

SCHEME OF EXAMINATION**&****SYLLABUS****OF****BACHELOR OF MEDICAL TECHNOLOGY (RADIOTHERAPY)****AT****Rajiv Gandhi Cancer Institute and Research Centre
Sector – 5, Rohini, New Delhi, INDIA****AFFILIATED TO****Guru Gobind Singh Indraprastha University
Kashmere Gate, Delhi**

Programme BACHELOR OF MEDICAL TECHNOLOGY (RADIOTHERAPY)**Duration** 3 years including internship**Intake** 4 seats + 1 seat for Kashmiri Migrant (non-transferable)**Seat Allocation/Matrix**

Category wise (Total 4 +1 (KM, Kashmiri Migrant non transferable Seat) – for BMTR)

Category	Seats
D GEN (Delhi General)	2
D SC (Delhi Schedule Caste)	1
OD GEN (Outside Delhi General)	1

Eligibility Pass in 12th class of 10 +2 of CBSE or equivalent with minimum aggregate of 55% marks in physics chemistry and biology provided the candidate has passed in each subject separately. A candidate also must have passed in English (Core or selective or functional) as a subject of studies in the qualifying examination.

OR

Diploma in Radiotherapy Technology after Pass in 12th class of 10 +2 of CBSE or equivalent with minimum aggregate of 50% marks in physics chemistry and biology provided the candidate has passed in each subject separately. A candidate also must have passed in English (CORE or selective or functional) as a subject of studies in the qualifying examination having minimum 5 years of experience in Radiotherapy.

Admission Procedure Through entrance test, to be conducted by the university as per the syllabus under 10 +2 scheme of CBSE, subject-wise distribution of questions will be as 40% in Physics, 25% in biology, 15% in Chemistry, 10% in English (Language & Comprehension) and 10% in General Awareness about health related methods.

Examination Scheme* There shall be internal examinations at the end of first semester, third semester and fifth semester conducted by the department of Radiation Oncology, Rajiv Gandhi Cancer Institute and Research Centre, Sector – 5, Rohini, New Delhi and there shall be annual examinations at the end of second semester, fourth semester and sixth semester at the end of each academic year to be conducted by the GGSIP University.

Theory 75 marks out of 100 marks – University Term End Examinations at the end of each academic year.
25 marks out of 100 marks – Internal Assessment based upon continuous teacher's assessment through out the year submitted by the institution.

Practical 60 marks out of 100 marks – University Term End Examinations at the end of each academic year.
[Breakup of 60 marks University test:
- 30 marks for practical in the form of technique demonstration
- 15 marks for spotting test
- 15 marks for viva-voce]
40 marks out of 100 marks – Internal Assessment based upon continuous teacher's assessment through out the year submitted by the institution.

*** Amendment in the examination scheme from 2009 onwards:**

All Practical Examinations shall be conducted after conducting all the theory examinations. The examiners for conducting the practicals and theory papers shall be same for evaluating overall performance of the candidates.

Eligibility for external /internal examiners Radiotherapy Oncologists(MD/DNB)/Radiotherapy Medical Physicists(M.Sc./Ph.D)/ Radiotherapy Technologists (B.Sc/ Post B.Sc. DRT) with minimum 5 years experience in concerned specialty subject-wise as.

Proposed names for external Examiners

1. Radiotherapy Technologists: (a) Mr. Hardip Singh, Deptt. Of Radiotherapy, PGI, Chandigarh, Ph. 09855336515 (b) Mr. A. Sridhar, Hyderabad (c) Ms. Lakshmi Iyer, Chief RTT, Jupiter Medical Centre, Mumbai.

2. Radiotherapy Medical Physicists: (a) Dr. S. D. Sharma, Officer Incharge, Radiotherapy Physics and instrumentation, RP & AD, BARC, CT & CRS Building, Anushakti Nagar, Mumbai, Ph. 09969378014, (b) Dr. K. J. Maria Dass, Asstt. Prof., SGPGI, Lucknow. Ph 9450652708 (c) Dr. D. D. Deshpande, Head of Medical Physics, TMH, Parel, Mumbai, Ph. 9819379774.

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w.e.f. August 2008

3. Radiotherapy Oncologists: (a) Prof. G. K. Rath, Head Of the Deptt. Of Radiotherapy, AIIMS, Delhi, Ph. 26589821, (b) Dr. S. C. Sharma, Head, Deptt. Of Radiotherapy, PGI, Chandigarh, Ph. 09914209391, 2601960.(c) Dr. P. K. Julka, Deptt. Of Radiotherapy, AIIMS, Delhi. Ph. 09818825626.

Proposed names for internal Examiners

1. Radiotherapy Technologists: (a) Mr. G. S. Wadhawan, Chief RTT, Deptt of RT, RGCI & RC, Delhi, Ph. 9350976211, 25497773. (b) Mr. Pradeep Sharma, Deptt of RT, RGCI & RC, Delhi, Ph 9811081286.

2. Radiotherapy Medical Physicists: (a) Prof. P. S. Negi, Chief Medical Physicist, Deptt. Of Radiotherapy, RGCI & RC, Delhi, Ph. 9811305925 (b) Mr. R. K. Munjal, Sr. Medical Physicist, Deptt. Of Radiotherapy, RGCI & RC, Delhi, Ph. 9810011314

3. Radiotherapy Oncologists: (a) Dr. N.R.Datta, Coordinator, Deptt. Of Radiotherapy, RGCI & RC, Delhi, Ph. 9212472304. (b) Dr.S.Rawat, Sr. consultant, Deptt. of Radiotherapy, RGCI & RC, Delhi. Ph. 9212472304

Declaration of successful student –

a student shall be declared successful on securing/earn all the credits i.e. 162 credits and the student is required to appear in all the examinations.

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Annual scheme of 2nd Year Examination
for
BACHELOR OF MEDICAL TECHNOLOGY (RADIOTHERAPY)
AT
Rajiv Gandhi Cancer Institute and Research Centre
Sector – 5, Rohini, New Delhi, INDIA

SECOND YEAR

Course Code	Subject/Course Name	L	T	P	Total	Yearly Credits*
BMTR –201	Radiation Oncology	5				10
BMTR –202	Medical Physics	5				10
BMTR –203	Technical Aspects	5				10
	Practicals/ Viva-voice					
BMTR–251	Radiation Oncology					8
BMTR–252	Medical Physics					8
BMTR–253	Technical Aspects					8
	Total					54

**Yearly Credits have been calculated by multiplying the semester-wise credits by two.*

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**COURSE CONTENTS FOR SECOND YEAR ANNUAL EXAMINATION
(THEORY & PRACTICAL)**

BMTR –201

RADIATION ONCOLOGY L-5

Credits-10

Cross Sectional Anatomy – Cranial NS
Care of the Cancer Patient – Skin Care
Linear Accelerators (Photons) – Common Cancers treated by each modality
Reproductive System
Common diseases encountered in the regions – Bone and Muscle
Linear Accelerator (X and e) – Common Cancers treated by each modality
Common diseases encountered in the regions – Cardiovascular System
Radiographic Anatomy – How to identify the different organs / structures on plain x-rays, CT scans / MRI and other available imaging modalities
Common diseases encountered in the regions – Respiratory System and Digestive System
Cardiovascular System
Universal precautions and care of cancer patients – Laboratory investigations
Radiobiology / Molecular Oncology – Radiation effect at cellular level
Radiobiology / Molecular Oncology – Radiation effect on human tissue
Radiation effect on the foetus
Radiographic Anatomy – How to identify the different organs / structures on plain x-rays, CT scans / MRI and other available imaging modalities
Biological modifiers (to include chemotherapy agents commonly used)
LET
Oncology and Epidemiology (For each identified site the oncology and Epidemiology, signs and symptom, diagnosis and general management must be covered) Breast
Oncology and Epidemiology (For each identified site the oncology and Epidemiology, signs and symptom, diagnosis and general management must be covered) Gynaecological
Oncology and Epidemiology (For each identified site the oncology and Epidemiology, signs and symptom, diagnosis and general management must be covered) Gastro-intestinal tract
Oncology and Epidemiology (For each identified site the oncology and Epidemiology, signs and symptom, diagnosis and general management must be covered) Liver
Oncology and Epidemiology (For each identified site the oncology and Epidemiology, signs and symptom, diagnosis and general management must be covered) Head & Neck
Oncology and Epidemiology (For each identified site the oncology and Epidemiology, signs and symptom, diagnosis and general management must be covered) - Prostate
Radiation effects on malignant cells & tissues- Fractionation and its effects
Clinical Aspects Site Specific- Lung
Oncology and Epidemiology (For each identified site the oncology and Epidemiology, signs and symptom, diagnosis and general management must be covered) Lung
Oncology and Epidemiology (For each identified site the oncology and Epidemiology, signs and symptom, diagnosis and general management must be covered) Lymphoma

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Oncology and Epidemiology (For each identified site the oncology and Epidemiology, signs and symptom, diagnosis and general management must be covered) Bladder
Oncology and Epidemiology (For each identified site the oncology and Epidemiology, signs and symptom, diagnosis and general management must be covered) CNS
Oncology and Epidemiology (For each identified site the oncology and Epidemiology, signs and symptom, diagnosis and general management must be covered) Kaposi Sarcoma
Promoting a healthy life style, early detection, screening
Cancer prevention and public education
Treatment Modalities for common malignance to include indications for use, and application- alone or in combination with other modalities- Radiation Therapy
Benign and malignant disease, Method of spread of malignant disease
Clinical Aspects Site Specific- CNS
Staging and grading system
Introduction to genetics, genetic predisposition and high risk groups
Treatment Modalities for common malignance to include indications for use, and application- alone or in combination with other modalities- Immunotherapy, Hormonal Therapy and Radio nuclide therapies
Clinical Aspects Site Specific- Kaposi Sarcoma
Treatment Modalities for common malignance to include indications for use, and application- alone or in combination with other modalities- Surgery and Chemotherapy
Communication Skills –verbal / non verbal
Treatment Units – IMRT & Specialized Treatments
Ethical cultural issues – Gender, Religion
Clinical Aspects Site Specific-Breast
Clinical Aspects Site Specific-Gastro-intestinal tract
Legal Aspects- Health and safety, Radiation
Clinical Aspects Site Specific-Gynecological
Clinical Aspects Site Specific-Liver
Clinical Aspects Site Specific- Head & Neck
Clinical Aspects Site Specific- Prostate
Clinical Aspects Site Specific-Lymphomas
Clinical Aspects Site Specific- Bladder
Clinical Aspects Site Specific- CNS

BMTR-251(Practicals/ Lab) Pertaining to above Topics in Radiation Oncology L-0 Credits-8

Radiographic Anatomy – How to identify the different organs / structures on plain x-rays, CT scans / MRI and other available imaging modalities
Treatment Modalities – Linear Accelerators (Photons) – Principles and function
CT Scanner
CT Simulator
Linear Accelerator (X and e) – Principles and function
Treatment Modalities – Linear Accelerators (Photons) – Advantages and Disadvantages
Heavy Particles – Common Cancers treated by each modality
Linear Accelerator (X and e) – Advantages and Disadvantages
Heavy Particles – Principles and function
Heavy Particles - Advantages and Disadvantages
Nature and Production of Ionising Radiation
Radiotherapy Equipment – Cobalt Treatment Units
Radiographic Anatomy – How to identify the different organs / structures on plain x-rays, CT scans / MRI and other available imaging modalities
Radiotherapy Equipment - Simulator
Linear Accelerator (photons And electrons)
Radiobiological Models
Brachytherapy (the principles pre-loaded or After loaded)Interstitial or intracavitary
Planning and dose calculation – target volume And Organs at rest
Planning and dose calculation- ICRU And Dimensions
Brachytherapy (the principles pre-loaded or After loaded)Interstitial or intracavitary – HDR, LDR, PDR, Radionuclide commonly used
Influence of shielding and FSD on dose distribution-2D
Planning and dose calculation- PDD, OAR And TAR
Planning and dose calculation- TMR, TPR & Isodose charts
Influence of shielding and FSD on dose distribution-3D
Radio nuclide therapy (Unsealed sources)
Planning and dose calculation- Conformal therapy Basic calculation Mean maximum, minimum
Normal tissue tolerance
Planning and dose calculation- Beam Attenuation and compensation
Planning and dose calculation- Conformal therapy Basic calculation Number of fractions, treatment time, monitor units, beam attenuators
Patient treatment chart
Planning and dose calculation- Conformal therapy Basic calculation tumour dose
Treatment Units – IMRT & Specialized Treatments
Planning and dose calculation- Beam Attenuation and compensation
Physics Aspects Site Specific-Breast
Physics Aspects Site Specific-Gastro-intestinal tract

Physics Aspects Site Specific- Liver
Physics Aspects Site Specific-Gynecological
Physics Aspects Site Specific- Head & Neck
Quality Assurance/ Control Protocols (evidence based)
Physics Aspects Site Specific- Prostate
Quality Assurance/ Control equipments
Quality Assurance/ Control Audits
Quality Assurance/ Control Incident registration
Physics Aspects Site Specific- Lung
Basics-cobalt unit
Physics Aspects Site Specific- Bladder

BMTR-252 (Practicals/ Labs) Pertaining to above Topics in Medical Physics L-0 Credits-8

BMTR –203**TECHNICAL ASPECTS L-5 Credits-10**

Radiotherapy Equipment - Simulator
Positioning Aids and Treatment Accessories on Treatment Units
Universal precautions for cancer patients - Dietary advice
Dietary advice for Diabetics
Mould room activities- Material used for Shielding
Mould room activities- Individual shielding
Mould room activities- Management of pollution and hazards
Simulation- Definition of target volumes And Organs at risk
Simulation- documentation and contours
Advantages and disadvantages of treatment modalities
Film processing
Technical Aspects Site Specific- Lung
Labeled diagram of simulator with Features of dark room X-ray processing
Introduction of treatment simulator
Importance of grid
Simulation process
Short information on patient positioning & immobilization during simulation
Definition of localization during simulation
Methods for obtaining external patient contours
Technical Aspects Site Specific-Gastro-intestinal tract
Resimulation /plan check
Technical Aspects Site Specific-Breast
Electronic portal imaging device
Technical Aspects Site Specific- Prostate
Introduction to heavy particles, or particle generator for radiotherapy
Principles & functions of treatment modalities
Technical Aspects Site Specific- Lymphomas
Technical Aspects Site Specific- Bladder
Technical Aspects Site Specific- CNS
Comparison in medical linear accelerators of Elekta, Siemens, Varian, & Philips

BMTR-253 (Practicals/ Labs) Pertaining to above Topics in Technical Aspects L-0 Credits-8

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**Annual scheme of 3rd Year Examination
for
BACHELOR OF MEDICAL TECHNOLOGY (RADIOTHERAPY)
AT
Rajiv Gandhi Cancer Institute and Research Centre
Sector – 5, Rohini, New Delhi, INDIA**

THIRD YEAR

Course Code	Subject/Course Name	L	T	P	Total	Yearly Credits*
BMTR –301	Radiation Oncology	5				10
BMTR –302	Medical Physics	5				10
BMTR –303	Technical Aspects	5				10
	Practicals/ Viva-voice					
BMTR–351	Radiation Oncology					8
BMTR–352	Medical Physics					8
BMTR–353	Technical Aspects					8
	Total					54

**Yearly Credits have been calculated by multiplying the semester-wise credits by two.*

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**COURSE CONTENTS FOR THIRD YEAR ANNUAL EXAMINATION
(THEORY & PRACTICAL)**

BMTR –301 RADIATION ONCOLOGY L-5 Credits-10

Clinical - Special Techniques Pediatrics
Clinical - Total Body Irradiation
Clinical-Intra-operative Radiotherapy
Intensity Modulated Radiation Therapy
Clinical - Special Techniques Total Skin Irradiation
Clinical - Special Techniques Stereotactic
Clinical LDR & HDR Intracavitary Brachytherapy
Clinical Interstitial implants LDR & HDR
Clinical – PET-CT
Clinical-KV-CBCT and on Board Imaging
Clinical-Image Guided Radiotherapy
Clinical- Respiratory Gated Radiotherapy in Lung
Clinical-4D CT Imaging and Simulation
Clinical- Role of MRI/CT/PET in Target Delineation
Clinical Parametres for Quality Assurance in External Beam Radiotherapy
3DCRT
IMRT
IGRT
Brachtherapy
Clinical- Tomotherapy
Clinical- Cyberknife
Clinical-Gamma Knife
Clinical –Proton and Ion Therapy
Clinical- Requirement of Radiation safety in Radiotherapy
Clinical- Requirement of Radiation Safety of patients, Radiation worker and public
Clinical Requirements of designing a Radiotherapy fascility
Assistance in Clinical trials

BMTR-351(Practicals/ Lab) Pertaining to above Topics in Radiation Oncology L-0 Credits-8

BMTR –302	Medical Physics	L-5	Credits-10
Physics - Special Techniques Pediatrics			
Physics - Total Body Irradiation			
Principle of Radiotherapy safety			
Physics-Intra-operative Radiotherapy			
Intensity Modulated Radiation Therapy			
Physics - Special Techniques Total Skin Irradiation			
Physics - Special Techniques Stereotactic			
Linear Accelerator specialised Treatment			
Physics- LDR & HDR Intracavitary Brachytherapy			
Physics- Interstitial implants LDR & HDR			
Physics of PET-CT			
Physics-KV-CBCT and on Board Imaging			
Principles of Image Guided Radiotherapy			
Principle of Respiratory Gated Radiotherapy in Lung			
Physics of 4D CT Imaging and Simulation			
MRI/CT/PET in Target Delineation for TPS			
Physical Parametres for Quality Assurance in External Beam Radiotherapy			
3DCRT			
IMRT			
IGRT			
Brachtherapy			
Physics of Tomotherapy			
Physics of Cyberknife			
Physics of Gamma Knife			
Physics Proton and Ion Therapy			
ICRP and IAEA guidelines of Radiation safety in Radiotherapy for patients, Radiation worker and public			
Physical Requirements of designing a Radiotherapy facility			
Assistance in Dosimetric Procedures			

BMTR-352 (Practicals/ Labs) Pertaining to above Topics in Medical Physics L-0 Credits-8

BMTR –303**TECHNICAL ASPECTS****L-5****Credits-10**

Technical - Special Techniques Pediatrics
Technical - Total Body Irradiation
Treatment Delivery Techniques –Proton and Ion Therapy
Physics-Intra-operative Radiotherapy
Intensity Modulated Radiation Therapy
Shielding Practices for patients, Radiation worker and public
Technical- Special Techniques Total Skin Irradiation
Technical - Special Techniques Stereotactic
Technical LDR & HDR Intracavitary Brachytherapy
Technical Interstitial implants LDR & HDR
Simulation Techniques on PET-CT
Role of KV-CBCT and on Board Imaging in Patient set-up
Technical requirement of Image Guided Radiotherapy
Technical requirement of Respiratory Gated Radiotherapy in Lung
Techniques of 4D CT Imaging and Simulation
Virtual Simulation Techniques with MRI/CT/PET
Technical Parametres for Quality Assurance in External Beam Radiotherapy
Radiation safety Technical Aspects
3DCRT
IMRT
IGRT
Brachtherapy
Treatment Treatment Delivery Delivery Techniques -Tomotherapy
- Treatment Delivery Techniques Cyberknife
Treatment Delivery Techniques –Clinical-Gamma Knife
Technical Requirements of designing a Radiotherapy fascility
Assistance in Implimentation of new techniques.
Demonstrate an ability to anticipate the physical and psychological needs of the cancer patient and respond to them;
Demonstrate the ability to communicate with ease with other staff involved in the multidisciplinary treatment of the cancer patient
Increasingly participate as a team member in all aspects of the patient’s management in radiotherapy in preparation to work as a qualified radiation therapist

BMTR-353 (Practicals/ Labs) Pertaining to above Topics in Technical Aspects L-0 Credits-8

List of recommended Books:

1. **Textbook of Radiation therapy_ PHILIPS**
2. **The physics of Radiation therapy _ F.M. Khan**
3. **Radiation therapy Physics_ HENDEE**
4. **Fundamental Physics of Radiology_ MEREDITH**
5. **Principles and practice of radiation oncology _ PEREZ**
6. **Textbook of Radiotherapy- Radiation Phycsis, therapy and Oncology_ C.K. Bomford, I.H. Kunkler, B.W. Hancock**
7. **Technical Basis of Radiation therapy-Practical Clinical applications_ S.H. Levitt, J.A. Purdy, C.A Perez, and S. Vijayakumar**