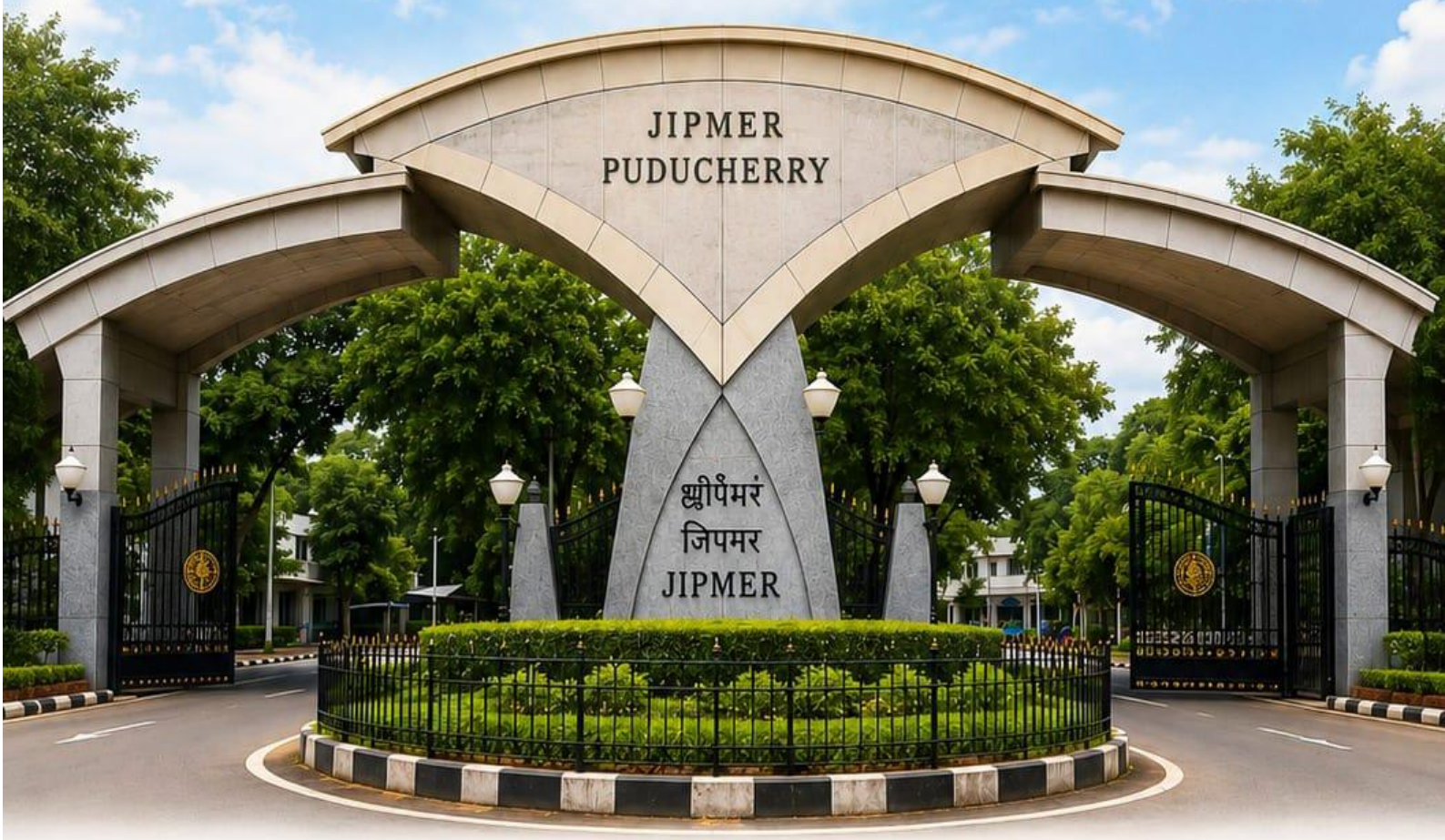
CURRICULUM

POSTGRADUATE

MD Radiation Oncology

From July 2026 session



JAWAHARLAL INSTITUTE OF POSTGRADUATE MEDICAL EDUCATION AND RESEARCH (JIPMER),
PUDUCHERRY – 605 006.

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This curriculum was approved at the 19th meeting of the Standing Academic Committee held on 28th January 2026 and ratified at the 22nd meeting of the Governing Body and will be applicable for students joining MD Radiation Oncology from the July 2026 session.

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GOAL OF THE COURSE

To produce honest and able clinical oncologists who can **efficiently diagnose and prognosticate the disease with appropriate evaluation, predict the possible treatment outcomes and treat effectively the patients with cancer,** primarily solid tumours, with non-surgical methods such as therapeutic radiation like X-rays, γ-rays, protons etc., anti-cancer systemic therapy like chemotherapy, hormones, molecular targeted therapies, immunotherapies etc., and provide supportive and compassionate healing; using **best possible evidence and knowledge in medicine and while striving towards bringing advancements in the science of oncology.**

TERMINOLOGY

Key-capabilities

They refer to the practices carried out by the specialists as part of their professional services. They represent the services required from them, by patients, students, other medical/paramedical staff or the society in general.
Thus, they refer to the specific tasks that the postgraduate will be expected to do after he completes the course.
For the purpose of training, the tasks are broken down into units that have distinct cognitive concepts, unless they are predominantly procedural or attitude based.

Core ideas in practice of Key-capabilities

They refer to the ideas that underly the practice of the specialists. They include ideas and concepts about structure and functioning of organs and organ systems in health and diseases, classification of diseases, equipment, tests, drugs etc.

COURSE CONTENT:

1. Key-capabilities (outline below, details in Annexure 1 (Part A))
2. Core ideas in the practice of key-capabilities (outline below, details in Annexure 1 (Part B))
3. Peripheral postings (details in Annexure 1 (Part C) and under 'Educational strategy)

(Please refer Annexure 1 for details)

OUTLINE

KEY-CAPABILITIES	
1	Cancer Diagnosis, Staging, Risk categorization, Patient assessment and Decision on treatment intent
2	Inpatient management, Treatment Compliance and Acute toxicity review for patients undergoing Radiotherapy with/out Systemic Anti-Cancer Therapy (SACT)
3	Prescription, Administration of Systemic Anti-Cancer Therapy (SACT) including chemotherapy and treatment Monitoring
4	Radiation Planning - EBRT and Brachytherapy
5	Follow-up management after Anti-cancer Treatment
6	Identification of Genetic, Psychosocial and ethical issues
7	Multi-Disciplinary Tumour (MDT) clinic and New Patient Evaluation (TPM-Treatment Plan Meet)
8	Clinical data and research
9	Social activities
10	Adherence to GCP Guidelines (Good clinical practice guidelines)
11	Leadership and Teamwork capabilities
12	Attitude, Relationships and communication skills
CORE IDEAS IN THE PRACTICE OF KEY-CAPABILITIES	
1	Basic Sciences and Principles of Oncology
	Radiation Biology
	Cancer Biology & Genetics
	Radiation Physics
	Cancer Pharmacology
	Medical Statistics
	Cancer epidemiology, Cancer registry & National cancer control Programme
	Anatomy and Imaging in Oncology
	Principles of management in other disciplines in oncology
2	Radiotherapy for malignant and benign conditions, Systemic Anti-Cancer Therapies in the treatment of cancers
3	Recent advances in Clinical Oncology

LEARNING RESOURCES

Recommended Books

Please refer to the latest edition when available

S.No	Name of Book	Editor/ Author	Edition	Publisher
Radiation Physics				
1	Treatment Planning in Radiation Oncology	Faiz M Khan	5th, 2021	LWW
2	The Physics of Radiation Therapy	Faiz M Khan	6th, 2019	LWW
3	Fundamental Physics of Radiology	Meredith & Massey	3rd, 1984	Elsevier
4	The Physics of Radiology	John and Cunninghams	5th, 2021	Charle. C. Thomas
5	Radiation Therapy Planning	Bentel Gunilla C	1991	McGraw-Hil
6	Text Book of Radiotherapy	G. Fletcher	3rd, 1980	Lea & Febiger
7	Radiotherapy in Practice - Physics for Clinical Oncology	Amen Sibtain	2nd, 2022	Oxford University
Radiobiology and Cancer Biology				
1	Radiobiology For The Radiologist	Eric J. Hall	8th, 2018	LWW
2	Molecular Biology of Cancer: Mechanisms, Targets, and Therapeutics	Lauren Pecorino	5th, 2021	OUP
3	Basic Clinical Radiobiology	Joiner & van der Kogel	5th, 2018	CRC press
4	The Biology of Cancer	Robert A Weinberg	3rd, 2023	WW Norton & Co
5	The Molecular Biology of Cancer: A Bridge from Bench to Bedside	Stella Pelangaris, Michael Khan	2nd, 2013	Wiley-Blackwell
Cancer Pharmacology				
1	Clinical Resources for Systemic Anti-Cancer Therapy (SACT) – Cancer Drug Manual, Cancer Management Manual http://www.bccancer.bc.ca/health-professionals/clinical-resources	BCCA	Internet, last accessed on 16Dec2023	-
2	The Chemotherapy Source Book	Perry	5th, 2012	Lippincott Williams and Wilkins
Miscellaneous				
1	AJCC Cancer Staging Handbook, American Cancer Society,	AJCC	8th	Springer Verlag

2	Diagnostic and Surgical Imaging Anatomy	H. Ric Harnsberger	1st,2006	LWW
3	Surface and Radiological Anatomy	A. Halim	3rd, 2020	CBS
4	Medical Statistics at a Glance	Petrie & Sabin	3rd, 2009	Wiley Blackwell
Clinical Oncology				
1	Principle & Practice of Radiation Oncology	Perez & Brady	8th, 2025	Wolters Kluwer
2	Cancer – Principles and Practice of Oncology (2 Volumes)	Devita, Hellman and Rosenburg	11th, 2018	Wolters Kluwer
3	Clinical Oncology	Abeloff	6th, 2019	Elsevier
4	Practical Essentials of Intensity Modulated Radiation Therapy	Chao	3rd,2013	LWW
5	Textbook of Radiation Oncology Principles and Practice	G. K. Rath	2nd,2007	Elsevier
6	Clinical Radiation Oncology	Gunderson & Tepper	5nd,2020	Elsevier
7	Principles and Practice of Radiation Therapy	Washington & Leaver	5nd, 2020	Elsevier
8	Intensity modulated radiation therapy: a clinical perspective	Arno J. Mundt	1st, 2005	BC Decker
9	Handbook of Evidence-based Radiation Oncology	Eric K. Hansen	3rd, 2018	Springer
10	The Manual of Clinical Oncology	Casciato	8th, 2017	Wolters Kluwer
11	Target Volume Delineation For Conformal And Intensity-modulated Radiation Therapy	Nancy Y Lee	1st, 2015	Springer
12	Leibel & Phillips Textbook of Radiation Oncology	Hoppe, Phillips and Roach	3rd, 2010	Elsevier
13	The Bethesda Handbook of Clinical Oncology	Abraham	6th, 2022	LWW
14	Handbook of Radiation Oncology: Basic Principles and Clinical Protocols	Bruce Haffty	1st, 2008	Jones & Bartlett
15	Radiotherapy for Head and Neck Cancers: Indications and Techniques	Adam Gardner	5th, 2017	Wolters Kluwer
16	Pediatric Radiation Oncology	Halperin	6th, 2016	Wolters Kluwer
17	Radiotherapy in Practice: External Beam Radiotherapy	Peter Hoskin	3rd, 2019	OUP
18	Radiotherapy in Practice: Imaging for Clinical Oncology	Peter Hoskin	2nd, 2021	OUP
19	Radiotherapy in Practice: Physics for	Sibtain, Morgan &	2nd, 2022	OUP

	Clinical Oncology	MacDougall		
20	Radiotherapy in Practice: Radiotherapy and the Cancers of Children, Teenagers, and Young Adults	Tom Boterberg, Karin Dieckmann, Mark Gaze	1st, 2020	OUP
21	Radiotherapy in Practice: Brachytherapy	Peter Hoskin, C. Coyle	2nd, 2011	OUP
22	Practical Radiotherapy Planning	Dobbs	3rd, 1999	Hodder Arnold
23	Oxford Handbook of Oncology	Miranda Payne Jim Cassidy	2015	Oxford Medical Handbooks
24	Tata Memorial Centre - Textbook of Oncology	Rajendra A Badwe	2024	Springer
25	Re-irradiation: New Frontiers	Carsten Nieder	2nd, 2017	Springer

Suggested Journals

S. No	Journal Title Journal Home Page	Abbreviation Browse Journal in Medline	ISSN	Publisher
1	Annals of Oncology	Ann Oncol	0923-7534	OUP
2	British Journal of Cancer	Br J Cancer	0007-0920	Churchill
3	Cancer	Cancer	0008-543X	Wiley
4	Cancer Genetics and Cytogenetics	Cancer Genet Cytogenet	0165-4608	Elsevier
5	Clinical Oncology	Clin Oncol (RCR)	0936-6555	Elsevier
6	European Journal of Cancer	Eur J Cancer	0959-8049	Elsevier
7	Gynecologic Oncology	Gynecol Oncol	0090-8258	----------
8	Indian Journal of Cancer	Indian J Cancer	0019-509X	
9	International Journal of Clinical Oncology	Int. J. Clin. Oncol	1341-9625	Springer-Verlag
10	International Journal of Gynecological Cancer	Int J Gynecol Oncol	1048-891X	Blackwell
11	International Journal of Oncology	Int J Oncol	1019-6439	

12	International Journal of Cancer	Int J Cancer	0020-7136	Wiley
13	International Journal of Radiation Oncology , Biology , and Physics	Int J Radiat Oncol Biol Phys	0360-3016	Elsevier
14	JAMA Oncology	JAMA Oncol	2374-2445	JAMA
15	Journal of Cancer Research and Clinical Oncology	J Cancer Res Clin Oncol	0171-5216	Springer-Verlag
16	Journal of cancer research and therapeutics	J. Cancer Res. Ther.	0973-1482	Medknow
17	Journal of Clinical Oncology	J Clin Oncol	1527-7755	LWW
18	Journal of medical physics	J. Med. Phys	1998-3113	Medknow
19	Journal of the ICRU	J ICRU	1742-3422	Sage
20	Journal of the National Cancer Institute	J Natl Cancer Inst	0027-8874	OUP
21	Lancet	The Lancet	0140-6736	Lancet
22	Lancet Oncology	Lancet Oncol.	1474-5488	Lancet
23	New England Journal of Medicine	New Eng J Med	0028-4793	Massachusetts Medical Society
24	Radiation Oncology Investigations	Radiat Oncol Investig	1065-7541	Wiley
25	Radiation Research	Radiat Res	0033-7587	–
26	Radiotherapy and Oncology	Radiother Oncol	0167-8140	Elsevier
27	Recent Results in Cancer Research	Recent Results Cancer Res	0080-0015	Springer-Verlag
28	Seminars in Oncology	Semin Oncol	0093-7754	Saunders
29	Seminars in Radiation Oncology	Semin Radiat Oncol	1053-4296	Saunders

EDUCATIONAL STRATEGY

Clinical Posting

The resident will be posted in various workplaces of the department and in other departments (peripherals) during the entire duration of the study course.

Departmental posting

The following table lists the rotation of residents in different workplaces during the course of study

First Year (PGY1)	Second Year (PGY2)	Third Year (PGY3)
1. Ward Posting 2. OPD Posting- New cases (Treatment plan meet) 3. CT Simulation 4. EBRT Review posting 5. Palliative clinic	1. OPD- Follow-up Posting 2. Ward/ ICU Posting 3. SACT Day-care Posting 4. Palliative clinic 5. CT Simulation 6. EBRT Review posting 7. Contouring and Planning 8. Minor OT Brachytherapy 9. Multi-Disciplinary Tumour Clinics (MDT)	1. OPD- Follow-up Posting 2. Ward/ ICU Posting 3. SACT Day-care Posting 4. Palliative clinic 5. CT Simulation 6. EBRT Review posting 7. Contouring and Planning 8. Minor OT Brachytherapy 9. Multi-Disciplinary Tumor Clinics (MDT)

Peripheral posting

The resident will be posted in relevant departments in rotation for every two weeks over a period of four months during the 2nd, 3rd and 4th Semester of the study course. The resident will be attending this peripheral after they pass a foundation test, focussing on the basics of oncology in the relevant theory exam conducted in the parent department. This is aimed to orient them and so help them realise the objectives of the peripheral posting optimally. Attendance and feedback from the posted departments will be sent to the Department of Radiation Oncology. The list of departments include the following and can include more as available.

1. Oto-Rhino-Laryngology
2. Surgical Oncology
3. Obstetrics & Gynaecology
4. Radiodiagnosis
5. Nuclear Medicine
6. Medical Oncology
7. Critical Care Unit
8. Emergency Medicine

Please note: The learning objectives of the posting is detailed in Annexure 1 (Part C)

Academic discussion

The resident will present and participate in didactic lectures, clinical case presentations, critical appraisal of journal articles,

	Day	Timing
Didactic lectures		
Lectures in Radiation & Cancer Biology, Cancer Pharmacology, Genetics and other basic sciences related to oncology	Monday	4.00-5.00 PM or 8.00-9.00 AM
Lectures in Radiation Physics, Radiation Protection, Quality Assurance & Quality Control	Thursday	4.00-5.00 PM or 8.00-9.00 AM
Classroom Presentation		
Seminars in clinical oncology	Tuesday	4.00-5.00 PM or 8.00-9.00 AM
Case Studies- Discussion	Wednesday	4.00-5.00 PM or 8.00-9.00 AM
Journal Club - Intra-Department level	Saturday	8.00-9.00 AM or 9:00-10:00 AM
Interdepartmental level (Combined journal club of Surgical, Radiation and Medical Oncology-Debates, Updates for Policy making, Controversial and research areas),	Monthly Twice-First and Last Wednesday	8.00-9.00 AM
Onco-Radiological meet (related to Staging, Target volume delineation, Response assessment, Infections)	Monthly Once-Last Thursday (or as available)	3.00-4.00 PM
Workshops, Master classes, Annual Foundation, Intermediate and Advanced courses in Radiation Oncology for Cancer updates	Yearly Once	

Clinical Activity

	Day	Timing
Group Case Discussions -At multi-levels		
Bed-side discussion	Every day - Ward rounds	9.00-10.00 AM & 6.00-7.00 PM
Multi-disciplinary tumour clinics	Monday-Friday-MDT	2.30-4.30 PM
Treatment planning meet	Monday-Friday-TPM Day	9.00AM-3.00 PM

Radiation Treatment - Plan, Delivery and Monitoring		
Target volume delineation, OARs, Plan evaluation	TVD & Plan Evaluation Day	9.00AM-5.00 PM
EBRT Setup & Image Verification	RT Plan Day	9.00AM-4.00 PM
Treatment verification, weekly review for acute toxicities	Review Day	9.00AM-5.00 PM
Brachytherapy		
Brachytherapy procedures	Brachytherapy OT Day	9.00 AM-3.00 PM
Systemic Anti-Cancer Therapy (SACT) – Prescription, Delivery and Monitoring		
SACT – Day-care OPD	Day-care OPD day	9.00 AM-5.00 PM
In-Patient Care		
Wards	Daily	8 AM-6 PM & Night Calls
Intensive Care Units	Daily	8 AM-6 PM & Night Calls
Out Patient Evaluation		
General & New Case Evaluation OPD	Monday- Saturday	9.00AM-3.00 PM
Follow-up for recurrence or late toxicities	Monday- Friday	9.00AM-5.00 PM

Dissertation

- A research project should be undertaken and dissertation must be submitted as per Postgraduate Research Monitoring Committee (PGRMC) guidelines of JIPMER.
- Two hard copies of the dissertation, prepared from the research project, should be submitted to the Dean (Academics) JIPMER, at two and half years of the course to become eligible to appear for the final examination at the end of the course, as per the guidelines of JIPMER.
- Six monthly interim presentations of the dissertations will be done to monitor the progress of the research work and take corrective measures when faced with difficulties.
- **Please refer to Postgraduate Dissertation Regulations and Postgraduate Examination Regulations document for further details**

Workplace Observation

Logbook

Please refer Annexure 2 for sample logbook forms.

1. A consolidated record of the number of cases, done independently and with assistance, of each procedure type is entered as per the format in Annexure 2. Each entry is made with date and certified by faculty.

2. Detailed work-up of selected cases - (2 cases selected every month from postings in different workplaces) will be maintained by the student and entered in the logbook.

3. Record of academic activities (at department, institute or outside institute level) to be entered in the logbook are as following

   a. Presentation in departmental seminars
   b. Presentations in journal clubs along with Title, Journal & Issue presented
   c. Conferences attended – National/International
   d. Papers presented at conferences with title, name of the conference, date of presentation, certified by faculty
   e. Papers published, with title, name & issue of the journal, certified by faculty
   f. Peripheral postings : Feedback forms obtained for academic presentations in other departments during peripheral postings will be attached as annexure

4. Record of co-scholastic activities, if any

Workplace observation scheme (recorded every 3/4 monthly submitted along with internal assessment marks)

Please refer Annexure 3 for sample forms.

The day to day activities in practice and learning of the student will be observed and recorded in the "workplace observation form", at pre-decided time instances. Assessment of logbook is to be done at the same time instances, and entry made in the 'workplace observation form' by the faculty. Feedback, as part of formative assessment is given to students, by faculty, during these time instances.

ASSESSMENT

Marks

Exam	Marks	Description
Theory exit examination	400 marks	This is the written exam at the end of the course. Four theory examination papers as given in the curriculum document of the course.
Practical exit exam	400 marks	This is the practical examination at the end of the course. The detailed scheme is given in the curriculum document of the course.
Internal Assessment	Internal assessment Theory: 50 marks	Two exams should be conducted - one at the end of first year and the other at the end of second year. Portions for the examination and pattern of the examination must be notified to the students at least one month in advance. The pattern of the internal assessment test will be similar to one paper of the theory exit examination. Two faculty members will evaluate the paper of each candidate in a blinded manner and the average of the 2 scores will be taken as the final score for the internal assessment. If a resident misses one of the tests due to medical reasons (medical certificate from a faculty member of the treating department and duly forwarded by the HoD to the Dean (Academic)), he/she can be permitted to appear in the test that is held for the next batch 6 months later. This can be permitted only once in the course period. If a resident does not attend an internal assessment test, or if he/she fails to attend the rescheduled test due to medical reasons, the score will be considered as 0 for the test. No retests or re-evaluation will be permitted under any circumstances. The internal assessment marks should be communicated to the students within two months of conducting the exams. Internal assessment test marks will be added to the final aggregate to the tune of 100 marks (theory and practical). There is no cut off of internal assessment test scores for determining eligibility to appear in the exit examination or to decide pass/fail solely based on the internal assessment test scores. However, when a student secures less than 50%

		marks in the internal assessment or when any concern is formally raised by the student with the Dean office, a review board with at least 3 faculty members should be constituted to review the student's performance with the student, recommend appropriate remedial measures, document the remedial plan, and submit a signed copy of the document to the Dean's Office. Additional periodic assessments can be held as part of formative assessment. Scores of these tests will not be considered for internal assessment and will not be considered for replacing scores of any of the internal assessment tests. Information to be provided to the Dean Office, before the final examination. 1. Dates of internal assessment examinations conducted 2. Names of faculty members involved in assessment against each date 3. Marks obtained by students in theory, practical and workplace-based observation in each exam session 4. Internal assessment marks for each student for Theory, Practical and Workplace based assessment. An average of the two theory and practical tests will be used to calculate scores for 50 and 25 marks respectively. Cumulative workplace-based assessment scores will be determined for 25 marks. 5. Copy of review documentations for periods of low performance of a student, if any, with remedial measures suggested by the departmental committee.
Internal Assessment (Practical and Workplace-based assessment)	Internal assessment Practical: 25 marks Internal assessment Workplace-based	For practical examinations, all members of the faculty of the department, from Assistant Professor to the senior-most faculty, shall participate in internal assessment on a rotating basis. The assessment shall be planned such that multiple faculty members are engaged for each student and different faculty members are engaged for the two assessments, wherever feasible. The pattern prescribed in the curriculum document shall be followed for practical assessments and the score shall be adjusted for 25 marks. Workplace-based assessment marks are given based on practice of the profession and affective domain attributes in the workplace and in the learning environment.

	assessment: 25 marks	Workplace observation proforma should be provided to students at the time of joining the department. The method of workplace observation should be explained to the students at the beginning of the course.
Dissertation	100 marks	Dissertation marks will be calculated by the average of the scores provided by 2 external examiners. Approval of the dissertation with more than 50% scores awarded by the external examiners will be one of the eligibility criteria for appearing for the exit examination of the discipline.
Total	1000 marks	**Criteria for PASS:** 1. (a) A candidate will need to pass the final Theory Exit Exam and Practical Exit Exam independently. (b) A minimum of 50% marks in 'Theory Exit exam' (a minimum of 40% in each of the four papers) and 50% in 'Practical Exit exam' separately shall be mandatory 2. A candidate should also score 50% or above in the final aggregate marks (500 out of 1000) to pass in the degree course. If a student secures a pass score in theory and practical examination but fails in the aggregate score, he/she can re-appear in the exit examination of the subsequent session. There is no provision to improve internal assessment or dissertation scores.
Please refer to Postgraduate Examination Regulations document for further details		

Syllabus for Exams

The Internal Examination syllabus may be subject to revision based on academic requirements.

Theory Exit Exam

Components of Theory & Practical Exam

Theory Exam		400 Marks
Written exam in conducted in the form of four papers as described below		
	Paper I: 100 Marks (Total 10 questions, each question carries total 10 marks)	Basic Sciences and Principles of Oncology a) Radiobiology b) Cancer Biology & Genetics c) Radiation Physics d) Cancer Pharmacology e) Medical Statistics f) Cancer Epidemiology including Prevention and Screening g) Anatomy & Imaging in Oncology h) Principles of management in surgical & other disciplines of oncology
	Paper II: 100 Marks (Total 10 questions, each question carries total 10 marks)	Clinical Radiotherapy, Chemotherapy and other Systemic Anti-Cancer Therapy (SACT) in management of malignancies – Group I a) Skin Cancer b) Central Nervous System Tumour c) Head and Neck Tumors d) Thoracic Tumors e) Breast Tumors f) Gastrointestinal Tumors g) Liver, Gall bladder and bile duct tumours h) Pediatric Tumors
	Paper III: 100 Marks (Total 10 questions, each question carries total 10 marks)	Clinical Radiotherapy, Chemotherapy and other Systemic Anti-Cancer Therapy (SACT) in management of malignancies – Group II a) Gynaecologic Tumors b) Male Genitourinary Tumors c) Urinary Tract Tumors d) Endocrine Tumors e) Lymphoma and Haematological Malignancies f) Sarcomas of Bone and Soft tissues g) Metastasis of Unknown Origin h) AIDS related Malignancies i) Miscellaneous
	Paper IV: 100 Marks (Total 10 questions, each question carries total 10 marks)	Recent advances in clinical oncology

Practical Exit Exam

Case Evaluation, Spotter identification, and Viva-Voce on all subjects including Instruments

Spotters- Identification and Description (20x5=100 Marks)	1. Pathological specimens 2. X-ray films, CT and MR Images, PET, Bone scan images 3. Clinical / Pathological staging 4. Clinical photographs of Cancer symptoms and signs, Oncological emergencies, Acute or Late toxicities of cancer treatment, 5. Isodose charts 6. Target volume Delineation-GTV/CTV 7. Dose volume histogram 8. Plan evaluation 9. Dosimetry calculations 10. Radiotherapy Instruments and Applicators 11. Anticancer and supportive drugs 12. Palliative/Critical care support- devices 13. Identification of critical lab values/ critical radio imaging findings 14. Medical Statistics
Long Case- One: 100 Marks	1. Case Documentation 30 marks 2. Patient Examination 30 marks 3. Differential Diagnosis & Investigations 10 marks 4. Case discussion 30 marks
Short Case- Two: 2x50 = 100 Marks	1. Case History & Examination 20 marks 2. Differential Diagnosis & Investigations 10 marks 3. Case discussion 20 marks
ORAL VIVA: 100 Marks	Topics to be covered include Radiobiology, Radiation Physics, Radiotherapy instruments and applicators, Cancer staging, Oncological imaging, Cancer management algorithms, EBRT and Brachytherapy techniques, procedures, Target Volume Delineation and Plan evaluation (DVH Analysis), Emergencies in radiotherapy, Quality assurance, Palliative care procedures, Medical statistics, and all other topics related to oncology

MODEL THEORY QUESTION PAPERS

M.D. DEGREE EXAMINATIONS
RADIATION ONCOLOGY

Paper I

Basic Sciences & Principles of Oncology

(Radiobiology, Cancer Biology & Genetics, Radiation Physics, Cancer Pharmacology, Medical Statistics, Cancer Epidemiology including Prevention and Screening, Anatomy & Imaging in Oncology, Principles of management in surgical & other disciplines of oncology)

Time: Three Hours **Maximum Marks: 100 (10x10marks)**

Answer all questions

1. What are the different ways or devices used to modify the radiation treatment beam? Explain the physical properties wherever applicable. (10)
2. List the various biases in clinical research and detail the measures available to reduce them. (10)
3. What is the definition of percentage depth dose, PDD? The percentage depth dose of a photon beam in a water phantom depends on energy, depth, field size and SSD. Explain how they affect the PDD. (4+6)
4. Discuss in detail the radiological appearance of brain and spine tumours. (10)
5. WHO Ladder for pain management? Discuss in detail neuropathic pain management in cancer patients. (5+5)
6. Describe in detail about the molecular mechanisms involved in ionising radiation-induced DNA damage and repair. (10)
7. Explain the role of lung cancer prevention with clinical evidence. (10)
8. Briefly describe different ways of interaction of radiation with matter. Discuss Compton Effects in detail. (5+5)
9. Describe the principle and advantages of intracavitary brachytherapy. Enumerate the different systems of intracavitary brachytherapy. Describe Manchester system in detail along with its limitation. (5+5)
10. Describe the hazards of chemotherapy drug extravasation and its management. (5+5)

M.D. DEGREE EXAMINATIONS
RADIATION ONCOLOGY

Paper II

Clinical Radiotherapy, Chemotherapy and other Systemic Anti-Cancer Therapy (SACT) in the Management of Malignancies -Group I

(Skin cancer, CNS Tumours, Head &Neck Tumours, Thoracic Tumours, Breast Tumours, Gastrointestinal Tumours, Liver, Gall Bladder and Bile Duct Tumours, Paediatric Tumours)

Time: Three Hours **Maximum Marks: 100 (10x10marks)**

Answer all questions

1. A Forest plot is often used to represent data in a meta-analysis. (5+5)
    a) Describe the main components of a Forest plot when used in this setting
    b) Use a diagram to help illustrate your answer.
2. Describe the timing of onset, pathogenesis, diagnosis and management of radiation induced pneumonitis. (2+3+3+2)
3. Discuss the complications of craniospinal irradiation in a child. Discuss the various strategies to minimise the complications. (5+5)
4. Write clinical design and results of following trials: (5+5)
    a) Monarch E Trial
    b) FAST-Forward Trial
5. 40-year-old male presented with complaints of ulcerative growth of about 4x4cm on floor of the mouth. Describe in detail staging and brief treatment options available for this patient. Write a brief note about interstitial implant for this patient. (3+3+4)
6. Discuss management of Malignant Pleural Effusion. (10)
7. Discuss radiation treatment of T3 N1 Mo case of carcinoma of Pyriform Fossa. (10)
8. Discuss the role and technique of post-operative radiation in Grade-3 Astrocytoma involving frontal lobe. Discuss about hippocampal sparing. (5+5)
9. Discuss systemic targeted therapy and immunotherapy of melanoma. (5+5)
10. a) What is role of PET imaging in Oncology? (5)
    b) What is role of monoclonal antibody therapy in cancer? (5)

M.D. DEGREE EXAMINATIONS
RADIATION ONCOLOGY

Paper Ill

Clinical Radiotherapy, Chemotherapy and other Systemic Anti-Cancer Therapy (SACT) in the Management of Malignancies -Group II

(Gynaecologic Tumours, Male Genitourinary Tumours, Urinary Tract Tumours, Endocrine Tumours, Lymphoma & Haematological Malignancies, Bone and Soft Tissue Sarcoma, Metastasis of Unknown Origin, AlDS Related Malignancies, Oncologic emergencies, local and systemic effects of cancer, Paraneoplastic syndromes, Impact of comorbidities on cancer outcomes and vice-versa, Benign tumours & Miscellaneous)

Time: Three Hours **Maximum Marks: 100 (10x10marks)**

Answer all questions

1. Define high risk endometrial cancers. Discuss the adjuvant treatment for high-risk endometrial cancers. Justify your answer with evidence. (2+5+3)
2. Discuss the endocrine and paraneoplastic effects of cancer. (5+5)
3. What is the role of sentinel lymph node biopsy in vulvar malignancies? (10)
4. Discuss the rationale of Image guided brachytherapy and the challenges in implementing MR based IGBT in cervix cancer. (5+5)
5. Discuss role of pelvic nodal irradiation and androgen deprivation therapy (ADT) in prostate cancer. (10)
6. Discuss role of radiotherapy in Orbital marginal zone lymphoma. (10)
7. Discuss total neoadjuvant therapy in rectal cancer with recent evidence. (10)
8. Discuss role of definitive irradiation in skeletal Ewing's sarcoma. (10)
9. Define CUP (Carcinoma of Unknown Primary). Role of IHC in the management of CUP. (5+5)
10. Discuss role of radiation therapy in benign tumours. (10)

M.D. DEGREE EXAMINATIONS
RADIATION ONCOLOGY

Paper IV

Recent Advances in Clinical Oncology

Time: Three Hours **Maximum Marks: 100 (10x10marks)**

Answer all questions

1. Discuss the role of MRI-Guided Linear Accelerator in management of solid cancer management with radiotherapy. (10)
2. Describe mechanism of action of Lapatinib, indication, dosing and monitoring of side effects for metastatic breast cancer. (2+2+2+4)
3. Role of hypofractionation in breast cancer. Discuss safety and toxicity profile of various fractionation schedules. (5+5)
4. Mention in detail motion management strategies for thoracic and abdominal malignancies. (10)
5. Discuss indications and efficacy profile of radiosensitisation with immunotherapy. (5+5)
6. Discuss mechanism of action, indication, dosing and toxicity monitoring of PARP inhibitors in ovarian cancer. (2+2+3+3)
7. What is adaptive radiotherapy? Discuss various methods for adaptive radiotherapy in head and neck cancer. (4+6)
8. Discuss the role of radiotherapy for oligometastases in NSCLC of Lung and RCC of kidney. (5+5)
9. Mention Clinical applications of proton and carbon ion therapy. (5+5)
10. Describe Principles and Regulations in setting up a new radiotherapy centre with brachytherapy, proton and photon beam equipment. (5+5)

Annexure 1 (PART A)

KEY CAPABILITIES IN THE PRACTICE OF RADIATION ONCOLOGY

The key capabilities are the practical skills, the resident is expected to acquire optimally during the entire course. The learning objectives are listed after the table below.

No.	Key capabilities	Minimum expected performance at months					
		6	12	18	24	30	36
KNOWLEDGE AND SKILLS (Key capabilities assessed, predominantly, in practical and viva-voce examination)							
1	**Cancer Diagnosis, Staging, Risk categorization, Patient assessment and Decision on treatment intent**						
	-Takes medical history, clinical check-up, and examine and correlate reports of prior studies; consult with referring physicians/surgeons in making accurate diagnosis -Asks for appropriate investigations for workup and confirmation of cancer diagnosis, staging	1,2	3		4		5
	Able to make Clinical Staging as per standard staging systems (AJCC, FIGO, Ann Arbor etc.)- Physical examination and Image based (x-raya/CTb/ Bone scanc/PETd/ MRe), Able to Identify image based normal anatomy and tumour extent	1,2a,b	3a,b,c	3a,b,c,d	3a,b,c,d,e	4a,b,c,d,e	4a,b,c,d,e
	Able to do Analysis and risk categorization based on serum Tumour markers, Molecular markers, IHC, Histopathology report, addictions, life expectancy, age, blood values (as applicable to each malignancy) and its prognostic significance	1,2	3	4			5
	Able to do Assessment of patient's general condition (Example-Performance (ECOG, KPS, Lansky play performance, Nutrition) and comorbidities	1,2	3			4	5
	Able to check VAS Scale for pain assessment and manage pain as per WHO Ladder	1,2	3		4		5

No.	Key capabilities	Minimum expected performance at months					
		6	12	18	24	30	36
2	**Inpatient management, Treatment Compliance and Acute toxicity review for patients undergoing Radiotherapy with/out Systemic Anti-Cancer Therapy (SACT)** **2A – Acute / Emergency care** **2B - Palliative care**						
	2C- Able to do Identification and management of oncological emergencies (Brain metastasis, Spine metastasis, SVCO, TLS etc.)	1	2	3	4		5
	Able to do Identification of critical lab values/image findings and management Identification of febrile neutropenia and management of related infections/sepsis	1,2	3	4			5
	Able to perform Palliative procedures – Pleural effusion tapping, Pain management as per WHO Ladder protocol, Malignant ascites, DVT, Medical decompression for raised ICT in brain tumours etc.	1,2	3	4			5
	· Able to counsel for and monitor treatment compliance · Able to do Identification of radiation and chemotherapy induced acute and late side effects, grading as per CTCAE, RTOG, LENT-SOMA Scale and management of complications · Complete the documentation of treatment summary, prescribe medication and call for/refer for adjuvant treatment if needed · Creates surveillance protocol and explain to patient the need for further follow-up	1	2	3	4		5
3	**Prescription, Administration of Systemic Anti-Cancer Therapy (SACT) and Monitoring** **3A- Prescription and delivery of commonly used systemic anticancer therapies (SACT)** **Drugs like chemotherapy, immunotherapy drugs, hormones,**						

No.	Key capabilities	Minimum expected performance at months					
		6	12	18	24	30	36
	molecular targeted drugs and supported drugs						
	Able to prescribe Chemotherapy prescription (regimen/dose and schedule) in various settings- Neoadjuvant/ Concurrent/ Adjuvant/ Palliative Conventional/ dose-dense/dose-intense protocols	1,2	3	4	5		
	Able to perform and monitor - Chemotherapy dose calculation (BSA, AUC Based) and Able to prescribe appropriate antiemesis protocol depending upon emetogenic potential of prescribed drugs or regimen, appropriate sequencing of drugs in combination regimen	1,2	3	4	5		
	Able to do Dose modifications based on hepatic, renal dysfunction, myelosuppression etc.	1,2	3	4	5		
	Able to identify and do Management of Extravasation	2	3	4	5		
	Able to identify and do Management of side effects – CINV, Febrile neutropenia, Thrombocytopenia, Hand-foot syndrome etc.	2	3	4	5		
4	**Radiation Planning - EBRT and Brachytherapy** **4A - Clinical decision making (CDM) for a course of radical and combined modality radiotherapy (including emerging techniques)** **4B- CDM in palliative radiotherapy** **4C- Imaging in oncology** **4D- Brachytherapy application and treatment**						
	Indication of RT in various settings- Neoadjuvant/ Radical/Adjuvant/ Palliative With or without chemotherapy/ radiosensitizers/ radioprotectors	1	2	3	4	4	5
	Positioning, Simulation, Immobilization, Motion management	1	2	3	4	4	5

No.	Key capabilities	Minimum expected performance at months					
		6	12	18	24	30	36
	strategies as per cancer site, type and age						
	Dosimetric calculations- PDD, EQ. Square, EQD2, BED Calculation, Wedge angle estimation, Electron energy, Isodose distribution of photons and electrons, effective and appropriate use of beam modification devices (BMDs) and analysis of isodose distribution with use of BMDs	1	2	3	4	4	5
	2D Planning for common cancers			1,2	3	3	4
	Import and co-registration of MR/PET Images			1,2	3	3	4
	Target volume delineation for common cancers as per standard guidelines, Apply concepts of ICRU Reports		1	2	3	4	4
	Radiation Dose prescription as per evidence-based medicine Fractionation type- Conventional/ Hypofractionation/ Hyperfractionation/Others Delivery Technique- Sequential/ Simultaneous integrated boost Planning technique- 3DCRT, IMRT, VMAT, SBRT, SRS/SRT		1	2	3	4	4
	Dose constraints for OARs as per QUANTEC, PENTEC and from level 1 evidence and on principles of ALARA (As low as reasonably achievable)		1	2	3	4	5
	Plan evaluation and selection of best plan based on Dose statistics, Cumulative DVH, Differential DVH		1	2	3	4	5
	Verification of patient setup and treatment plan IGRT- Portal imaging/CBCT Based online/offline review using Eclipse software		1	2	3	4	5
	Gap correction Strategies		1	2	3	3	4
	Brachytherapy procedures and Dose prescription As single modality or in combination		1	2	3	3	4

No.	Key capabilities	Minimum expected performance at months					
		6	12	18	24	30	36
	with EBRT Types- ILBT, ICBT, Interstitial brachytherapy, Mold brachytherapy, Surface brachytherapy						
	Able to write comprehensive treatment summary of delivered radical or palliative treatment and able to provide surveillance protocol for common cancer.		1	2	3	3	4
	Monitoring of Quality assurance protocols- Daily, Weekly, monthly, Annual in radiation oncology setup as per AERB Guidelines and Department protocols			1	2	3	4
	Radiation Emergencies – Identifications of radiation emergencies in radiation oncology setup, reporting to RSO, HOD and steps to handle accidents as per AERB Guidelines and Department RSO (Radiation safety officer) instructed procedures			1	2	3	4
	Re-irradiation concepts and strategies			1	2	3	4
5	**Follow-up management after Anti-cancer Treatment**						
	Treatment response assessment as per standard criteria e.g., RECIST, PERCIST etc.		1	2	3	4	5
	Cancer wise surveillance protocol for clinical examination and request for appropriate investigations		1	2	3	4	5
6	**Identification of Genetic, Psychosocial and ethical issues Genetic- e.g., Hereditary effects of radiation/chemotherapy, Identification of familial cancer syndromes/ high risk patients with genetic susceptibility Psychosocial- e.g., Handling cancer related depression, Treatment and prognosis related counselling for patients and caretakers, insomnia Ethical issues- e.g., specifically related to radiotherapy or chemotherapy long term side**		1	2	3	4	5

No.	Key capabilities	Minimum expected performance at months					
		6	12	18	24	30	36
	effects e.g., Fertility related issues and appropriate counselling Handling end of life care, supportive and palliative care related issues with empathy and professionalism						
7	**Multi-Disciplinary Tumour clinics and New Case Evaluation OPD (Treatment Plan Meet - TPM) 7A- Participation in Multi-disciplinary Team (Inter departmental) & Treatment plan (Departmental) meetings**						
8	**Clinical data and research 8A- Clinical data and research Section 8B- Participation and presentation in journal club**	1	2	3	4		5
9	**Social activities Cancer awareness, screening camps**		1	2	3	4	5
10	**Adherence to GCP Guidelines (Good clinical practice guidelines) 10A- Professionalism, Medical Ethics, Patient safety and communication**	1	2	3	4	4	4
11	**Leadership and Teamwork capabilities 11A- Teaching, Supervising and Teamwork capabilities**			1	2	3	4
Affective Domain							
12	**Attitude, Relationships and communication skills For learning objectives and assessment -Refer 12A- Affective domain**	1	2	3	4	4	4

LEARNING OBJECTIVES

2A - (Acute/Emergency care)

a) Assess and manages the immediate and ongoing care of patients presenting acutely with complications of cancer and its treatment
b) Coordinates targeted investigation and rapid triage of patients presenting with a possible new diagnosis of malignancy, malignancy of undefined origin (MUO) and carcinoma of unknown primary (CUP)
c) Liaises with other specialist services as appropriate, supporting ongoing management
d) Assesses the appropriate ceiling of care taking the cancer context and the holistic patient assessment into account and sensitively discusses this with the patient and their advocates
e) Participates in decision-making with regard to resuscitation, including decisions not to attempt cardiopulmonary resuscitation (CPR), and communicates sensitively with patients and their advocates in regard to these decisions
f) Ensures clear and adequate documentation of an acute event, appropriate follow up plans and clear and timely communication with community-based teams and the responsible specialist team

2B - Palliative care

a) Ensures continuity of patient care through safe and effective handover to hospital and community-based teams
b) Safely and effectively manages disease and treatment-related complications in oncology patients taking into consideration acute and chronic medical co-morbidities and liaising with relevant specialty services when required
c) Promptly identifies the acutely deteriorating patient, institutes the appropriate initial medical management and seeks appropriate advice, including from other specialties
d) Knows the prognoses and treatment options of different cancers and considers these, together with individual patient factors and wishes, to decide on an appropriate ceiling of care, including escalation to HDU/ITU (High Dependency Unit/ Intensive Care Unit)
e) Understands current guidance regarding CPR orders, participates in shared decision-making and involves other relevant professionals in complex cases
f) Communicates and works effectively with relevant multi-professional teams to provide appropriate holistic in-patient care and safe and timely hospital discharge

g) Effectively manages the common physical symptoms in patients with advanced cancer, recognising the role for pain management, supportive medications, palliative radiotherapy and other approaches. Liaises with specialist palliative care teams when required
h) Recognises when a patient is approaching the end of life, communicates effectively and compassionately with patients and carers regarding advanced care planning and individualised end of life care plans
i) Learn communication skill and breaking bad news.

2C-Identification and management of oncological emergencies (Brain metastasis, Spine metastasis, SVCO, TLS etc.)

a) Demonstration of knowledge of signs and symptoms of acute emergencies
b) Demonstration of knowledge of doses of pharmacological agents/radiotherapy measures to treat acute emergencies
c) Demonstrate judgement in institution of life saving procedures and drugs
d) Demonstrate ability to mobilize resources appropriately
e) Communicate effectively with physicians and other health care professionals for further management of the patient
f) Communicate effectively to patient/family for shared decision making

3A- Prescription and delivery of commonly used systemic anticancer therapies (SACT) Drugs like chemotherapy, immunotherapy drugs, hormones, molecular targeted drugs and supported drugs

a) Selects the most appropriate SACT regimen and associated supportive measures for the clinical situation according to available evidence, MDT discussion and holistic patient assessment
b) Modifies approach to address the specific needs of individual patients, including vulnerable groups
c) Clearly communicates the benefits and risks of available treatment options, including those available within clinical trials, to enable informed consent
d) Applies the knowledge of mechanisms of action and treatment toxicities to pre-empt, monitor and manage these in patients receiving SACT
e) Co-ordinates the appropriate investigations, procedures and logistic arrangements required for SACT delivery

f) Generates a SACT prescription that is safe and accurate
g) Evaluates toxicity and response during treatment and adapts SACT/supportive measures accordingly, balancing treatment goals with patient safety and priorities
h) Assesses, grade and reports SACT toxicity according to regulatory and, where relevant, research governance processes
i) Collaborates effectively with members of the multi-disciplinary team when patients are receiving SACT as part of a multi-modality treatment pathway
j) Pro-actively liaises with the relevant teams when SACT is completed or discontinued to enable co-ordinated ongoing management

4A - Clinical decision making (CDM) for a course of radical and combined modality radiotherapy (including emerging techniques)

a) Determines the most appropriate dose/fractionation regime for the clinical situation and patient factors, including concomitant systemic therapy
b) Takes into account when radiotherapy has been given previously (possibly for a separate cancer diagnosis) and demonstrates an understanding of how this may impact on current treatment decisions
c) Identifies and organises appropriate investigations and procedures required prior to treatment
d) Determines the most appropriate radiotherapy treatment strategy to include patient position, immobilization techniques, methods of tumour localization and radiotherapy delivery techniques
e) Accurately delineate appropriate target volumes and organs at risk for the chosen regimen of radical radiotherapy
f) Critically evaluates a radiotherapy treatment plan
g) Evaluates digitally reconstructed radiographs and on-line portal imaging to assess accuracy of patient set-up and verify a treatment plan and recommends adjustments if required
h) Assesses patients undergoing radical radiotherapy and grade and manages acute radiotherapy reactions appropriately, including dose or volume adjustment in cases of severe toxicity
i) Recognises the detrimental impact of treatment prolongation on radiotherapy efficacy and has strategies for dealing with gaps in treatment

j) Assesses patients following radical radiotherapy in the out-patient clinic, recognises, grades and manages acute and late toxicities, and refers to relevant specialists if required

4B- CDM in palliative radiotherapy

a) Takes a relevant history and performs an appropriate clinical examination to make an accurate assessment of symptoms to assist in defining the area to be treated
b) Determines the most appropriate radiotherapy treatment strategy to include patient position, immobilization techniques and field arrangement
c) Determines the most appropriate dose / fractionation regime for the clinical situation
d) Appropriately defines and arranges palliative fields with adequate margins around target sites to allow for internal organ motion and set-up variation
e) Understands the risks of re-treatment with radiotherapy based on normal tissue tolerances, accurately assesses when re-treatment is acceptable and counsels the patient appropriately
f) In cases of re-treatment, is able to calculate EQD2 (or BED) for planned and previous treatments to ensure maximum tolerated dose is not exceeded, taking into account expected recovery over time and seeking advice from colleagues where appropriate
g) Safely prescribes supportive treatment

4C- Imaging in oncology

a) Accurately recognises the radiological anatomy visible on optimal imaging modalities
b) Understands which radiological investigation is appropriate for the patient
c) Uses diagnostic imaging (with the aid of the imaging reports) to identify cancer pathology on radiotherapy planning scans and appropriately defines target volumes, organs at risk and normal anatomical structures.
d) Reviews imaging with a radiologist in cases of complexity or uncertainty

4D- Brachytherapy application and treatment

a) Able to identify patients suitable for brachytherapy treatment based on evidence, availability and patient factors
b) Determines the most appropriate dose/fractionation regime according to the evidence base, the chosen source and delivery system and any patient factors
c) Identifies and organises appropriate investigations and procedures required prior to treatment

d) Communicates effectively with the wider team to ensure the availability of all required facilities and personnel
e) Understands how the procedure should be performed and the rules for implantation as per the dosimetry system used
f) Correctly determines the volume to be treated and the organs at risk for the procedure
g) Appropriately evaluates a brachytherapy treatment plan in line with consensus guidelines and employs suitable strategies to improve an inadequate plan
h) Understands how to safely prescribe the radiation dose according to plan constraints
i) Understands the radiation protection measures required following a brachytherapy procedure and is able to communicate them appropriately
j) Able to recognise and appropriately manage any acute and late complications of treatment
k) Understands and applies legislation governing the use of sealed brachytherapy sources in hospitals in India

7A- Participation in Multi-Disciplinary Team (Inter-departmental) & Treatment Plan (departmental) meetings

a) Presents new cases to the MDT in a clear and concise manner highlighting the relevant points and questions to be answered
b) Understands the indications for all treatment options available for different types and stages of cancer within the tumour site, applying relevant guidelines and the most up-to-date evidence base to give an informed oncology opinion
c) Assesses the risks and benefits of treatment options for each patient considering disease stage, tumour biology and individual patient factors to formulate an appropriate personalised management plan
d) Recognises the limitations of clinical guidelines in cases of uncertainty or complexity
e) Communicates views and recommendations clearly, promptly and effectively to all members of the MDT
f) Respects the expertise, viewpoints and responsibilities of all MDT members and helps foster a supportive and collaborative environment for open discussion
g) Understands the local, regional/national MDT network and communicates effectively between the elements of the service

8A- Clinical Data & Research

a) Understand the importance of accurate and secure collection of clinical data every day.
b) Actively participates in departmental Morbidity & Mortality Meeting and contributes to clinical data collection
c) Ability to interpret clinical data and suggest improvement measures accordingly
d) Understands principles of research and academic writing
e) Demonstrates ability to carry out critical appraisal of the literature
f) Understands the role of evidence in clinical practice and demonstrates shared decision making with patients
g) Demonstrates appropriate knowledge of research methods, including qualitative and quantitative approaches in scientific enquiry
h) Demonstrates appropriate knowledge of research principles and concepts and the translation of research into practice
i) Follows guidelines on ethical conduct in research and consent for research
j) Participating in clinical research trials and developing guidelines and protocols to safely implement new radiotherapy/combined modality regimens/techniques
k) Understands and adheres to the laws, frameworks and guidelines which govern the set up and delivery of clinical trials
l) Understands and adheres to trial protocols
m) Understands and follows the correct safety reporting requirements, including reporting mechanisms for any deviations from protocol or adverse events
n) Understands the roles and responsibilities of regional/ national/ international organisations involved in oncology trials
o) Understands public health epidemiology and global health patterns
p) Recognises potential of applied informatics, genomics, stratified risk and personalised medicine and seeks advice for patient benefit when appropriate
q) Demonstrates knowledge of available new radiotherapy techniques and potential benefits and risks
r) Completes a dissertation project under the supervision of a faculty
s) Presents research work in state/ national/ international conference
t) Participates in workshops, symposium and other Continued Medical Education programmes

8B- Participation and presentation in journal club

a) Identification of PICOT, Understanding statistical analysis, identification of type of trials Recognition of knowledge gaps and lacunae in current practice

b) Formulation of question to address knowledge gap and lacunae

c) Identification of sources of knowledge to answer the question

d) Interpretation and critique of evidence

e) Determination of validity and risk of bias in evidence

f) Application and potential integration of evidence into practice

g) Formulation of research study design to answer question

h) Execution of research protocol

i) Analysis and interpretation of research findings

j) Dissemination of research findings in conference presentation

k) Dissemination of research findings in journal publication

10A- Professionalism, Medical Ethics, Patient Safety and Communication

a) Aware of legal responsibilities, including safeguarding vulnerable groups like children, physically/mentally challenged etc.

b) Demonstrates ability to offer apology or explanation when appropriate

c) Demonstrates ability to lead the clinical team in ensuring that medical legal factors are considered openly and consistently

d) Demonstrates ability to convey bad news professionally to patients and their family

11A- Teaching, Supervising & Teamwork capability

a) Delivers effective teaching and training to medical students, junior doctors and other health care professionals

b) Able to supervise less experienced trainees in their clinical assessment and management of patients

c) Able to supervise less experienced trainees in carrying out appropriate practical procedures

d) Able to act a clinical supervisor to doctors in earlier stages of training

12A- Affective domain

The resident:

a) Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
b) Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
c) Aware of national legislation and legal responsibilities, including safeguarding vulnerable groups
d) Behaves in accordance with ethical and legal requirements of the state and the nation
e) Demonstrates ability to offer apology or explanation when appropriate
f) Demonstrates ability to lead the clinical team in ensuring that medical legal factors are considered openly and consistently
g) Develop good communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching

Annexure 1 (PART B)

Foundations for practice of Key-capabilities in RADIATION ONCOLOGY

The foundations for the practice of Key-Capabilities comprise of the scientific areas which the resident is expected to have a thorough knowledge and understanding. This would help him/her to acquire the Learning Objectives as mentioned after the table below. The section is assessed, predominantly, in the theory examination.

S.No	Key capabilities	Minimum expected performance at months					
		6	**12**	**18**	**24**	**30**	**36**
1	**Basic Sciences and Principles of Oncology**						
	Radiobiology - Part A Radiation Physics- Part A Cancer Pharmacology- Part A Medical Statistics- Part A Anatomy and Imaging- Part A	1					
	Radiobiology – Part B Cancer Biology & Genetics– Part A Radiation Physics- Part B Cancer Pharmacology- Part B Medical Statistics- Part B Anatomy and Imaging- Part B		1				
	Cancer Biology & Genetics – Part B Radiation Physics- Part C Cancer epidemiology, cancer registry and National cancer control Programme Principles of management in other disciplines in oncology			1			
2	**Radiotherapy, chemotherapy and other systemic anti-cancer therapies (SACT) in the treatment of cancers (Group I)**			1	1	1	1
3	**Radiotherapy, chemotherapy and other systemic anti-cancer therapies (SACT) in the treatment of cancers (Group II)**			1	1	1	1
4	**Recent advances in Clinical Oncology**					1	1

LEARNING OBJECTIVES – COMPONENTS

The resident should have detailed understanding of the all the components listed below.

I. Basic Sciences & Principles of Oncology
   a. Radiobiology
   b. Cancer Biology & Genetics
   c. Radiation Physics

d. Cancer Pharmacology
e. Medical Statistics
f. Cancer Epidemiology
g. Anatomy & Imaging
h. Other disciplines related to Oncology

II. Radiotherapy, Chemotherapy and other Systemic Anti-Cancer Therapy (SACT) in management of malignancies – Group 1

III. Radiotherapy, Chemotherapy and other Systemic Anti-Cancer Therapy (SACT) in management of malignancies – Group 2

IV. Recent Advances in Clinical Oncology

DETAILED DESCRIPTION OF EACH COMPONENT

1. BASIC SCIENCES & PRINCIPLES OF ONCOLOGY

The following are the subjects to be covered under this component:

- Radiobiology
- Cancer Biology & Genetics
- Radiation Physics
- Cancer Pharmacology
- Medical Statistics
- Cancer Epidemiology
- Anatomy & Imaging
- Other disciplines related to Oncology

Expanded concepts under each subject are given below.

- **Radiobiology**

The resident should learn and comprehend the therapeutic effects and toxicity of ionising radiation at the level of cells, organs and organisms

Radiobiology – Part A

1) Describe cellular systems (hierarchical, flexible) and their response to radiation
2) Contrast parallel and serial systems

3) Outline the principles of cell survival curves
4) Describe the relevance of Linear Energy Transfer (LET) to cellular damage
5) Describe radiation damage at the cellular level (including outcome phenotypes, chromosome damage and cell radiosensitivity)
6) Describe the molecular biology of radiation damage and repair
7) Compare bystander with direct effects of radiation
8) Describe interactions between systemic anti-cancer therapies and radiotherapy
9) Discuss the concept of lethal, sublethal, potentially lethal damage
10) Discuss the concept of early and late repair
11) Describe the effect of cell cycle on radiation sensitivity
12) Discuss repopulation
13) Explain the role of the cell survival curve as a basis for fractionation
14) Describe the linear quadratic model
15) Define terms describing cellular sensitivity (SF2, α, β, mean inactivation dose)

Radiobiology – Part B

16) Discuss the α/β ratio and its relevance to tumours, acute and late responding tissues
17) Calculate Biological Effective Dose (BED)
18) Define and use equivalent dose in 2 Gy fractions (EQD2)
19) Discuss fractionation and its influence on tumour control with different α/β ratio
20) Define hyperfractionation, accelerated fractionation and hypofractionation
21) Discuss the influence of gaps in radiotherapy and their management
22) Describe the influence of dose rate effects, including low, pulsed, medium and high dose rate
23) Define relative biological effect (RBE) and discuss its relationship to LET
24) Explain the influence of oxygen on radiosensitivity, including oxygen enhancement ratio (OER)
25) Explain the role of reoxygenation
26) Explain the relationship between OER and LET

- **Cancer Biology & Genetics**

The resident should learn and comprehend the molecular basis of cancer and relevant genetics. Discuss underlying genetic abnormality, its mechanism of action and associated cancers in:

Cancer Biology and Genetics- Part A

1) Understand the processes of cancer cell transformation and tumour development, the molecular basis of abnormalities that give rise to dysplasia, invasive cancer and metastases,
    a. DNA Replication and the Cell Cycle
    b. Regulation of Growth: Growth
    c. Factors, Receptors, and Signalling Pathways
    d. Oncogenes
    e. Tumour Suppressor Genes
    f. Apoptosis
    g. Telomeres and Senescence
    h. Genetic Instability, Chromosomes, and Repair
    i. Cell–Matrix Adhesion, Cell–Cell Interactions, and Malignancy
    j. Tumour Immunity and Immunotherapy
    k. Angiogenesis
    l. Genomics and Proteomics in Cancer
2) Understand the therapeutic effects and toxicity of ionising radiation at the level of cells, organs and organisms
3) Define and distinguish between different types of growth disorder (e.g. dysplasia and carcinoma in situ)
4) Describe the cell cycle, basic cell kinetics and control mechanisms
5) Describe the mechanisms of spread, local invasion/ migration, metastasis
6) Describe the effects of tumours, including local effects (e.g. pressure) and distant effects (metastatic and non-metastatic)
7) Discuss the importance of tumour vasculature and angiogenesis
8) Describe mechanisms of DNA damage and repair: – single strand DNA breaks: base excision repair (BER); nucleotide excision repair (NER); and mismatch repair (MMR) – double strand DNA breaks: non-homologous end joining (NHEJ); and homologous recombination (HR)

9) Describe the potential role of cancer stem cells
10) Describe mechanisms of cell death, e.g. apoptosis, autophagy
11) Describe the molecular targets for anti-cancer therapy
12) Describe normal chromosomal structure and function, normal gene transcription and its control
13) Describe polymorphisms and microsatellites
14) Describe chromatin structure and function
15) Describe the importance of methylation Discuss chromosomal and genetic changes in malignancy, point mutations, translocations, deletions, gene amplification and over-expression
16) Discuss oncogenes, proto-oncogenes, tumour suppressor genes and their mode of action, describing well established examples in each class
17) Recognise the clinical relevance of genomics in cancer biology and treatment
18) Discuss the control of normal cell growth and behaviour
19) Contrast autocrine, paracrine and endocrine growth factors
20) Discuss altered expression, function and control of these mechanisms in malignancy
21) Describe signal transduction
22) Describe gene promoters and their activity in normal and malignant cells
23) Describe the following non-inherited factors and influences:
    a. environmental
    b. chemical
    c. lifestyle
    d. viral and non-viral infection
    e. inflammatory
    f. ionising and non-ionising radiation

Cancer Biology and Genetics- Part B

24) Retinoblastoma
25) Wilm's tumour
26) familial adenomatous polyposis coli
27) hereditary non-polyposis colon cancer
28) familial breast cancer

29) Li Fraumeni syndrome
30) neurofibromatosis 1
31) MEN 1
32) MEN 2
33) xeroderma pigmentosum
34) ataxia telangiectasia
35) Peutz-Jeghers' syndrome
36) Von Hippel-Lindau syndrome
37) Cowden syndrome
38) Outline the basic principles of immunoediting, including elimination, equilibrium, and escape
39) Outline the basic principles of tumour immunology: – fundamentals of immune response – innate versus adaptive immunity – relevant cell types including T cells (CD4 and CD8), B cells, dendritic cells
40) antibodies
41) immune tolerance; self/non-self, danger hypothesis
42) MHC class I and II
43) immunomodulation, including co-stimulation and negative regulation.
44) tumour associated antigens
45) immune suppression by tumours; tumour infiltrating lymphocytes, regulatory T cells

- **Radiation Physics**

The resident should demonstrate knowledge and understanding of:

Radiation Physics- Part A

1) The interaction of ionising radiation with matter
2) How a desired dose distribution is produced, calculated and quality assured
3) How the dose of unintended radiation can be minimised for patients and staff
4) Describe atomic structure, atomic and mass numbers
5) Describe electron shells and energy levels
6) Describe electromagnetic radiation and the electromagnetic spectrum
7) Explain the relationship between wavelength, frequency and energy

8) Describe an x- or gamma-ray beam (quality, energy, intensity, size)
9) Explain the basic principles of production of x- or gamma-rays
10) Contrast continuous and discrete spectra
11) Describe attenuation, absorption, scattering of x-rays
12) Define attenuation coefficients and half value layer
13) Discuss the nature of the following effects and their dependence on the properties of the irradiated material (e.g. density, atomic number), their variation with energy and their relative importance in therapy and imaging:
    a. Compton effect
    b. photoelectric effect
    c. pair production
    d. scattered radiation
    e. secondary electrons
    f. linear energy transfer
14) Discuss ionisation and excitation due to charged particles
15) Discuss the interactions of electrons with matter:
    a. collision loss
    b. radiative loss
    c. stopping power due to each and total stopping power
    d. particle range
16) Explain the principle of Bremsstrahlung
17) Discuss the interactions of neutrons with matter: elastic and inelastic collisions
18) Discuss the principles of heavier charged particle therapy including proton beam therapy:
    a. ionisation profile
    b. Bragg peak
19) Discuss variation of absorbed dose in different tissues and materials
20) Explain the concept of exposure and KERMA
21) Describe the principles of the relationship between exposure, KERMA and absorbed dose
22) Describe the physical principles underlying radiation dose measurement
23) Describe methods of measurement, including the advantages and disadvantages of the following:

a. ionisation methods (ionisation chamber, Geiger counter, diodes)
b. thermoluminescence (TLD)
c. calorimetry

24) Discuss calibration standards (local and national)
25) Discuss practical dose measurements
    a. derivation of isodose curves
    b. central axis depth dose profiles
    c. use of phantoms

Radiation Physics- Part B

26) Describe energy ranges of x-rays used in clinical practice
27) Discuss the dose distribution for therapeutic x-rays noting the effects on the isodose curve (% depth dose and beam profile) of:

a. energy
b. FSD (Focus to Skin Distance)
c. beam modifying devices such as wedges
d. build-up and skin sparing
e. field size
f. surface obliquity
g. inhomogeneous media

28) Understands the concept of monitor units
29) Describe beam geometry
30) penumbra
31) field size definition
32) Describe the dose distribution of electron beams used in clinical practice noting the effect on the isodose curve (% depth dose and beam profiles) of:
33) energy
34) tissue factors affecting dose at depth (e.g. lung)
35) field size
36) build up and skin sparing
37) surface obliquity and inhomogeneities
38) shielding
39) Discuss the techniques available to optimise patient set-up
40) Discuss the effects of patient and organ movement

41) Describe the methods of tumour volume definition: clinical examination, radiograph, CT, MRI, ultrasound, functional imaging

42) Explain the concept of planning volumes:

i. gross tumour volume (GTV)
ii. clinical target volume (CTV)
iii. planning target volume (PTV): internal target volume (ITV); set-up margin (SM)
iv. treated volume
v. irradiated volume
vi. organs at risk (OAR)
vii. planning organ at risk volume (PRV)

43) Explain the methods of planning volume localisation:

i. clinical mark-up
ii. CT scanning

44) Compare fixed FSD versus isocentric planning

45) Describe isodose distributions, their uses and critical assessment in each of the following situations:

a. single field
b. multifield (coplanar and non-coplanar)
c. arc and rotational therapy
d. weighting

Radiation Physics- Part C

46) Explain radiation protection mechanisms, including time, distance, shielding

47) Discuss quality factors and dose equivalent

48) Discuss background radiation

49) Describe the statutory framework for radiation protection

50) Describe the classification of staff, designated areas

51) Outline the principles of :

a. Atomic Energy (Radiation Protection) Rules, 2004
b. IAEA (International Atomic Energy Agency)
c. controlled areas
d. radiation dose limits for humans

52) Explain the design of treatment rooms:
    a. primary/secondary barriers
    b. transmission through barriers
    c. mazes, doors and interlocks
    d. leakage and scattered radiation
53) List the methods of monitoring of personnel e.g.:
    a. TLD badge
    b. direct reading dosimeter
54) Outline the principles of beam shaping including conformal therapy, IMRT and VMAT
55) Outline the principles of forward and inverse planning
56) Discuss dose prescription including the ICRU reference point
57) Outline the principles of dose calculations in the presence of extensive shielding
58) Explain the principles of field matching
59) Describe the principles of plan evaluation and verification using isodose display, dose volume histograms (DVH, cumulative and frequency) and digitally reconstructed radiographs (DRR)
60) Outline the principles of superficial and orthovoltage x-ray production
61) Outline the principles of the linear accelerator, including:
    a. electron beam production
    b. x-ray production, beam control and stability
    c. output
    d. IMRT and VMAT
62) Describe the concept and definition of the isocentre
63) Describe the techniques for defining the beam geometry:
    a. collimators
    b. applicators
    c. multileaf collimators
64) Explain the factors influencing penumbra
65) Define beam quality
66) Describe the shielding techniques available and the materials used in their construction
67) Explain the concepts of transmission, scatter and doses under shields

68) Discuss the factors involved in accurately irradiating the target:
    a. the treatment couch (including modern techniques of couch movements and the concept of 6 degrees of freedom)
    b. positioning of the patient
    c. lasers
    d. light fields
    e. monitoring radiation output
69) Describe the functioning of multileaf collimators:
    a. edge definition
    b. leaf leakage
    c. influence of leaf size
70) Outline the principles of stereotactic ablative radiotherapy (SABR)
    a. Understands the role of 4D imaging
    b. Understands and discusses the advantages and disadvantages of SABR delivery platforms including standard external beam linacs, CyberKnife and Tomotherapy
    c. Understands the concepts of conformity index and gradient index in SABR plan appraisal
    d. Understands the difference in homogeneity of dose seen in SABR compared to conventional radiotherapy
    e. Understands the principles of quality assurance of SABR
71) Recognise motion management techniques for SABR including
    a. active breathing control
    b. abdominal compression
    c. gating
    d. fiducial implantation
72) Define quality assurance and quality control in radiotherapy
73) Describe the processes that are undertaken to ensure that the prescription is correctly implemented:
    a. the role of computer verification
    b. manual checking
    c. monitoring accuracy of treated volume: offline and online IGRT
    d. monitoring accuracy of positioning (lasers, light-fields, tolerances)

e. in vivo dosimetry

74) Outline monitoring to assure accuracy of:
    a. radiation output
    b. symmetry
    c. field flatness
    d. beam energy
    e. field size
75) Describe the rules for reporting near misses and errors including the legal requirements
76) Describe the basic principles of gynaecological brachytherapy (Manchester and three- dimensional image guided)
77) Describe the basic principles of prostate brachytherapy using permanent seeds
78) Describe the basic principles of radioactivity including:
    a. definitions and units of activity and half-life including physiological and biological half-life of 192Ir, 131I, 125I, and 60Co
    b. inverse square law
    c. hazards with sealed and unsealed sources
    d. source strength
    e. afterloading
79) Cobalt Machine: working principle, construction, design and QA
80) Gamma-knife: working principle, construction, design and QA
81) Cyber-knife: working principle, construction, design and QA
82) HDR machine: working principle, construction, design and QA
83) CT simulator: working principle, construction, design and QA
84) 4D-CT: indications, accessories
85) MR Simulator: working principle, construction, design and QA
86) MR Linac: working principle, construction, design and QA
87) SGRT: Surface Guided Radiation Therapy

- **CANCER PHARMACOLOGY**

The resident should demonstrate knowledge of the safe, appropriate and effective use of drugs for anti- cancer systemic therapy and symptomatic treatment of cancer, including the use of analgesia and anti-emetics.

Cancer Pharmacology-Part A

1. Describe the mechanisms of action for commonly used anti-cancer drugs
2. Discuss the mechanisms of drug resistance
3. Describe strategies to optimise efficacy of cytotoxic therapy
4. Describe the dose limiting and common toxicities
5. Describe dose-related and idiosyncratic toxicity
6. Define the concepts of acute and long-term toxicity
7. Discuss the mechanisms of toxicity
8. Discuss chemical and other factors modifying drug toxicity
9. Describe the principles of managing cytotoxic extravasation
10. Discuss the principles of pharmacokinetics and interpret pharmacokinetic data
11. Explain the role of the route and timing of administration
12. Discuss the importance of plasma concentration and its relationship to drug actions
13. Define Area Under Curve (AUC) and discuss its importance
14. Discuss drug activation, metabolism and clearance
15. Discuss the importance of protein and tissue binding
16. Describe the importance of drug concentration at target site
17. Describe dose response curves

Cancer Pharmacology-Part B

18. Explain the concept of dose intensity
19. Discuss the effects of single agent and combination therapy
20. Discuss the interactions of systemic therapy with other modalities of treatment
21. Describe the principles of regional therapy
22. Describe safe practice in intrathecal treatment

23. Outline the principles of high dose therapy
24. List the classes of anti-emetics and discuss their use
25. Discuss the use of steroids
26. Discuss use of haematopoietic growth factors
27. Outline the clinical pharmacology of analgesics and co-analgesics
28. Discuss the use of drug combinations for pain management
29. Describe different formulations and their use
30. Discuss common or important interactions between drugs used in cancer therapy and other commonly used drugs

- **MEDICAL STATISTICS**

The resident should demonstrate the statistics knowledge necessary to:

- understand the design of trials
- read and use a trial protocol
- present and interpret data
- interpret results of clinical trials
- critically review and evaluate papers

MEDICAL STATISTICS-Part A

1. Present and summarise individual variables
2. Recognise categorical data (nominal, ordinal)
3. Recognise discrete and continuous numerical data
4. Recognise symmetric and skewed distribution
5. Describe the normal distribution
6. Interpret bar charts and histograms
7. Define and apply measures of central tendency and Spread
8. Describe the concept of a source population
9. Explain random sampling
10. Explain estimation of population statistics
11. Describe standard error of a sample mean and of a proportion, and their differences
12. Define and use confidence intervals
13. Explain reference ranges
14. Explain hypothesis testing and estimation
15. Contrast Type I and II errors

16. Interpret p-values and confidence intervals
17. Define and identify the difference between statistical and clinical significance
18. Explain the concept of and correction for multiple testing (e.g., false discovery rate, Bonferroni correction)

MEDICAL STATISTICS-Part B

19. Interpret tests comparing means and percentages
20. Interpret the meaning of correlation and regression analysis
21. Interpret the meaning of scatter plots
22. Calculate and interpret the meaning of sensitivity, specificity, positive and negative predictive values and accuracy
23. List types of time-to-event data
24. Interpret and describe the principles of Kaplan-Meier and actuarial survival curves
25. Understand censorship
26. Understand how the KM curves can be derived using algorithms and how to input the data
27. Describe the possible methods of summarizing survival data
28. Interpret and describe methods used to compare groups:
    a. Log rank test for two or more groups, including ordered groups
    b. Cox's proportional hazards regression model
    c. hazard ratios and their interpretation
29. Compare the design and role of phases I-IV of clinical trials
30. Explain the need for randomization and the problems with non-randomised studies and historical controls
31. Describe the methods of randomisation (simple, block, stratified, minimisation)
32. Explain the concepts of blinding/masking
33. Describe the possible trial designs: parallel group, cross-over, factorial
34. Describe the contents of a trial protocol
35. Discuss the ethical basis for research of what constitutes informed consent and reporting adverse events
36. Describe the possible measures of response including:
    a. tumour regression

b. quality of life
c. toxicity
d. local and regional recurrence
e. distant metastases
f. death
g. cause specific death
h. disease free survival
i. progression free survival

37. Outline the principles of:
    a. sample size calculation
    b. interim analyses
    c. intent-to-treat analysis
    d. early stopping rules
38. Outline the role and basic principles of meta-analysis and systemic reviews
39. Contrast the design and interpretation of cross-sectional case control and cohort studies
40. Define the principles, calculate and interpret odds ratios and risk ratios
41. Define incidence, prevalence, mortality rates and standardised mortality rates

- **Cancer Epidemiology, Cancer Registry & National Cancer Control Programme**

The resident should have adequate knowledge of

1. Prevalence and Incidence of cancers in India and the World
2. Population-Based and Hospital-Based Cancer Registries in India
3. National Centre for Disease Informatics and Research (NCDIR)
4. Prevention and Screening of cancers
    a. Principles and Methods
    b. National Cancer Control Programme (NCCP)

- **Anatomy & Imaging in Oncology**

The resident should have adequate knowledge of

1. Lymphatic drainage of all organs and structures in the body

2. Radiological anatomy as required to identify different organs and tumors in various imaging modalities

- **Principles of management in other disciplines in oncology**

The resident should have adequate knowledge of

1. Basic principles of surgical oncology, biopsy, conservation surgery, radical surgery, palliative surgery
2. Basics of surgical techniques - head & neck, breast, thorax, abdomen, gynaecological, genitourinary, musculoskeletal, CNS

2. Radiotherapy, Chemotherapy and other Systemic Anti-Cancer Therapies in the treatment of cancers (Group I)

The resident should have knowledge in the clinical oncological management (non-surgical) of the following cancers including diagnosis, staging, prognosis, treatment with radiation and/or systemic anti-cancer drugs, follow-up of newly diagnosed/relapsed/recurrent tumors along with principles and practice of re-treatment. Knowledge in Cancer survivorship and rehabilitation. Tumors to be learnt under this group include. Tumors to be learnt under this group include-

Group - I

a. Skin Cancer
b. Central Nervous System Tumor
c. Head and Neck Tumors
d. Thoracic Tumors
e. Breast Tumors
f. Gastrointestinal Tumors
g. Liver, Gall bladder and bile duct tumours
h. Paediatric Tumors

Group - II

i. Gynaecologic Tumors
j. Male Genitourinary Tumors
k. Urinary Tract Tumors
l. Endocrine Tumors
m. Lymphoma and Haematological Malignancies

n. Sarcomas of Bone and Soft tissues
o. Metastasis of Unknown Origin
p. AIDS related Malignancies
q. Miscellaneous cancers
r. Oncologic Emergencies
s. Local & Systemic effects of cancer
t. Impact of comorbidities on cancer outcomes and vice-versa
u. Paraneoplastic syndromes
v. Benign Diseases

3. Recent Advances in Clinical Oncology

The resident should have knowledge in the latest developments in clinical oncology comprising improved diagnosis, prognosis, treatment and follow-up and rehabilitation of patients with solid tumours.

a. Latest development in radiation techniques, delivery and equipment.
b. Newer systemic anti-cancer and supportive drugs approved for clinical use
c. Recent updates in the field of molecular and immune-oncology
d. Knowledge to set up a Radiotherapy and Oncology department including planning of infrastructure, equipment and local/national laws governing the radiation safety and the usage of various equipment used in oncology.

Annexure 1 (PART C)

Learning Objectives -Peripheral posting of MD RO residents

The resident will have to attend the peripheral posting in 2nd, 3rd and 4th Semester. The total duration of this posting will be 4 Months (Each posting for 2 weeks)

Log Book:

Residents should update their logbook on all the academic and clinical activities performed in the peripheral postings.

Peripheral posting of MD RO residents in Oto-Rhino-Laryngology

Objectives:

- Demonstrate knowledge, clinical and technical skills and decision-making capabilities pertinent to the management of Head and Neck Cancer patients.

Specific Objectives

1. Evaluation of a patient Head and Neck Cancer - Staging and workup
2. Evaluation of a patient with dysphagia
3. Observe surgical procedures for head and neck malignancies.
4. Exposure to Speech and Swallowing therapy
5. Observing Direct Laryngoscopy for evaluation of Laryngeal malignancies
6. Exposure to Audiometry - PTA interpretation

Following the completion of the posting, the resident should be able to demonstrate knowledge and technical competence in performing the following procedures:

- Biopsy procedures for Head and Neck Cancer
- Dysphagia evaluation
- Indirect Laryngoscopy
- Direct Nasal Endoscopy
- Counselling on Swallowing therapy

Interpretation of PTA results

Peripheral posting of MD RO residents in Surgical Oncology/Surgery

Objectives:

- Demonstrate knowledge, clinical and technical skills and capabilities pertinent to the management of a patient with cancer, evaluated for surgery

Specific Objectives

1. Observe Surgeries for patients with cancer.
2. Observe HIPEC procedures
3. Observe and assist day-care procedures such as biopsy, etc.

Following the completion of the posting, the resident should be able to demonstrate knowledge and technical competence in performing the following procedures:

- Biopsy procedures for Cancer
- Assess basic surgical fitness for a patient with cancer
- Identify operable vs. inoperable diseases for Head & Neck, Breast malignancies, etc.
- Identify benign vs malignant lesions based on imaging findings
- Understand staging of common malignancies based on imaging findings
- Preparing a patient for guided procedure

Peripheral posting of MD RO residents in Obstetrics & Gynaecology

Objectives & Log-book:

- Demonstrate knowledge, clinical and technical skills and decision-making capabilities pertinent to the management of Gynaecologic Cancer patients.

Specific Objectives

1. Evaluation of a patient with bleeding per vaginum
2. Evaluation of a patient with adnexal mass
3. Observe Surgeries for gynaecological malignancies.
4. Observe Curettage procedures for endometrial/endocervical lesions
5. Observe Colposcopy procedures
6. Exposure to fertility issues in oncology

Following the completion of the posting, the resident should be able to demonstrate knowledge and technical competence in performing the following procedures:

- Biopsy procedures for Gynaecological Cancer
- Counsel patients on fertility issues in oncology - associated with treatment
- Perform PAP smears for screening

Interpret Colposcopy findings and suggest further measures

-

Peripheral posting of MD RO residents in Radiodiagnosis

Objectives:

- Demonstrate knowledge, clinical and technical skills and decision-making capabilities pertinent to the imaging evaluation of patients with malignancy.

Specific Objectives

1. Understand the Principles of CT and MR imaging
2. Understand different sequences in CT and MR imaging and their clinical utility in Malignancies
3. Assisting Guided Biopsy procedures
4. Understand RECIST criteria in Reporting
5. Understand different reporting systems like BIRADS, THYRADS, etc pertinent to Oncology

Following the completion of the posting, the resident should be able to demonstrate knowledge and technical competence in performing the following procedures:

- Fluoroscopy - Barium Swallow, Cholangiogram etc.

Peripheral posting of MD RO residents in Nuclear Medicine

Objectives:

- Demonstrate knowledge, clinical and technical skills and capabilities pertinent to the management of a patient with cancer, using Radionuclide therapy

Specific Objectives

1. Observe PET scans (FDG, PSMA, etc.) for patients.

2. Observe Bone scans, Iodine Scans, MIBG etc.
3. Observe Thyroid ablation procedures, PRRT therapy, Samarian/Lutetium therapy etc.
4. Observe other common scans using Radionuclides.
5. Reporting based on PERCIST Criteria for solid malignancies, Deauville scoring for Lymphoma

Following the completion of the posting, the resident should be able to demonstrate knowledge and technical competence in the following procedures:

- Indications of Radionuclide imaging
- Assessing suitability of a patient for Radionuclide therapy.
- Gain basic knowledge of other Nuclear Medicine related Imaging such as DMSA, DTPA, Cardiac Scans, etc.

Peripheral posting of MD RO residents in Medical Oncology

Objectives:

- Demonstrate knowledge, clinical and technical skills and capabilities pertinent to the management of a patient with Hematologic malignancies.

Specific Objectives

1. Observe, assist and independently perform Minor OT procedures such as Central Line Insertion, CSF tap, Bone Marrow Biopsy, etc.
2. Infection management during treatment of hematologic malignancies
3. Observe preparation, treatment and follow up of a patient on Bone Marrow Transplantation.

Following the completion of the posting, the resident should be able to demonstrate knowledge and technical competence in the following procedures:

- Central line insertion
- CSF tap
- Bone Marrow Biopsy
- Management of febrile/afebrile neutropenia

- Chemotherapy practices in Leukaemia, Lymphoma, myeloma and other haematological malignancies
- Management of infections during intensive/prolonged chemotherapy regimens.

Indications on BMT, procedures to be followed during care for a patient with Bone marrow transplant.

Peripheral posting of MD RO residents in Critical Care Unit

Objectives:

- Demonstrate knowledge, clinical and technical skills and decision-making capabilities pertinent to the management of critically ill patients.
- Demonstrate awareness of the ethical principles pertinent to critically ill patients, including end-of-life care and issues around withdrawing and withholding life support

Specific Objectives

1. Airway Management
    a. Principles of airway management
    b. Indications for intubation
2. Respiratory Critical Care
    a. Interpretation of blood gases
    b. Assessment of acid-base status
    c. Provision of ventilator orders for most patients
    d. ARDS
3. Cardiac Critical Care
    a. ACLS principles
    b. Recognition of common rhythm disturbances
    c. Interpretation of electrocardiogram/recognition of important life-threatening findings
4. Shock
    a. Classification of shock, including:
        - Hypovolemic shock
        - Distributive shock
        - Cardiogenic shock

- Anaphylactic shock
- Neurogenic shock

b. Outline of hemodynamic patterns specific to different causes of shock
c. Appropriate use of inotropes, vasopressors and antiarrhythmics

5. Sepsis and Critical Care
    a. Organ failure associated with sepsis
6. Renal Problems and Critical Care
    a. Renal failure and principles of dialysis/ultrafiltration
    b. Fluid and electrolyte disorders
    c. Myoglobinuria
7. Nutritional Support in Critical Care
    a. Nutritional assessment in the ICU
    b. Enteral nutrition
    c. Parenteral nutrition & maintenance, weaning and resumption of oral/enteral feeding.
8. Identify & manage Ventilator-Associated Pneumonia
9. Others

Following the completion of the posting, the resident should be able to demonstrate knowledge and technical competence in performing the following procedures:

- Arterial line placement
- Basic airway management, including:
    - Bag/mask ventilation
    - Uncomplicated intubation
- Central venous catheter insertion
    - Insertion of and instruction in the insertion of intra-arterial (radial, femoral, axillary) and central venous catheters (internal jugular, subclavian, femoral).
    - Insertion of and the instruction in the insertion of pulmonary artery catheters (internal jugular, subclavian and femoral) - optional.
- Insertion of chest tubes (optional).
- Percutaneous tracheostomies (optional).
- Application of ACLS principles in patient resuscitation
- Seek appropriate consultation from other health professionals
    - Demonstrate insight into his/her own limitations by self-assessment

Demonstrate effective, appropriate and timely consultation of another health professional as needed for optimal care of the critically ill patient

Peripheral posting of MD RO residents in EMS

Objectives:

- Demonstrate knowledge, clinical and technical skills and decision-making capabilities pertinent to the management of patients presenting to the EMSD.

Specific Objectives

1. Basic Life Support
2. Advanced Cardiovascular Life Support
3. Triage patients
4. Initial history and physical examination of a patient with acute emergencies
5. Initial management of a patient with acute coronary syndrome, stroke, trauma, etc

Following the completion of the posting, the resident should be able to demonstrate knowledge and technical competence in performing the following procedures:

- Interpretation of Critical Lab values
- Basic Life Support
- Advanced Cardiovascular Life support
- Identification of critical lab values
- Co-Ordination with EMSD services
- Management of Oncologic emergencies

Annexure 2

Record of Case evaluations/ Procedures during Intra-department rotational posting in different workplaces

No.	I- Independently managed A-Assisted / Managed under supervision		Numbers in nth Posting									Total
	Procedures		**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**	**9th**	
	Case Evaluation, Staging , TPM Discussion											
	Site and Stage wise Details -	I										
	Site and Stage wise Details -	A										
	Oncological Emergencies											
	Disease Condition and Management Details	I										
	Disease Condition and Management Details	A										
	General Emergencies – Critical lab values/ image findings											
	Disease Condition and Management Details	I										
	Disease Condition and Management Details	A										
	Day care Chemotherapy Procedures											
	Site, Stage, Intent, Type, Regimen Details	I										
	Site, Stage, Intent, Type, Regimen Details	A										
	Supportive care Procedures											
	Disease Condition and Type of Procedure Details	I										
	Disease Condition and Type of Procedure Details	A										
C	**Palliative care Procedures**											
	Disease Condition and Type of Procedure Details	I										
	Disease Condition and Type of Procedure Details	A										
	Chemotherapy induced Acute toxicity management											
	Site and Grade wise Details	I										
	Site and Grade wise Details	A										
	Radiotherapy induced Acute toxicity management											
	Site and Grade wise Details	I										
	Site and Grade wise Details	A										

R	**Radiotherapy induced Late toxicity management**											
	Site and Grade wise Details	I										
	Site and Grade wise Details -	A										
	CT Simulation											
	Site wise Details	I										
	Site wise Details	A										
	RTP Planning –Contouring, Beam placement, Evaluation, Setup & Delivery											
	Site and Type wise Details	I										
	Site and Type wise Details	A										
	IGRT Review											
	Site and Type wise Details	I										
	Site and Type wise Details	A										
	Brachytherapy											
	Site and Type wise Details	I										
	Site and Type wise Details	A										
	Surveillance/ Follow-up											
	Site and Type wise Details	I										
	Site and Type wise Details	A										
	Participation in MDTs											
	Site wise Attended – No.											

Details of the following are to be enclosed.

1. Presentations in the departmental seminars, journal article critical appraisal, and other classes.
2. Conferences attended – National/International
3. Papers presented at conferences with abstract, name of the conference, date of presentation, certified by faculty
4. Papers published, with abstract, name & issue of the journal, certified by faculty
5. Feedback forms obtained from other departments during peripheral postings should be enclosed
6. Co-scholastic activities, if any.

Annexure 3

Workplace - Resident Performance Assessment Form

Place of posting: **Reporting time: on time/late**

Number of leaves taken: authorised: **unauthorised absenteeism, if any**

Duration of posting: From ……. To …….

	Scores	**0**	**1**	**2**	**3**
	Score 0- Not attempting to meet expectations **Score 1-** Attempting to, but yet to meet expectations **Score 2-** meets expectations **Score 3-** Proficient, independently exhibits responsibility and standards beyond minimum expectations				
1	**Clinical Work- OPD** a. Takes History and does physical Examination b. Assesses Performance status, Pain scoring, tumour extent on Imaging, Does Staging c. Interprets and properly documents available Investigations for General and metastatic Work-up **d. Creates Management plan – Primary disease or Relapse** ➢ Identifies Intent and Indication for anticancer treatment ➢ Selects type and technique of Radiation and Anti-cancer systemic treatment regimen ➢ Plans dose and schedule of Radiation and Systemic treatment ➢ Prescribes and provide Symptomatic and Palliative care ➢ Requests for appropriate investigations, prophylaxis and check-up prior to administration/ initiation of anti-cancer treatment ➢ Assigns appointments for administration/initiation of treatment **e. Identifies and Manages - Oncological Emergencies and General Emergencies** ➢ Identify Emergencies from symptoms and signs, Clinical exam and investigations				

	➢ Initiate timely management of Emergencies based on examination, critical lab values and Image findings ➢ Coordinates with Nursing, Primary Physician and Ward team and ➢ Consults with allied departments for optimal care				
	Communication with the patient and/or family members for shared decision making regarding anti-cancer and supportive treatment.				
	Obtains written informed consent on treatment/interventions by explaining benefits and related adverse events to patients/chaperones				
6	**Clinical Work- Follow-up** **Treatment response assessment and Surveillance plan-** a. Assesses treatment response with patient reported symptoms/signs, clinical examination and appropriate lab/imaging investigations at appropriate post-treatment interval b. Creates customized surveillance plan for cancer survivors to monitor & manage late toxicities and to detect any recurrence or second malignancy c. Defines frequency of clinical visits d. Plans examination and investigation strategies during each clinical visit **e.** Discusses with Primary physician in case of relapse/toxicity and plans further surgical/non-surgical management options				
7	**Clinical Work- Systemic Anti-Cancer Therapy** ● Checks eligibility for planned anti-cancer systemic therapy (Chemotherapy, targeted therapy, immunotherapy) based on patient reported signs/symptoms, Physical Examination, Lab/Image				

	Investigations prior to each chemo cycle administration ● Explains related adverse effects of SACT to patients and attenders to involve in shared decision making, patient education ● Prescribes appropriate Antiemetic/Anti-Hypersensitivity protocol prior to chemotherapy administration ● Performs appropriate chemotherapy dose modification based on renal/hepatic/other dysfunction ● Identifies and timely manages Critical lab values ● Prescribes under supervision, Growth factors, transfusion, haematinics based on lab values ● Identifies and manages Febrile/Afebrile neutropenia, sepsis ● Requests for investigations for response assessment and consults with primary physician and allied departments for further management ● Aware of oncologic emergencies and is able to seek help from others in the team. ● Prescribes post-chemotherapy antiemetic regimens and gives instructions ● Gives appointment for interim, pre-chemo investigations and next chemotherapy cycle ● Requests for investigations for response assessment and consults with primary physician and allied departments for further management ● Identifies extravasation, allergic/anaphylactic reactions, chemotherapy side effects based on CTCAE criteria and manages appropriately.				
8	**Clinical Work- Ward (IPD)** a. Takes History and does Physical Examination				

	b. Documents Reasons for admission c. Triage patients based on performance status and critical findings d. Prescribes treatment based on examination, lab values and imaging e. Consults or sends necessary referrals f. Maintains Monitoring charts for specific conditions g. Requests for appropriate investigations **h.** Monitors daily progress of patients and co-ordinates with ward team				
9	**Clinical Work- Review** a. Monitors weekly acute toxicities during radiotherapy or chemo-radiotherapy as per CTCAE/RTOG Criteria b. Educates patients and family on common measures to be taken during the course of Radiation therapy. c. Manages toxicities/symptoms on OPD/IPD Basis depending upon severity d. Timely prescribes appropriate concurrent chemotherapy protocol **e.** Monitors compliance during treatment				
10	**Clinical Work- Simulation** a. Checks eligibility and enrols patient in appropriate insurance policy (Government) b. Compares and documents clinical findings at diagnosis vs. simulation, assesses response to neoadjuvant chemo if given c. Checks eligibility for IV contrast and prescribes appropriate dosage d. Site wise follows simulation protocol with appropriate beam modification devices and accessories				

	e. Enters site-wise checklist f. Requests for MR/PET-CT images/Pre-op CT/MR/Pre-chemo CT/MR images for co-registration				
11	**Clinical Work- Target volume Delineation, Field Placement, Isodose distribution, Target Volume dose and OAR Dose constraint prescription, Plan Evaluation, Treatment Setup & Image Verification** a. Compares and documents clinical findings at diagnosis vs. simulation, assesses response to neoadjuvant chemo if given and discusses with the team for confirmation of the treatment course. b. Identifies Indication, Intent of radiation / chemo-radiotherapy treatment c. Checks requirement/eligibility for IV contrast & able to manage any drug-reactions. d. Follows site wise simulation protocol with appropriate immobilization measures e. Able to identify other imaging methods required for target & OAR delineation f. Import, co-registration of appropriate images with CT-Sim images g. Discusses with team -examination findings, histo-path reports, simulation images and creates optimal EBRT plan outline for Target Volume Delineation and Organs At Risk Contouring h. Follows site and stage specific contouring protocols and completes contouring task in time i. Prescribes radiation dose for TVs and constraints for OARs j. Able to place treatment fields for non-inverse treatment planning and generate dosimetry.				

	k. Have good knowledge on the use of Beam modifying devices to achieve an optimal plan. l. Evaluates plans and selects optimal plan for execution m. Obtains a written informed consent from patient or legal guardians prior to radiotherapy initiation n. Perform radiation treatment setup and verification on the first day along with the rest of the plan/treatment team o. Gives clear written instructions to Radiotherapy Technologists for radiation treatment setup and verification. p. Perform image verification on patients undergoing RT(Online/Offline mode) **q.** Coordinates with physicist for pre-treatment plan Quality Assurance tests				
12	**Clinical Work- Brachytherapy** a. Identifies Indication, Intent of radiation, technique of brachytherapy b. Ensures completion of Pre-brachytherapy workup as per site-wise checklist c. Explains procedure of applicator placement and related complications to the patient and family prior to procedure and obtains written informed consent. d. Selects appropriate brachytherapy applicators and technique of their placement e. Performs the procedure under aseptic conditions with / without varying levels of sedation. f. Takes Simulation images using X-ray/CT/MR equipment/simulators g. Prescribes Point/Volume doses to the target volumes and evaluates and optimizes the Brachytherapy treatment plan for treatment.				

	h. Explain to the patient and instruct them about the radiation delivery process . i. Monitors/Ensures safety of the patient through camera vigilance during treatment delivery j. Evaluates patient for adverse effects after completion of treatment fraction and prescribes any post-treatment medication k. Co-ordinates with all team members including nursing staff, physicists, RTTs to safely execute the whole procedure l. Documents, informs and manages procedure related complications if any **m.** Prepares a treatment summary and discusses with the patient about the appropriate instructions and appointment for the next visit				
13	**Clinical Work-Palliative care** ➢ Identifies need for palliative care based on symptoms, stage and performance status ➢ Takes holistic approach for providing palliative care to maintain and improve quality of life ➢ Enrols patient and care taker in decision making ➢ Prescribes treatment and monitors patient at regular intervals for timely addressing needs based on disease progression/ tolerance				
14	**Attends and participates in MDTs (Multi-disciplinary Tumour Clinics)**				
15	**Displays adequacy of literature search and justifies rationale for management and surveillance**				
16	**Maintains Meticulousness and Comprehensiveness of Records- in** ➢ Written and online data entry				

17	**Communication with patient and care taker** ➢ Explains and Counsel patients in terms of disease status, treatment options, expected benefits and side-effects of treatment, prognosis, need for further regular or SOS investigations, enrols in shared decision making, discuss strategies to prevent, monitor and reporting for acute and late toxicities, importance of treatment compliance				
18	**Team-based work and Leadership** ➢ Coordinates with Seniors and Colleagues ➢ **Shows interest in teaching juniors**				
19	**Accepts feedback, self reflects and demonstrates willingness to change**				
	Total marks **(Maximum possible marks-30)**				
	Log Book Scoring (20 marks)				
	Signature of Faculty				