State Medical Faculty of West Bengal

INFORMATION BROCHURE

FOR

DIPLOMA IN RADIOTHERAPEUTIC TECHNIQUE 2015

State Medical Faculty of West Bengal
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Price : Rs. 500/-

-: Contents :-

INTRODUCTION:

State Medical Faculty of West Bengal was established as a statutory body by the Government of West Bengal in the Year 1914. The Faculty was entrusted with conduction of Licentiate Courses in Medical Sciences (L.M.F.). Subsequently the Faculty started conducting examination of Diploma in Pharmacy.

With the rapid growth of medical sciences it was felt necessary to train the paramedical personnel of the State. With this object in view, the State Medical Faculty started conduction of different diploma and certificate courses with the approval of the Government of West Bengal. It is essential to have a uniform standard while conducting the courses not only in Government Institutions but also in the Private Organizations and as such, the Faculty has already stipulated minimum requirement for starting conduction of different Para Medical Courses.

As per provision of Clinical Establishment Act of West Bengal any Diagnostic Laboratory possessing Valid Licence under the said Act can start the Training Course with the permission of appropriate authority provided the diagnostic laboratory fulfills the minimum requirements as stipulated by the State Medical Faculty of West Bengal.

Any Institution desirous of starting Para Medical Courses with the affiliation of State Medical Faculty of West Bengal has to fulfill the stipulated requirements and to follow the syllabus as prescribed by the Faculty. The State Medical Faculty also acts as an Examining Authority for such courses.

Conduction of a Para Medical Course in Affiliated Institutions is being monitored by the Faculty so that uniformity is maintained while conducting the same course in different institutions.

Presently, the State Medical Faculty of West Bengal is considering grant of recognition to Institutions for conducting the following courses:

Sl.	Name of the Courses
1.	Diploma in Medical Laboratory Technology
2.	Diploma in Radiography
3.	Diploma in Radiotherapeutic Technique
4.	Diploma in Optometry with Ophthalmic Technique
5.	Diploma in Perfusion Technology
6.	Diploma in Neuro Electro Physiology
7.	Diploma in Cath-Lab-Technician
8.	Diploma in Dialysis Technician
9.	Diploma in Critical Care Technology
10.	Diploma in Operation Theatre Technology

COMMON PROCEDURE FOR OBTAINING AFFILIATION FOR ANY DIPLOMA COURSE RUN BY THE FACULTY

PART – I

The intending institute which wants to start a particular course is required to collect the booklet **"Information Brochure"** for that particular Course by paying the requisite fee of **Rs.500/-.**

The Institute should create the facilities required for starting the course as per norms of the course.

The Institute after fulfilling the norms for the course is required to apply in the prescribed form annexed in **Part-II** alongwith the requisite Inspection Fee of **Rs. 5000/- for each course**. Inspection fee is not refundable.

The Faculty will send Inspection Team for physical verification of the facilities to start the course.

On the basis of report received from the Inspection Team, the Faculty may ask the Institute for compliance or modification, as the case may be, or accord permission to start the course.

Caution Money Deposit:

i) Private Institutions to be recognized are required to deposit with State Medical Faculty of West Bengal Caution Money of Rs.50,000/- per course.

ii) Caution Money will be treated as one-time payment till students of private institutions continue their studies.

iii) Caution Money deposited by Private Institutions will not accrue any interest payable to the concerned depositors.

iv) Caution Money will be refunded without any interest at the time when the institute closes their course of studies with prior intimation to the Faculty.

v) In the event of de-recognition of the institution by the Faculty, Caution Money deposited would be forfeited.

vi) Caution Money deposit is applicable in case of new Institute / existing Institute to conduct new course(s).

Conduction of Paramedical Courses:

Paramedical Courses should exclusively be conducted at the institute premises under the control of the Affiliated Institute, save and except Blood Bank Training for DMLT [Tech] Course, which could be done in any Government Hospital or any Private Hospital with their consent. Consent letter to be attached in Application Form for recognition.

In case of rented building of the institute, three years' rental agreement with the owner of the premises be submitted with the Application Form for grant of recognition/extension of recognition.

Fire Safety Measures:

Fire Safety Measures should be ensured. Provision for alternative exit be arranged.

In case of non-availability of Fire Safety Measures, the same may be informed and also their plan of actions for introduction/improvement of Fire Safety Measures.

Duration of Course:

Duration of Para Medical Courses is 2 years followed by 6 months compulsory Post Examination Practical Training of minimum **600 hours in 6 months** after passing of Final Examination of Para Medical Courses.

Eligibility:

Any person seeking admission into the course of study in Para Medical Courses must fulfill the following conditions:

a) That he/she has passed the Higher Secondary or an equivalent Examination of any Indian University or duly constituted Board, with pass mark in Physics, Chemistry and Biology.

b) That he/she has attained the age of 17 years on 1st September of the respective year of his/her admission into the course in an approved institution.

c) That he/she has furnished a certificate of physical fitness from a registered medical practitioner and two references from persons other than relatives testifying to satisfactory general character.

Selection:

Selection will be made on the basis of pass marks obtained in Physics, Chemistry and Biology in the Qualifying Examination [i.e. Higher Secondary and/or equivalent Examination]. The Faculty will, however, reserve the right to amend/alter/modify the selection procedure at its sole discretion.

Fees:

The admission and tuition fees will be charged by the individual institution with the approval of the Faculty. The Tuition Fees will be Rs.15,000/- per course per annum in respect of all Affiliated Institutions.

The Registration Fees of Rs.500/- per student per course and Examination Fees of Rs.400/- per student per examination will be charged by the State Medical Faculty of West Bengal separately in respect of students admitted in Para Medical Courses in Affiliated Institutions. Students of **ESI Hospitals**, **Kolkata Port Trust Centenary Hospital, Chittaranjan National Cancer Institute are required to pay Registration Fees and Examination Fees.**

Academic Session:

The Session will commence ordinarily in September of every year. The exact date is to be announced at the time of admission.

Inspection, Counseling, etc.:

Inspection is to be carried out to all Institutions including existing Institutions.

All affiliated Institutions have to join Counseling of the Faculty on scheduled date, time and venue. Seed money for joining the Counseling is Rs. 4000/- for each course. However, if they do not get students in Joint Counseling then they will be allowed for second counseling at their end.

Prospectus and Application Forms, etc. are to be issued by the Affiliated Institutions by their own arrangements for the second counseling, if any. Subject to the approval of the Faculty.

Students of the Non-Government Institutions, selected in the Joint Counseling, have to deposit Rs.15,000/- preferably by Demand Draft in favour of State Medical Faculty of West Bengal at the time of admission in the Counseling Hall. Faculty will remit this amount to the concerned Institution in due course.

Affiliated Institution has to pay Rs.500/- per student per month for six months as stipend to the students during Internship (Clinical) and/or Post-Examination Practical Training.

Affiliated Institution has to pay **Recognition Fee of Rs. 10,000/-** per course per annum.

Affiliated Institutions have also to pay **Rs.4000/-** as Examination Fee per examination per course.

Institutions should have been attached with Multi Specialty Hospital of its own; in case of DMLT [Tech] Course, Diagnostic Centre with large laboratory and in case of DRD [Tech] Course, well equipped Radio Diagnostic Centre, should have been attached.

New Institution (other than existing one) has to submit "No Objection Certificate" for conduction of course from the State Government.

Internship for all the passed out students of Diploma Courses is compulsory and that same should be completed just after passing the Final Examinations.

No Objection Certificate

I. In case of new Institute proposed for affliation to conduct different Para Medial course(s) is required to submit Noc from State Govt

II. Similarly existing Institutes intend to conduct new Para Medical course(s) is also required to submit Noc from State Govt.

PART II

Application for obtaining fresh affiliation or extension of affiliation of

State Medical Faculty of West Bengal for conducting _____
(Name of the Course(s))

1. Name and address of the applicant:

   Name _____

   Address with Pin Code _____

   _____

   Phone No. _____Fax No. _____ E-mail _____

2. Whether any other training course(s) are running by the Institute: Yes/No
   If yes, please indicate the name of other course(s): _____

3. Status of the Institution: _____

4. Details of the Institution: _____

   A. If it is Society/Trust _____
   The Society Registration Act No. or the Trust No. under which the Society/Trust was formed:

   (i) Registration No. ----------
   (ii) Date of Registration ----------
   (iii) Place of Registration ----------

   (Attached copy of Registration of Society/Trust alongwith detail of constitution/Memorandum of Association of the Society/Trust)

   (iv) Details of member/Trustees and their experience in running Para Medical Courses alongwith present occupation and academic background:

Name of the Member/Trustees	Designation in Society	Present Occupation	Academic Background	Experience

B. If other, specify:

i) Name and complete postal address of the proposed Institution.

ii) Name and address and Telephone No. of the authorized person for communication.

iii) Furnish the details of Resource and funding agencies.

iv) Number of students proposed to be admitted.

v) Year of starting/proposed date of starting the course.

vi) Specify the nature of attached hospital/laboratories with full description thereto and status of the same.

vii) Registration No. of the establishment for Practical Training.

5. Details of Fire Safety Measures are as under :

(Attach separate sheet)

6. Alternative exit arranged or not.

7. Rented Building, Yes/No.

8. Name of the authorized person to sign Registration forms, Admit Cards and other documents.

Note:-

a) Copy of current license under Clinical Establishment Act of West Bengal be attached.

b) In case of new Institution, copy of permission letter from the Government of West Bengal for conducting Para Medical Course be attached.

c) In case of rented building of the institute, three years' rental agreement with the owner of the premises be submitted with the Application Form for grant of recognition/extension of recognition.

d) Copies of **Blood Bank Facility (For DMLT [Tech] Course only)** provided by Govt. Hospital / Private Blood Bank if any**.**

e) Copies of updated **Registration Certificate** of WBMC for Medical Faculty are attached.

f) Copy of License under clinical Establishment Act is attached

Name :

Signature of the Head of Institute :

Date with stamp :

Availability of Existing Infrastructural Facilities:

1. Whether the Institution is/will be established in own building or in a rented building –
(Documentary evidence is required in case of owned building and in case of rented building the rent receipt and Agreement with the owner is required.)

Accommodation:-

Administrative Area:

Sl. No.	Particulars	Size of the room	Remarks of Inspectors
	Head of Department Room		
	Staff Room:		
	a) Room for Teaching Staff		
	b) Room for Technicians		
	c) Office Room		
	d) Store Room		

2. Academic Area:

Sl. No.	Particulars	Size of the room	Remarks of Inspectors
	Class Room		
	Library		
	Students' Common Room		

3. Staff:

Non-Teaching staff –

(a) Regular :

Sl.No.	Designation	Name & Address	Qualification & experience	Date of Appointment	Inspector's Remarks
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Non-Teaching staff –

(b) Part Time :

Sl.No.	Designation	Name & Address	Qualification & experience	Date of Appointment	Inspector's Remarks
1					
2					
3					
4					
5					
6					
7					

Whether portable water is supplied :
Whether Gas is provided :
Whether electricity is provided :
Whether waste disposal management system is followed :

Whether the following records are maintained :

1. Attendance for staff
2. Salary Payment Sheets
3. Cash Book
4. Store material receive and supply (Stock Ledgers)
5. Students Attendance
6. Student Register (Admission)
7. Dead Stock Register
8. Patients' Attendance Register/Daily Treatment Register in Clinic.

4. The Training Area should be provided with the following:

Sl. No.	Particulars	Size of the room	No. available	Remarks of Inspectors
1	Teletherapy Room			
2	Brachytherapy Room			
3	LINAC Room (Optional)			
4	Simulator Room (Optional)			
5	Treatment Planning System Room			
6	Gamma-Zone Monitor Room			
7	Protection Level Instruments Room			
8.	Dosimeters Room			
9	Waiting Room for patients/any other treatment machines, if available			

5. Teaching Staff:

(A) Regular Faculty **:**

Sl.No.	Designation	Name & Address	Qualification & experience	Date of Appointment	Regn No*	Inspector's Remarks
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						

* **In case of Doctor**

(B) Guest Faculty **:**

Sl.No.	Designation	Name & Address	Qualification & experience	Date of Appointment	Regn No*	Inspector's Remarks
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						

* **In case of Doctor**

6. List of equipment:

Sl.No.	Name of Equipment	No. Required	Inspector's Remarks
1	Teletherapy		
2	Brachytherapy		
3	LINAC (Optional)		
4	Simulator (Optional)		
5	Treatment Planning System		
6	Gamma-Zone Monitor		
7	Protection Level Instruments		
8	Dosimeters		

Name :

Signature of the Head of Institute :

Date with stamp :

PART III

Standard requirements of infrastructural facilities to start Para Medical Course : DRT [Tech]

Accommodation:

The Institution must provide adequate ventilation, lighting and maintain hygienic condition. The Institute should provide with adequate number of toilets separately for teaching staff and for male and female students.

1. Administrative Area should consist of the following:

Sl. No.	Particulars	Size of the room	Remarks of Inspectors
	Head of Department Room	150 Sq. ft.	
	Staff Room:		
	a) Room for Teaching Staff	200 Sq. ft.	
	b) Room for Technicians	200 Sq. ft.	
	c) Office Room	150 Sq. ft.	
	d) Store Room	150 Sq. ft.	

2. Academic Area should provide with the following:

Sl. No.	Particulars	Size of the room	Remarks of Inspectors
	Class Room	300 Sq. ft.	
	Library	500 Sq. ft.	
	Students' Common Room	300 Sq. ft.	

3. The Training Area should be provided with the following:

Sl. No.	Particulars	Size of the room	Remarks of Inspectors
1	Teletherapy Room	As per BARC Specification	
2	Brachytherapy Room	As per BARC Specification	
3	Linear Accelerator	As per BARC Specification	
4	Room for preparing immobilization	50 Sq. M. area	
5	Treatment Planning System Room	50 Sq. M. area	
6	Waiting Room for patients/any other treatment machines, if available	1 (4' x 8')	

4. Staff -

Non-Teaching Staff:

Sl.No.	Designation	Qualification	No. Required
1	Office Superintendent	Graduate in any discipline with experience	One
2	Office Assistant	Qualification same as that of 1 with experience in Computer operation	One
3	Store Keeper	Qualification same as that of 1 with experience in Store Keeping	One
4	Library Assistant	Graduate in Science	One
5	Laboratory Attendant	Nurse (Female)	Two
6	Office Attendant	10^{th} Standard	Two
7	Cleaner/Safaiwala		Two

5. Teaching Staff:

The following Teaching Staff are required:

Sl.No.	Designation	Qualification	No. Required
1	Lecturer or above in Radiotherapy or Radiotherapist with post MD with 5 years' or more experience.	MBBS, M.D. (Radiotherapy)	Two
2	RMO/Registrar in Radiotherapy or Radiotherapist	MBBS, M.D. (Radiotherapy)	Two
3	Radiation Physicist	M.Sc., DRP (With RSO approval of BARC)	One
4	Technologist	As per BARC approval/State Government approved	Two for each machine

6. List of Equipment:

Sl.No.	Name of Equipment	No. Required	Inspector's Remarks
1	Teletherapy	One	
2	Brachytherapy	One	
3	LINAC (Optional)	Optional – One	
4	Simulator (Optional)	Optional – One	
5	Treatment Planning System	One	
6	Gamma-Zone Monitor	One for each Machine	
7	Protection Level Instruments	As per BARC rules	
8	Dosimeters	As per BARC rules	

RULES, REGULATIONS AND SYLLABUS

PART – IV

Duration of the DRT [Tech] Course:-

(a) The first one year of the course shall be devoted to the training in the subjects of the Preliminary Courses.

(b) On completion of the Preliminary Course, the Preliminary Examination will be held.

(c) On passing the Preliminary Examination, the students shall follow for one year the curriculum of the Final Course. On completion of the course, the Final Examination will be held.

(d) After successfully passing the Final Examination, the students shall undergo Compulsory Practical Training of not less than 600 hours in not less than 6 months in a recognized hospital.

1. The Preliminary and Final Course shall include the respective subjects as given in the Tables as well as the minimum number of hours devoted to each subject, lectures, practical and demonstration, subject to addition and alteration at the discretion of the Governing Body of the State Medical Faculty.

   The detailed syllabus of each subject is given in **Appendix I**.

Preliminary Course

Subject to be taught	No. of Theoretical Classes	No. of Demonstrations and Practical classes
1. Paper I : Radiotherapy Physics, Part I	80	10
2. Paper II : Anatomy, Physiology & Principles of Pathology in relation of Radiotherapy	70	

Final Course

Subject to be taught	No. of Theoretical Classes	No. of Demonstrations and Practical classes
1. Paper III : Radiotherapy Physics, Part II	75	10
2. Paper IV : Radiotherapeutic Practices & Principles of Treatment	75	10

Apart from Theoretical and Practical classes the students will have to be engaged in several Radiotherapy treatment units for hands on experience in between Theoretical and Practical classes.

Examination for the Diploma Course:

1. No person other than a student borne on the roll of an approved training institution and studying therein at the time shall be eligible for appearing at the examination held by the Governing Body of the Faculty.

2. Every student after admission into the course of study in an approved Institution shall apply in the prescribed form **Appendix II** through the Principal/Director of the Institution with a fee of Rs.500/- to have his/her name registered in the Students' Register maintained by the Governing Body. A registration certificate bearing serial number allotted to the student will be sent to him/her through the Head of the Institution.

3. (a) There will be two examinations – (a) Preliminary and (b) Final. The examinations shall be held twice a year at such time and place as may be determined by the Governing Body.

   (b) **Internal Assessment** marks for all Para Medical Courses have been introduced from the academic session 2013, **20% of allotted marks in Theory and 10% of allotted marks in Oral and Practical in each paper of Diploma courses** would be assigned for internal assessment marks. **Pass marks in Internal assessment is 50% in each paper rounded off to the nearest five**. A candidate should not be allowed to sit for examination without pass marks in Internal Assessment.

4. **Preliminary Examination** : Only such students, who produce certificate from the Head of the approved Institutions in proof of their having regularly undergone the Preliminary Course of study by attending not less than 75% of classes, both in theoretical and practical in each subject, shall be eligible for appearing at the Preliminary Examination.

   The Examination will be conducted according to the following table:

Subject of Examination	Total marks Theory+IA	Total marks Oral/Practical+IA
1. Paper I : Radiotherapy Physics, Part I	80+20	45+5
2. Paper II: Anatomy, Physiology & Principles of Pathology in relation to Radiotherapy	80+20	45+5

5. All written examinations shall be of three hours' duration and the number of papers in each subject shall be as mentioned above.

6. Every candidate for the Preliminary Examination shall apply to the Secretary, State Medical Faculty of West Bengal through the Head of the Institution where he/she is undergoing his/her study, in the prescribed form together with the necessary certificates **Appendix III**.

7. No application will be entertained unless it reaches the Secretary atleast 21 days before the date notified for commencement of the examination. An application received later but not later than 14 days before the commencement of examination, may on sufficient grounds being shown and accepted, be entertained provided that a late fee of Rs.20/- is paid for the delay.

8. **Final Examination:** Only such students, who produce certificate from the Head of the Institution concerned in proof of their having regularly undergone after successfully passing the Preliminary Examination by attending not less than 75% of classes – lectures, practical and clinical of each subject separately and has worked for atleast 350 days in the Radiography Department of a recognized Hospital shall be eligible for appearing at the examination as given in the following table:

Subject of Examination	Total marks Theory+IA	Total marks Oral/Practical+IA
1. Paper III : Radiotherapy Physics, Part II	80+20	45+5
2. Paper IV: Radiotherapeutic Practices & Principles of Treatment	80+20	45+5

NB: All written examination shall be of 3 hours' duration and the number of papers in each subject shall be as shown against each.

9. Every candidate for the Final Examination shall apply to the Secretary, State Medical Faculty of West Bengal through the Head of the Institution where he/she had been undergoing his/her course of studies, together with the necessary certificates from the Head of the Institution **Appendix IV**.

10. The fee payable with the application shall be such as may be prescribed by the Governing Body from time to time. The fee is not refundable on any account.

11. No such application will be entertained unless it reaches the Secretary atleast 21 days before the date notified for commencement of the examination. An application received later but not later than 14 days before the commencement of examination, may on sufficient grounds being shown and accepted, be entertained provided that a late fee of Rs.20/- is paid for the delay.

12. A candidate declared to have passed the above examinations – both Preliminary and Final – if he/she secures 50% of the total marks in each subject – Theoretical + Oral – 50% and Practical – 50%. A candidate securing 75% marks or above in any subject or subjects, shall be declared to have obtained "Distinction" in that subject or subjects, provided he/she passes in all the subjects of the examination at the same time and at his/her first appearance at the examination.

13. A candidate, who appears at the Preliminary or Final Examination for the course but fails to pass in all the subjects or in one or more subjects, may be admitted to one or more subsequent examinations in subject or subjects in which he/she failed provided, however, that he/she passes in all the subjects in three subsequent examinations within a period of two years computed from the date of the examination in which he/she appeared for the first time. If he/she does not pass the entire examination within a period of two years, as mentioned above, he/she shall have to take the whole examination in all the subjects at the time when he/she appears next.

14. A failed candidate shall have to undergo a further course of training and produce a certificate from the Head of the Institution stating that he/she has, since the date of the last examination and within the period of six months proceeding his/her re-examination, attended to the satisfaction of the Head of the Institution further course of study in the subject or subjects in which he/she failed **Appendix V**.

15. The general rules and regulations regarding conduct of examinations of the State Medical Faculty of West Bengal shall apply with necessary modifications for the conduct of Diploma in Radiotherapeutic Technology Course examinations. Detailed rules and regulations may be framed by the Governing Body from time to time.

AWARD OF DIPLOMA IN RADIOTHERAPEUTIC TECHNOLOGY COURSE : DRT [TECH]

1. A candidate who passes successfully the Final Examination will be granted a Diploma in Radiotherapeutic Technology – DRT [Tech].

2. Every such application shall be accompanied by a certificate from the Head of the recognized Hospital, in the form given in **Appendix VI**, with all the particular mentioned therein and the Head of the Institution shall forward the same to the Secretary, in the form given in **Appendix VII**, stating whether he/she considers him/her eligible to receive the Diploma in Radiotherapeutic Technology – DRT [Tech]..

3. The Governing Body may then, if satisfied that all requirements of these regulations have been fulfilled, issue the Diploma, which shall be in the form given in **Appendix VIII.**

PART IV

Appendix I

DRT (Tech)

REVISED (2012) SYLLABUS OF THE COURSE

PRELIMINARY (1ST YEAR)

PAPER - I

Radiotherapy Physics – Part – I

Introduction : The subject should be taught at an elementary level. The treatment should be descriptive and qualitative rather than quantitative. Principles and practical applications should be emphasized throughout.

CHAPTER – I : REVISION OF MATHEMATICS

1. Calculations of percentages. Proportion, Surds, Indices, Logarithm. Inverse square law. Geometry of triangles. Properties of similar triangles. Graphical representation of exponential and inverse exponential functions. Linear and semilog graphs.

CHAPTER – II : ELECTROSTATICS, MAGNETISM & CURRENT ELECTRICITY

1. Coulomb's Law, Electric Field and potential, Potential energy, Capacitance, Ohm's law, Heating effect of current, Biot-Severt law, Definition of Tesla and Gauss, Magnetic field due to circular coil and long solenoid, the left hand rule. Elementary Principles of – magnetization of materials by electric current, electromagnets. Force on conductor in magnetic field (Lorentz force), Magnetic flux. Electromagnetic induction, Mutual and self inductance, the right hand rule. Transformer, Eddy current. Instruments – ammeter, voltmeter. Units used in Electrostatics, Magnetism and current Electricity. RMS and average current and voltage in AC. Variation of voltage and current in AC circuit consisting only resistor, only inductor, only capacitor. Power factor of the AC circuit.

CHAPTER – III : PHYSICS OF RADIATION

1. Definition of radiation and its types. Electromagnetic [EM] radiation. Radiation as a wave motion. Wave length, Frequency, Amplitude, Velocity and their relations. Concept of quanta, Energy of radiation, Electromagnetic spectrum, Common properties of radiation.

2. Sources of radiation – Natural and Artificial.

3. Radioactivity – Atomic and Nuclear structures, Rutherford, Bohr model, Energy level of Hydrogen atom. Atomic Number, Mass Number, Atomic Mass, Binding energy, Energy level, Nuclear binding energy, NP ratio, Definition of radioactivity, Natural radioactivity, Radioactive decay, Half life, decay constant, Mean line and their relation, Specific activity, Radiation from radioactive elements, Alpha and Beta particles, Gamma radiation and their properties. Radioactive series. Properties of Radium and its daughter products. Radioactive equilibrium. Units of activity. The Curie and Bequarel, Specific Gamma Ray constant.

DRT (Tech)
REVISED (2012) SYLLABUS OF THE COURSE

FISSION, FUSION, ARTIFICIAL RADIOACTIVITY.

4. X-ray -Conduction of electricity through gases, effect of varying pressure, cathode rays, X-rays. Principles of production of X-rays, Intensity, continuous and characteristic spectrum. Basic Circuit of X-ray tube. Construction of modern X-ray tubes, Filament, Anode, Cathode, Methods of cooling anode, Inherent filtration, added filtration and their effect on quality of spectrum. Rectification. Basic principles of CT & MRI.

CHAPTER – IV : INTERACTION

1. Interaction of X and Gamma rays with matter – Attenuation of a beam of X or Gamma rays, Attenuation and absorption coefficients, Modes of interaction, Coherent scattering, Photoelectric effect, Compton effect, Pair production, Photo disintegration. Basic principles of Interaction of charged particle and neutrons with matter, Bragg peak.

CHAPTER – V : MEASUREMENT OF X AND GAMMA RADIATION

1. The ionizing process. Ionization of air as a basis for a practical system of dosimetry. Exposure, the ROENTGEN and its practical realization. Photon and energy flux density and fluence. Absorbed dose and its units – rad, Gy. Principles of measurement – ionization, different regions of operation of gas filled detectors. Ionization & scintillation detectors. Photographic, calorimetric, thermoluminescence dosimetry principles. Measuring instruments, Dosimeters. Quality of radiation. Half value layer and its measurement.

CHAPTER – VI : ABSORPTION OF X AND GAMMA RAYS

1. Attenuation of beam of X-ray or Gamma rays. Absorption of X and Gamma rays. Linear attenuation coefficient , Mass Electronic and Atomic absorption coefficients. Energy transfer and absorption coefficients. Energy absorption in biological material, the effect of bone on depth dose curves, energy absorption in cavities within bone.

DRT (Tech)
REVISED (2012) SYLLABUS OF THE COURSE

PAPER -II

Anatomy, Physiology, Pathology and Radiobiology in relation to Radiotherapy

Introduction: The standard aimed is that a more extensive and detailed knowledge is required of surface and regional anatomy, since during the treatment knowledge of the size and position of organs is of paramount importance. Emphasis should be made in the appropriate context on topographical relation of the organs of the body.

CHAPTER– I ANATOMY & PHYSIOLOGY

1. Structure and function of cell; Cell division; Tissue: definition and classification[Gross outline]

2. General anatomical terms and topography of the body – Planes, Regions, Positions, Movements.

3. Skeleton & Joints – Long bones, Vertebrae, Pelvic and shoulder girdles, Hands and Feet, Skull, Face and Teeth; Parts of a classical Long Bone; Out line of different Joints and types of movements.

4. Muscles: classification, structure and function [Gross outline]

5. Brain & Spinal cord with its Coverings and Cavities including Cerebrospinal Fluids and Pituitary gland [Macroscopic anatomy and surface anatomy only].

6. Head and Neck: Oral Cavity & Lips, Pharynx, Larynx, Nasal Cavity and Para nasal sinuses, Salivary glands, Ear; Orbit & its content; Thyroid gland and Nodal areas [Macroscopic anatomy only].

7. Thorax: Structure of thoracic cage, esophagus, trachea, lungs & Pleura, the mediastinum including Thymus, Heart and great vessels and diaphragm [Macroscopic and Surface anatomy].

8. Abdomen: Structure of abdomen & Peritoneum, Retro peritoneal structures [including Kidney], Stomach, Small intestine, Colon, Liver, Pancreas, Spleen. [Macroscopic and Surface anatomy].

9. Pelvis and Perineum: Structure of Pelvis, Rectum & Anus, bladder, prostate, Female genital tract, Male genital tract and inguinal-femoral region [Macroscopic and Surface anatomy].,

10. Lymphatic system and reticulo-endothelial system [Gross outline only] – Position and Function of Lymph nodal regions [including neck, axilla, mediastinum, paraaortic, inguinal], extranodal lymphatic tissues [Waldeyer's ring, Spleen and liver, MALT, bone marrow, Thymus

DRT (Tech)
REVISED (2012) SYLLABUS OF THE COURSE

CHAPTER – II: PATHOLOGY and RADIOBIOLOGY

Introduction: Teaching of Pathology and the clinical aspect of disease should be at the elementary level with the intention of providing a background to the students' understanding of the work being carried out in the department.

1. Elementary pathology – Degeneration and process of cell death, repair of wounds, inflammation, infection, immunity [Brief outline only].

2. Tumors – Definitions, causes, classification, spread, general effects.

3. Effects of radiation on the body – physical, chemical and biological effects of radiation [including radiation induced cell death]; Principles of Radiotherapy [Differential effects on tumors and tissues]- Therapeutic gain; four R's of Radiobiology and fractionation; Acute and late effects of different organs of the body including skin and mucous membrane; Effects of Whole body acute and chronic radiation exposure; Acute radiation syndrome; Lethal dose.

4. Factors modifying radiation effect : Patient related – age, state of health, tumor type, site, blood supply, oxygenation, organ at risk, previous treatment; Treatment related - Type of radiation, Dose, volume, total time and fractionation of treatment. LET, RBE and OER; Response to Radiation: Radiosensitivity and Radiocurability

DRT (Tech)
REVISED (2012) SYLLABUS OF THE COURSE AS PER STIPULATION PRESCRIBED BY AERB

FINAL YEAR (2ND YEAR)

PAPER – III

RADIOTHERAPY PHYSICS , PART – II

Radiation Quantities and Units:

Kerma, Exposure, Absorbed Dose, Equivalent Dose, Weighting Factors, Effective Dose, Natural Background Radiation, Occupational Exposure Limits, Dose limits to Public.

Radiation Measuring Instruments:

Ionization Chamber, G.M. Counters, Scintillation Detectors, TL Dosimeters and their use in personnel monitoring badges, Pocket Dosimter. Advantages and disadvantages of various detectors.

Radiotherapy Treatment Techniques:

Historical development of Radiotherapy, physical components of Tele-cobalt unit, Linear Accelerator unit, Remote after Loading Brachytherapy unit, Gamma Knife unit, Medical Cyclotron, Simulator. Various types of sources used in Radiotherapy along with their properties.

Physical parameters of dosimetry such as Percentage Depth Dose, Tissue Air Ratio, Tissue Maximum Ratio, Physics of bolus and Phantom materials, Compensators, Wedges, breast device, Shielding Blocks, Patient immobilization devices, Port film, processing and development, Mould room procedures, different types of Brachytherapy, sources used in Brachytherapy, special techniques in Radiotherapy such as SRS, SRT, IMRT, IGRT and Tomotherapy.

Planning Procedure:

Manual contour diagram for isodose plan, tumor localization, field arrangement, use of isodose curves on body contours, estimation of resultant dose on tumor, tissue inhomoginity correction, correction of body curvature, irregular shaped fields, large and very large fields, field junction and field matching.

Quality Assurance in Radiotherapy:

Tools used for QA tests such as Front Pointer, Back Pointer, Laser Alignment etc. Optical and radiation field congruence, Beam shaping locks, beam shaping jaws, Delineator/Diaphragm movements, Isocentric alignment, patient support system, Beam off and on mechanisms, Technician's role in QA tests on Telecobalt/Linear Accelerator/Brachytherapy/Simulator/CT Simulator machines.

Radiation Emergency Preparedness:

Safety and security of radiation sources, case histories of emergency situations and preparedness, equipments and tools including role of Gamma Zone Monitor, Regulatory requirements and prevention of emergency, preventive maintenance and safety culture, role of technicians in handling emergencies.

Radiation Hazard evaluation and control:

Philosophy of radiation protection, Effect of time, Distance and Shielding, calculation of workload, calculation of weekly dose to the radiation worker and general public, good work practices in Radiotherapy, Planning consideration for radiation equipments installation including workload, use factors, effect of different shielding material.

Biological effects of radiation:

The cell, effect of ionization radiation on cell, chromosomal aberration and its application for the biological dosimetry, Somatic effects and hereditary effects, stochastic and deterministic effects, Acute exposure and chronic exposure, $LD_{50/60}$.

Regulatory requirements:

National Regulatory Body, Responsibilities, Organization, safety standards, codes and guides, Responsibilities of licensees, registrants and employers and enforcement of Regulatory requirements.

Demonstration:

- Time, Distance and shielding, measurement of HVT & TVT.
- Familiarization of radiation survey meters and their functional parameters checks.
- Radiological Protection Survey of Radiotherapy installation.

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PAPER – IV

RADIOTHERAPEUTIC PRACTICES & PRINCIPLES OF TREATMENT

Introduction: The emphasis in this subject will be on practical instruction and demonstration.

1. Methods of diagnosis (Elementary principles) – Clinical, radiographic, histological/cytological and biochemical methods.

2. Staging of cancer and their clinical importance[Brief outline].

3. Treatment modalities: General principles of Medical, Surgical and Radio therapeutic methods.

4. Principles underlying choice of treatment -- Age and Performance status of patient, Co morbid conditions, Type of neoplasm [sensitivity to a particular treatment modality], Stage of disease, Accessibility, Nature of tumor bed (Relation to bone, Air and Organ at Risk); Radical and palliative treatment.

5. Cancer in special sites (A brief description of pathology, symptoms, signs, complications, natural history of disease in each site and methods of treatment with **particular reference to radiotherapy techniques** should be given)

i. Head and Neck: Oral Cavity & Lips, Pharynx, Larynx, Nasal Cavity and Para nasal sinuses, Salivary glands, Ear.
ii. Orbit and its content
iii. Thyroid gland
iv. Thorax: Esophagus, Lung, Mediastinum [including Thymus]
iv. Abdomen: Stomach, Small intestine, Colon, Liver, Gall Bladder and Pancreas and Kidney.
vi. Pelvis: Testis, Prostate Bladder and Penis, Uterine cervix, Endometrium, Ovary, Vagina, Vulva, Rectum, Anus.
vii. Breast.
viii. Bone tumors and Soft tissue sarcoma.
ix. Brain, Spinal cord and Pituitary.
x. Lymphoid and other hematological malignancies.
xi. Skin.
xii. Benign diseases

6. Care of patients undergoing radiotherapy: Behavior and Physical and emotional support to the patients; Identifying toxicities and other problems; Routine check up and verifications; Care of toxicities; When and how to communicate with Radiation Oncologist and Medical Physicist.

STATE MEDICAL FACULTY OF WEST BENGAL

APPENDIX II

Form of application for registration of the name of a student admitted to an approved Training institution for Diploma in Radiotherapeutic Technology – DRT [Tech].

[Vide Regulation 2 of Part II]

1. Name of the student in full :

2. Address –
   (a) Permanent :

   (b) Present :

3. Father's Name :
   {In case of married women, her Husband's name}

4. Age [as on the date of admission] :

5. Race – Caste or religion :

6. Name of the approved training Institution :

7. Date of admission :

8. Preliminary educational qualification :

_____
Signature of the applicant

I hereby certify that the above particulars are true to my knowledge.

_____
Signature of the Head of the Institute

Dated, the ……20
Place :

STATE MEDICAL FACULTY OF WEST BENGAL

APPENDIX III

Application for admission to the Preliminary Examination for Diploma in Radiotherapeutic Technology – DRT [Tech].

[Vide Regulation 10 of Part III]

To
The Secretary, State Medical Faculty of West Bengal.

Sir,

I beg to apply for admission to the ensuing Preliminary Examination for Diploma in Radiotherapeutic Technology : DRT [Tech] to be held by the Governing Body of the State Medical Faculty of West Bengal from ……..

The required certificate from the Head of the Institution is given herewith and I have paid the prescribed fee of Rs. ……. in his office.

1.	Name in full (Block letters)	:
2.	Father's Name	:
3.	Present Age	:
4.	Student Registration No.	:
5.	Permanent Address	:
6.	Present	:

Dated, the ……20 Signature of the applicant in full

Certificate of the Head of the Institution

I certify as below –

[1] that the above named …….. was admitted in this Institution for the course of Diploma in Radiotherapeutic Technology – DRT [Tech]. on …….

[2] that previous to his/her admission, he/she has attended regularly the course of studies as laid down in the Regulations. His/her attendance in the several subjects being as below:

Subject to be taught	No. of Theoretical Classes	No. of Demonstrations and Practical classes	Attendance
1. Paper I : Radiotherapy Physics, Part I	80	10	
2. Paper II : Anatomy, Physiology & Principles of Pathology in relation of Radiotherapy	70		

[3] That he/she has paid in my office the prescribed fee of Rs.400/- which is being separately remitted to the Faculty.

[4] That his/her conduct in the Institution was satisfactory.

Signature of the Head of the Institute

Dated, the ……20

STATE MEDICAL FACULTY OF WEST BENGAL

APPENDIX IV

Application for admission to the Final Examination for Diploma in Radiotherapeutic Technology – DRT [Tech].

[Vide Regulation 15 of Part III]

To
The Secretary, State Medical Faculty of West Bengal.

Sir,

I beg to apply for admission to the ensuing Final Examination for Diploma in Radiotherapeutic Technology – DRT [Tech]. to be held by the Governing Body of the State Medical Faculty of West Bengal from ……..*

The required certificate from the Head of the Institution is given herewith and I have paid the prescribed fee of Rs. …… in his office.

I passed the Preliminary Examination in …….. and my present age is …….

1. Name in full (Block letters) :
2. Father's Name :
3. Present Age :
4. Student Registration No. :
5. Permanent Address :
6. Present :

Dated, the ……20 Signature of the applicant in full

* State name of the training institution.

Certificate of the Head of the Institution

I certify as below –

[1] that the above named …….. passed the Preliminary Examination for Diploma in Radiotherapeutic Technology – DRT [Tech]. in …….

[2] that he/she has attended regularly in this Institution. The 2nd Year's course of studies laid down in the Regulations and fulfilled the other requirements.. His/her attendance in the several subjects being as below:

Subject to be taught	No. of Theoretical Classes	No. of Demonstrations and Practical classes	Atendance
1. Paper III : Radiotherapy Physics, Part II	75	10	
2. Paper IV : Radiotherapeutic Practices & Principles of Treatment	75	10	

[3] That he/she has paid in my office the prescribed fee of Rs.400/- which is being separately remitted to the Faculty.

[4] That his/her conduct in the Institution was satisfactory.

Signature of the Head of the Institute

Dated, the ……20

STATE MEDICAL FACULTY OF WEST BENGAL

APPENDIX V

(Certificate by the Head of the Institution regarding further course of training in the subject or subjects in case of a failed candidate)

[Vide Regulation 21 of Part III]

This is to certify that Sri/Sm. ……. who appeared at the Preliminary/Final Examination for the Diploma in Radiotherapeutic Technology – DRT [Tech]. in ……20 and failed in ……. has undergone a further course of training in the following subject/subjects since the date of the last examination to my entire satisfaction.

Sl. No.	Subject(s)	Number of Theoretical Lecturers/ Demonstrations attended
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Signature of the Head of the Institute

Dated, the ……20

Place :

STATE MEDICAL FACULTY OF WEST BENGAL

APPENDIX VI

(Certificates to be produced by students of Diploma in Radiotherapeutic Technology – DRT [Tech]. after completion of Practical Training)

[Vide Regulation 2 of Part IV]

No. : …… Date : ……

I……., hereby certify that……
[name of the student] after passing the Final Examination for Diploma in Radiotherapeutic Technology – DRT [Tech]. underwent practical training for ……..hours during the period from ……..to …… under my supervision and guidance.

Signature ……..

Name …….

Designation …….

Address ……..

(Countersigned by the Head of the Hospital)

STATE MEDICAL FACULTY OF WEST BENGAL

APPENDIX VII

[Vide Regulation 2 of Part IV]

To
The Secretary
State Medical Faculty of West Bengal
Dated, the ……..20

Sir,

I am to say that the under-mentioned students have passed the Final Examination for the Diploma in Radiotherapeutic Technology – DRT [Tech]. held by the Faculty in ……..20and have thereafter undergone the practical training as required under the Regulations of which the necessary certificates arte enclosed. I certify that I consider the students to be eligible to receive the Diploma in Radiotherapeutic Technology – DRT [Tech]. .

Yours faithfully,

Head of the Institution

STATE MEDICAL FACULTY OF WEST BENGAL

APPENDIX VIII

[Vide Regulation 2 of Part IV]

Diploma in Radiotherapeutic Technology : DRT [Tech]

We, the President and Members of the Governing Body of the State Medical Faculty of West Bengal, acting under the authority vested in us by Article 16 of the Statutes of the said Faculty and in accordance with the Regulations made there under with the approval of the Government of West Bengal, do hereby declare that ……after undergoing the prescribed course of training for the Diploma in Radiotherapeutic Technology : DRT [Tech], duly passed the Final Examination for the Diploma in Radiotherapeutic Technology : DRT[Tech] held by this Faculty in the month of ……20 with distinction.

And we, accordingly, grant him/her this Diploma in Radiotherapeutic Technology : DRT [Tech] of this Faculty.

Dated at Kolkata, the ……..day of ……in the year ……

Signed on behalf of the Governing Body of the State Medical Faculty of West Bengal.

Secretary *President*

Signature of the holder ……

REPORT OF THE INSPECTORS

Part V

Summary of findings by the Inspectors in respect of _____
Name of the Institution

For _____ Course.

1.	Accommodation (including toilet, ventilation, light)	:
2.	Fire Safety Measures available or not?	:
3.	Water, Electricity, Gas & Waste Disposal	:
4.	If the Institute is in rented building, then 3 years Agreement is shown or not?	:
5.	Furniture	:
6.	Office Records	:
7.	Laboratory equipment	:
8.	Qualification of Teachers	:
9.	Teacher-student ratio	:
10.	Workload of teachers	:
11.	Library books and Journals	:
12.	No. of working days in the session	:
13.	Daily working hours	:
14.	Laboratory facilities provided to the students	:
15.	Standard of teaching	:
16.	Standard of students	:
17.	Performance of students in	
	i) Theoretical	:
	ii) Practical	:
	iii) Oral	:
18.	Facilities provided for conducting the examination (Examination hall rented may be allowed)	:

19. Date of Last Inspection :

20. In case of DMLT [Tech] Course Blood Bank facilities have been shown in Government Hospital/Private Hospital and attendance of DMLT students in Blood Bank has been seen. :

21. Compliance of past deficiencies (if any) :

22. NOC from State Govt. for conduction of new course has been seen. :

23. Updated License for clinical Establishment Act. has been seen. :

24. Updated Registration Certificates of the Doctor Tutors from WBMC. :

25. Recommendation of Inspectors: The Institution may be granted affiliation/following conditions are to be fulfilled before consideration of extending/according affiliation.

1.

2.

Name and Signature of the Inspectors with date