SCHEME OF EXAMINATION

&

SYLLABI

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

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.

Eligibility for external /internal examiners	Radiotherapy Technologists (B.Sc/ Post B.Sc. DRT) /Radiotherapy Medical Physicists (M.Sc./Ph.D)/ Radiotherapy Oncologists (MD/DNB) with minimum 05 years experience in concerned specialty subject-wise as.
Proposed names for external Examiners	**1. Radiotherapy Technologists:** (a) Mr. Hardip Singh, Deptt. Of Radiotherapy, Post-Graduate Institute & Medical Education Research Centre (PGIMER), Chandigarh, Ph.09855336515 (b) Mr. A. Sridhar, Sr Radiotherapy Technologist, Nizam Institute Hyderabad ph.040-24540707,09849070541(c) Ms. Lakshmi Iyer, Chief RTT,Siliguri / Mr J.P.S.Manav, CTO, AIIMS, Delhi , Ph. 26594598,25383559 **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. **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, Post-Graduate Institute & Medical Education Research Centre (PGIMER), Chandigarh, Ph. 09914209391, 2601960.(c) Dr. A. K. Bhahadur, Head of Deptt. Of Radiotherapy, LNJP Hospital, Delhi. Ph.9968026111.
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. A. K. Anand, Coordinator, Deptt. Of Radiotherapy, RGCI & RC, Delhi, Ph. 9810398838. (b) Dr.N. R. Datta, Sr. consultant, Deptt. Of Radiotherapy, RGCI & RC, Delhi. Ph. 9212472304.

Guru Gobind Singh Indraprastha University, Delhi

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

FIRST YEAR

Course Code	Subject/Course Name	L	T	P	Total	Yearly Credits*
BMTR –101	Radiation Oncology	5				10
BMTR –102	Medical Physics	5				10
BMTR –103	Technical Aspects	5				10
	Practicals/ Viva-voice					
BMTR–151	Radiation Oncology	4				8
BMTR–152	Medical Physics	4				8
BMTR–153	Technical Aspects	4				8
	Total					**54**

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

Guru Gobind Singh Indraprastha University, Delhi

Annual scheme of 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	4				8
BMTR–252	Medical Physics	4				8
BMTR–253	Technical Aspects	4				8
	Total					**54**

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

Guru Gobind Singh Indraprastha University, Delhi

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

THIRD YEAR
(First Part of the Third Year)

INTERNSHIP (25 Credits)

1. Candidates seeking entry to the internship period must have passed all examinations in all subjects (i.e. He/She must have secured total credits of the Programme).
2. Duration: 6 months inclusive of posting in planning area and treatment delivery.
3. During the internship candidate shall have to work full time average 6 hours per day (each working day) for 6 Calendar months.
4. Each candidate is allowed maximum of 6 holidays during entire internship programme and in case of any exigencies during which the candidate remains absent for a period more than 6 days, he/she will have to work for the extra days during which the candidate has remained absent.
5. Assessment: The interns/candidate shall maintain the record of work, which will be verified and certified by the Head of the Department under whom he/she works. Apart from scrutiny of the record of work, assessment and evaluation of training shall be undertaken by an objective approach using situation tests in knowledge, skills and attitude during and the end of training. Based on the record of work the student will be examined by an internal examiner and an external examiner to be appointed by the university on the recommendation of the programme coordinator and the credits will be earned on the following basis.

- Internal Assessment based upon continuous teacher's assessment through out the internship submitted by the institution. (5 Credits)
- End examinations/ viva-voice by the university at the end of internship (20 Credits)

Guru Gobind Singh Indraprastha University, Delhi

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

THIRD YEAR
(Second Part of the Third Year)

Course Code	Subject/Course Name	L	T	P	Total	Half-Yearly Credits*
BMTR –301	Radiation Oncology	5				5
BMTR –302	Medical Physics	5				5
BMTR –303	Technical Aspects	5				5
	Practicals/ Viva-voice					
BMTR–351	Radiation Oncology	4				4
BMTR–352	Medical Physics	4				4
BMTR–353	Technical Aspects	4				4
	Total					**27**

Declaration of successful student – A student shall be declared successful on securing/earn all the credits i.e. 160 credits and the student is required to appear in all the examinations.

COURSE CONTENTS FOR FIRST YEAR ANNUAL EXAMINATION

for the first year of (BMTR) 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

BMTR –101 RADIATION ONCOLOGY (PAPER 1)

Cell cycle/structure/function
Tissue structure/types/ features and functions/ Tissue importance in Radiation Therapy
Organs and systems(Structure/function) – Skin/ Central Nervous System/ Autonomic Nervous System / Peripheral Nervous System /Lymphatic System/ Endocrine System/ Urinary/ Respiratory System/ Digestive System/ Cardiovascular System
Bone and Muscle
Surface Anatomy/ Cross-sectional Anatomy – Brain & Cranial NS
Surface Anatomy – Head & Neck/ Lower Limb (Pelvis)/ Chest/ Abdomen and Limbs
Organs and Systems – Skin/ Central Nervous System/ Autonomic Nervous System / Peripheral Nervous System /Lymphatic System/ Endocrine System (Diseases encountered in the region)
Multidisciplinary approach to cancer diagnosis and management and how the patient arrives in R.T.
Treatment Intent – Curative
Procedure in Radiotherapy department – Treatment Review
Treatment Intent – Palliative
Procedure in Radiotherapy department – Importance of Follow-up – Instructions to Patients

BMTR –102 MEDICAL PHYSICS (PAPER 2)

Atomic structure/ Importance in Radiation Therapy
Radioactivity
General information treatment planning system
Professional Aspects – Principles of Professional Practice/ Appearance and Hygiene/ Universal Precautions/– History and role of radiotherapy in cancer
Interaction of Radiation and Matter (Photoelectric/Pair production/ Compton), Importance of interaction of Radiation in matter in R.T
Information Technology Computer Skills
Measurements and units
Resourcing Information
Physical characteristic – Optical Systems/ Couches Systems/ Laser Systems
Beam characteristic – Photons/ Electrons/ Heavy particles
Radiation Production
Radiation Protection
Treatment modalities – Teletherapy – Superficial/ Orthovoltage/ Cobalt – Advantage and Disadvantage/ Principles and Functions/ Common Cancers treated
Nature and Production of Ionising Radiation

BMTR –103 TECTNICAL ASPECTS (PAPER 3)

Introduction and orientation to the RT Deptt.
Patient Positioning
General consideration of RTT
General information - Radiation Therapy Equipments
Human body with typical technical terminology
Immobilization procedures
General Care of the patient
Setup reproducibility
Basic Nursing Procedures for patient care and emergency situations
Mould room activities
Errors – Immobilization / Positioning Procedures
Positioning Aids – Benefits / Limitations Mould Room Activities
Care of Patient – Lifting and Moving Techniques for patient and staff safety
First Aid to include Cardio Pulmonary Resuscitation
Benefits / Limitations of Thermoplastic Mask
Hip and pelvis positioning and immobilization
Breast and Thorax Positioning
Limitations of Breast and Thorax Positioning
Procedure in Radiotherapy department – First Visit to include Room Preparation, Equipment and Documentation and assistance with procedures / examinations
Professional development skills
Treatment preparation
Treatment equipment
Treatment set-up and delivery
Patient care
Care of the Caner Patient – Nutrition

List of recommended Books:

1. Anatomy and Physiology (Ross and Wilson)
2. The physics of Radiation Therapy (Faiz M. Khan)
3. Linear Accelerators for Radiation Therapy (Peter C. Williams)
4. Radiotherapy: Principles to Practice (Griffith)/Basics of Radiotherapy, Technical Aspects of techniques

For internal assessment Practical/viva of each paper the student will be assessed keeping in view the following factors.

S. No.	Description
1.	Attendance
2.	Discipline and general Behaviour in the Deptt.
3.	Approach to patients
4.	Inquisitiveness regarding the subject
5.	Knowledge about evaluation of conditions
6.	Knowledge about various therapeutic modalities
7.	Knowledge about actual application of therapeutic skills
8.	Emergency Procedures
9.	Treatment Preparation
10.	Technique
11.	Care of The Patient
12.	Recognize signs of reactions to treatment
13.	Communicate effectively with patients, relatives and other professionals

List of the External/Internal Examiners

for the first year of (BMTR) 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

BMTR 101/ BMTR-151 (RADIATION ONCOLOGY):

(External)

- Prof. G. K. Rath(Ph. 26589821)/ Prof. Julka (Ph.9818825626) Deptt. Of Radiotherapy, IRCH, AIIMS, Delhi.
- Dr. S. C. Sharma, Head, Deptt. Of Radiotherapy, Post-Graduate Institute & Medical Education Research Centre (PGIMER), Chandigarh, Ph. 09914209391, 2601960.
- Dr. A. K. Bhahadur, Head of Deptt. Of Radiotherapy, LNJP Hospital, Delhi. Ph.9968026111.

(Internal)

- Dr. A. K. Anand, Coordinator, Deptt. Of Radiotherapy, RGCI & RC, Delhi, Ph. 9810398838.
- Dr. N. R. Datta, Sr. consultant, Deptt. Of Radiotherapy, RGCI & RC, Delhi. Ph. 9212472304.

BMTR 102/ BMTR-152 (MEDICAL PHYSICS):

(External)

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

(Internal)

- Prof. P. S. Negi, Chief Medical Physicist, Deptt. Of Radiotherapy, RGCI & RC, Delhi, Ph. 9811305925
- Mr. R. K. Munjal, Sr. Medical Physicist, Deptt. Of Radiotherapy, RGCI & RC, Delhi, Ph. 9810011314

BMTR 103/ BMTR-153 (TECTNICAL ASPECTS):

(External)

- Mr. Hardip Singh, Deptt. Of Radiotherapy, Post-Graduate Institute & Medical Education Research Centre (PGIMER), Chandigarh, Ph.09855336515
- Mr. A. Sridhar, Sr Radiotherapy Technologist, Nizam Institute, Hyderabad, Ph. 04024540707, 09849070541
- Mr J.P.S.Manav, CTO, IRCH, AIIMS, Delhi , Ph. 26594598,25383559, 9868397777/ Lakshmi Iyer, Chief RTT, Siliguri,

(Internal)

- Mr. G. S. Wadhawan, Chief RTT, Deptt of RT, RGCI & RC, Delhi, Ph. 9350976211, 25497773.
- Mr. Pradeep Sharma, Deptt of RT, RGCI & RC, Delhi, Ph 9811081286.

LEVEL 1

This is considered to be the basic level at which a graduate will have gained sufficient theoretical knowledge to understand the scientific concepts underpinning radiotherapy and have spent sufficient time in a clinical setting to achieve the level of clinical competence to work accurately and safely. The level 1 programme will be of two years duration and will be divided equally between the academic and clinical components. The programme has been designed primarily to cater for graduates who will subsequently work in a radiotherapy department where the main modality used for treatment is a Cobalt-60 unit and/or a single energy linac with simulator and mould room support. It is anticipated that Brachytherapy will be in most departments and must
therefore be included at this level.

The focus of the academic content is to give a basic understanding of:

- The structure and function of the body
- Cross sectional, surface and radiological anatomy as it relates to radiotherapy
- Radiation and Equipment physics
- Basic radiobiology / molecular oncology
- Professional role
- Basic patient care
- Site specific oncology and epidemiology
- The practice of radiotherapy to include diagnosis, general management,

simulation, planning, treatment, patient care and quality assurance. Details of the syllabus content are given on the following pages. The emphasis is on delivery of treatment through simple techniques and where personnel with additional training carry out the more complex tasks. The responsibility assumed by the graduates of the level 1 course would relate directly to treatment delivery.

LEVEL 2

The content of the level 2 course includes all of the above but is extended to include:

- Linear accelerator (multi-energy)
- Radionuclide therapy
- More complex radiobiology
- Information technology.

The level 2 programme will be of a longer duration depending on the centre requirements and the level of additional responsibility which is expected of the graduate. Additional emphasis may be placed on the academic content. A deeper level of knowledge and understanding will be facilitated with the aim of moving towards development of a reflective practitioner. The programme has been designed primarily to cater for graduates who will subsequently work in a radiotherapy department where the main modality used for treatment are multi-energy Linear Accelerators and Brachytherapy with simulator and mould room support. The graduate will be expected to become involved in specified quality assurance procedures and information technology.

Details of the syllabus content are given on the following pages. The emphasis is on delivery of treatment through more complex tasks. The responsibility assumed by the graduates of the level 2 course would relate to treatment preparation and delivery, development of quality assurance procedures and protocols, data input and supervision.

LEVEL 3

The content of the level 3 course includes all of the content of level 2 but is further extended to include:

- Physics of CT simulator and CT scanner
- Heavy particle accelerators
- Special techniques.

The level 3 programme will be of three to four years duration depending on the centre requirements and the level of additional responsibility which is expected of the graduate. Additional emphasis may be placed on the academic content. A deeper level of knowledge and understanding will be facilitated moving towards a reflective practitioner. Some research skills should be incorporated. The programme has been designed primarily to cater for graduates who will subsequently work in a radiotherapy department where the main modality used for treatment are Linear Accelerators, Heavy particle accelerators and Brachytherapy
with simulator and mould room support. Graduates will be expected to become involved in specified quality assurance procedures, treatment planning, some management and information technology.

Details of the syllabus content are given on the following pages. The emphasis is on delivery of treatment through special techniques and more complex tasks and the support and encouragement of more junior staff. The responsibility assumed by the graduates of the level 3 course would relate to treatment preparation and delivery, development of quality assurance procedures and protocols, treatment planning, data input and management.