- Principles of Radiation Oncology
- Principles of Chemotherapy
- Principles and application of Biological therapy
- Clinical Pharmacology of Cancer Chemotherapy
- Specialized Techniques of Cancer Management
- Cancer of Head and Neck
- Cancer of Lung
- Neoplasms of the Mediastinum
- Cancer of Esophagus
- Cancer of Stomach
- Cancer of Pancreas
- Cancer of Hepatobiliary system
- Cancer of Small Intestine
- Colorectal Cancer
- Cancer of Anal Region
- Cancer of Kidney and Ureters
- Cancer of Bladder
- Carcinoma of Prostate
- Cancer of Urethra and Penis
- Gynecologic Tumors
- Cancer of Ovary
- Cancer of the Breast
- Cancer of Endocrine system
- Sarcomas of the soft tissues
- Benign and Malignant Mesotherlioma
- Sarcoma of Bone
- Cancer of Skin
- Cutaneous Melanomas
- Intralocular Melanomas
- Neoplasms of Central Nervous System
- Solid tumors of Childhood
- Leukemias and Lymphomas of Childhood

- Hodgkin's Disease
- Plasma cell Neoplasms
- Paraneoplastic Neoplasms
- Cancer of Unkown Primary site
- Cancer in AIDS and other immunodeficiency states
- Oncologic Emergencies
- Supportive care of Cancer Patients
- Supportive care of Cancer Patients
- Adverse effects of Treatment
- Psycologic Aspects of Patients with Cancer
- Treatment of Metastatic Cancer
- Rehabilitation of Cancer Patients
- Newer Methods of Cancer Treatment
- Design and conduct of clinical trials
- Research Methodology

❖ **Palliative Care:** Palliative medicine, Principles, Symptom management, Psychosocial Oncology, Nursing issues, End of life care, Communication skills and Spiritual aspects.

❖ **Log Book:** Log book should be construed so that the candidate should have attained the expected knowledge at the end of the specified period of tenure.

3.2 Practical

- ❖ Ability to obtain, organize, document and present a cohesive patient history and perform a physical examination appropriate for the patient.
- ❖ Ability to stage tumor according to the AJCC staging system.
- ❖ Ability to plan a course of Radiation Therapy and write a Radiation Prescription.
- ❖ Ability to perform uncomplicated simulations.
- ❖ Ability to research the medical literature to address uncommon or complex clinical problems.
- ❖ Understanding of the concepts relating to the use of radiation therapy as part of multi-modality treatment.
- ❖ Understanding of the natural history, epidemiology and treatment of the tumors most commonly encountered in a Radiation Oncology Department.
- ❖ Understanding of the basic concepts of Brachytherapy.
- ❖ **Radiobiology**

  Mastery of basic radiobiological concepts, particularly as they relate to clinical radiation therapy.

- **Physics**

  Understanding of the basic concepts relating to simulation and treatment planning.

  Understanding of the basics of radiological physics and radiation safety.
- Further refinement of the clinical skills including ability to perform a comprehensive pelvic examination and head and neck examination.
- Ability to perform more complicated treatment planning.
- Ability to perform more complicated simulation (i.e. mantle, cranio-spatial).
- Ability to produce a comprehensive consultation note, including delineation of a plan of management supported by the clinical literature.
- Ability to accurately and succinctly orally present clinical cases.
- Ability to interact appropriately with referring physicians and fellows or residents from other specialties.
- Ability to perform virtually all types of simulation.
- Ability to critically analyze the medical literature with particular attention to the methodological and statistical approaches of the author.
- Ability to research the recent medical literature for current and/or recently concluded clinical trials that impact on patient management.

- **Radiology**

  Further refinement of understanding and practical applications of radiobiological principles.

- **Physics**
  - Ability to perform uncomplicated dosimetric calculations, evaluate treatment plans, and actively participate in generation of 3D conformal and/or IMRT treatment plans.
  - Reinforcement and further refinement of concepts learned in the PGY-1 year.
  - In addition to further refinement of understanding of Physics, residents should now be familiar with the physics of specialized treatment techniques including Stereotactic Radiosurgery, total skin electron beam treatment and total body irradiation.

4. Teaching Programme

4.1 General Principles

Acquisition of practical competencies being the keystone of postgraduate medical education, postgraduate training is skill oriented.

Learning in postgraduate program is essentially self directed and primarily emanating from clinical and academic work. The formal sessions are merely meant to supplement this core effort.

4.2 Teaching Sessions

In addition to conducting and reporting of routine and special investigation in the area of posting under direct supervision, formal teaching session to be held on working days. These include seminars in physics and general radiology, journal clubs, case presentations; Interdepartmental meets, Film reading session.

4.3 Teaching Schedule

The suggested departmental teaching schedule is as follows:

Postgraduate Training: The teaching should be structured as follows:

- Didactic lectures in Radiation Physics, Radiation Biology, Radiological Protection and principals of Radiotherapy & Oncology.
- Seminars, Journal clubs, Reviews, Symposia and Guest Lecture
- Interactive sessions (rounds, Group discussions, Bedside Teaching, Grand Rounds, Clinical Demonstrations and Audits)
- Inter-Departmental meetings like Tumor Boards (with the department of General Surgery & its various specialities, ENT, Gynaecology, Radio-diagnosis and pathology)
-

i. Students should be made conversant and responsible in the treatment planning, Execution and Monitoring of the patients throughout the treatment both in Teletherapy & Brachytherapy for the common malignancies as per their phase of training.
ii. Students should have hand-on training in various Medical and Brachytherapy procedures for the management of common cancers should be well versed with quality assurance with Quality Assurance Programmes in Radiotherapy and Chemotherapy.
iii. All sessions will be co-ordinated by the faculty members.
iv. All the teaching sessions to be assessed by the consultants at the end of session and graded
v. Attendance of the Residents at various sessions should be atleast 75%

5. Posting

The postgraduate student should be posted in Radiotherapy unit.

6. Assessment

All the PG resident are assessed daily for their academic activities and also periodically.

6.1 General Principles

- The assessment is valid, objective and reliable
- Formative, continuing and summative (final) assessment is conducted in theory as well as practical / clinicals. In addition, thesis is assessed separately.

6.2 Formative Assessment

The formative assessment is continuous as well as end-of-term. The former is based on the feedback from the senior residents and the consultants concerned. End-of-term assessment is held at the end of each semester (upto the 5th semester). Formative assessment will not count towards pass/fail at the end of the program, but will provide feedback to the candidate.

6.3 Internal Assessment

The performance of the Postgraduate student during the training period should be monitored throughout the course and duly recorded in the log books as evidence of the ability and daily work of the student. Marks should be allotted out of 100 as followed.

Sr. No.	Items	Marks
1.	*Personal Attributes*	*20*
2.	*Clinical Work*	*20*
3.	*Academic activities*	*20*
4.	*End of term theory examination*	*20*
5.	*End of term practical examination*	*20*

1. Personal attributes

- **Behavior and Emotional Stability:** Dependable, disciplined, dedicated, stable in emergency situation shows positive approach.
- **Motivation and Initiative:** Takes on responsibility, innovative enterprising, does not shirk duties or leave any work pending.
- **Honesty and Integrity:** Truthful, admits mistakes, does not cook up information, has ethical conduct, exhibits good moral values, loyal to the institution.

- **Interpersonal Skills and Leadership Quality:** Has compassionate attitude towards patients and attendants, gets on well with colleagues and paramedical staff, is respectful to seniors, has good communication skills.

2. Clinical Work:

- **Availability:** Punctual, available continuously on duty, responds promptly on calls and take proper permission for leave.
- **Diligence:** Dedicated, hardworking, does not shirk duties, leaves no work pending, does not sit idle, competent in clinical case work up and management.
- **Academic ability:** Intelligent, shows sound knowledge and skills, participates adequately in academic activities, and performs well in oral presentation and departmental tests.
- **Clinical Performance:** Proficient in clinical presentations and case discussion during rounds and OPD work up.
  Preparing Documents of the case history/examination and progress notes in the file (daily notes, round discussion, investigations and management)
  Skill of performing bed side procedures and handling emergencies.

3. **Academic Activity:** Performance during presentation at Journal club/Seminar/Case discussion/Stat meeting and other academic sessions.
   Proficiency in skills as mentioned in job responsibilities.
4. **End of term theory examination:** Written test conducted at end of 1st year and 9 months
5. **End of term practical/oral examination:** Practical exam and viva examination at end of 1year and 9 months

Marks for **personal attributes** and **clinical work** should be given annually by all the consultants under whom the resident was posted during the year. Average of the Two years should be put as the final marks out of 20.

Marks for **academic activity** should be given by the all consultants who have attended the session presented by the student.

The Internal assessment should be presented to the Board of examiners for due consideration at the time of Final Examination

6.4 Summative Assessment

- Ratio of marks in theory and practical will be equal
- The pass percentage will be 50%
- Candidate will have to pass theory and practical examination separately

A. Theory examination

Paper- 1:	Basic Sciences and Physics as applied to Radiotherapy	100
Paper-2:	Principles of Radiotherapy including Radiobiology	100
Paper-3:	Practice of Radiotherapy and Cancer Chemotherapy	100
	Total	**300**

B. Practical:

1. Long case (1) 100
2. Short cases (2) (50 marks each) 100
3. Radiological Physics, Pathology and Instruments including Grand viva 100

7. Job Responsibilities

i. Students should be made conversant and responsible in the treatment planning, Execution and Monitoring of the patients throughout the treatment both in Teletherapy & Brachytherapy for the common malignancies as per their phase of training.

ii. Students should have hand-on training in various Medical and Brachytherapy procedures for the management of common cancers should be well versed with quality assurance with Quality Assurance Programmes in Radiotherapy and Chemotherapy.

8. Suggested Books

8.1 Books

- Meredith, Fundamental Physics of Radiology
- Faiz M Khan, The physics of Radiation Therapy, Edition 3rd
- Khan F M, Treatment Planning in Radiation Oncology, 2nd Edition
- Perez & Brady textbook of principles and practice of Radiation Oncology, 5th Edition
- Leibel Phillips textbook of Radiation Oncology
- Devita-Cancer Principles and Practice of Oncology, 8th Edition
- Hall E J, Radiobiology for the Radiologist, 6th Edition.

8.2 Journals

- International Journal of Radiation Oncology Biology Physics
- Radiotherapy and Oncology-Journal of the European Society for Therapeutic Radiology and Oncology.
- Oncology

- Cancer Chemotherapy and Pharmacology
- Journal of cancer Research and Therapeutics
- Radiation Oncology
- Journal of Radiotherapy in Practice
- International Journal of Radiobiology
- Cancer Philadelphia

9. Model Test Papers

MODEL QUESTION PAPER
Diploma in Medical Radiotherapy (DMRT)
Paper-I
Basic Science and Physics as applied to Radiotherapy

Max. Marks:100 Time: 3 hrs

- **Attempt ALL questions**
- **Answer each question & its parts in SEQUENTIAL ORDER**
- **ALL questions carry equal marks**
- **Illustrate your answer with SUITABLE DIAGRAMS**

1. Discuss Hyperthermia- methods of heating with special emphasis on mechanisms of action of Hyperthermia. 25

2. Enumerate the steps in radiation teletherapy planning. Discuss simulation and verification in detail. 25

3. Describe Interaction of ionizing radiation with matter. 25

4. Write notes on:

a. Percentage depth dose 5x5
b. Particle beam therapy
c. Interaction of ionizing radiation with matter
d. Multi leaf Colimeter
e. Bolus materials in Radiotherapy.

MODEL QUESTION PAPER
Diploma in Medical Radiotherapy (DMRT)
Paper-II
Principles of Radiotheapy including Radiobiology

Max. Marks:100 Time: 3 hrs

- **Attempt ALL questions**
- **Answer each question & its parts in SEQUENTIAL ORDER**
- **ALL questions carry equal marks**
- **Illustrate your answer with SUITABLE DIAGRAMS**

1. Define Radical Radiotherapy. Describe the management of Carcinoma Glottis. 25

2. Describe the role of Multi-modality treatment in Organ conservation in Breast Cancer. 25

3. Describe the role of Brachy therapy in 'Tongue Cancer'. 25

4. Write notes on: 5x5=25

   a. Beam modification devices
   b. Cell survival curve
   c. Dose Rate in Radiotherapy
   d. Oxygen in Radiotherapy
   e. Particulate therapy.

MODEL QUESTION PAPER
Diploma in Medical Radiotherapy (DMRT)
Paper-III
Clinical Practice of Radiotherapy and Cancer Chemotherapy

Max. Marks:100 Time: 3 hrs

- **Attempt ALL questions**
- **Answer each question & its parts in SEQUENTIAL ORDER**
- **ALL questions carry equal marks**
- **Illustrate your answer with SUITABLE DIAGRAMS**

1. How will you manage Carcinoma breast of Left side proven by FNAC and clinically staged as $T_2N_1M_1$ disease. 25

2. Describe staging of Lung cancer. Describe role of Radiotherapy and chemotherapy in its management 25

3. Classify Brain Tumours. Discuss the management of Glioblastoma Multiforme. 25

4. Write notes on: 5x5

a. Tomotherapy
b. Acute Radiation effects management
c. Management of Liver Metastasis
d. GM-CSF in Oncology
e. Taxanes in Brest Cancer