



DEPARTMENT OF PARAMEDICAL SCIENCES

Subharti Medical College

Recognized by Govt. of India, Ministry of Health & Family Welfare, Govt. Letter No. U. 12012/69/96-ME(P)
Website: medical.subharti.org, e-mail: paramedical@subharti.org, Ph.: 0121-3055000 (Extn: 2118), Telefax: 0121-2439127, 2439067

A constituent college of

SWAMI VIVEKANAND SUBHARTI UNIVERSITY

(Established under U.P. Govt. Act no. 29 of 2008 and approved under section 2(f) of UGC Act 1956)



Ref. No-SVSU/PMS/2024/1643

Date: 03/05/2024

To
The Principal,
Subharti Medical College,
Swami Vivekanand Subharti University, Meerut

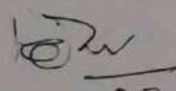
Subject: Minutes of Meeting of Board of Studies which held on 02/05/2024

Dear Sir,

A meeting of Board of Studies, Department of Paramedical Sciences, SMC was held on 02/05/2024 and following agendas was discuss in meeting and send to Faculty board for the approval.

Agenda: 1. Introduction of New course Bachelor of Science in Radiotherapy Technology (BRTT).

Agenda: 2. To Introduce new value added courses for Academic session 2024-25.


DC Saxena
Director (General)

DC SAXENA
Dir. (Gen.), SVSU


Dr. Pankaj Kishor Mishra
Prof. & Head

Enclosure: Minutes of Meeting



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Ref. No./SVSU/PMS/2024/1644

Dated: 03.05.2024

Minutes of Meeting

A BOS Meeting was held on 2nd May, 2024 at 02:00 PM in Departmental Conference Hall under the guidance of Prof. (Dr.) Pankaj Kishor Mishra, Head of Department of Paramedical Sciences, SMC, Meerut.

The following members were present in meeting-

1. Prof. (Dr.) Pankaj Kishor Mishra	Head of Department
2. Dr. Umesh Kumar	Member
3. Dr. Anshu Kumar Singh	Member
4. Dr. Meenakshi Mishra	Member
5. Dr. Ravindra Kumar Manik	Member
6. Mr. Akash Kumar	Member
7. Mr. Rahul	Member
8. Mr. Pushpendra Rajput	Member
9. Mr. Ankit	Member
10. Ms. Shmruti	Member
11. Ms. Yashika Bhardwaj	Member
12. Ms. Zeba Naaj	Member
13. Mr. Vishwanath Pratap Singh	Member
14. Mr. Sumit Kumar Sagar	Member
15. Ms. Khushi Kansal	Member
16. Mr. Navdeep Singh	Member

Subject Expert

Dr. Kishore Singh- Professor, Department of Radio Oncology, Subharti Medical College, SVSU

Almuni Member

Ms. Laiba Siddiqui- Student Batch-2016

All the participants were welcomed by Prof. (Dr.) Pankaj Kishor Mishra, Head of Department.

The following agenda items were discussed in the meeting:-

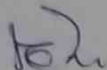
Agenda 1: Introduction of new course Bachelor of Science in Radiotherapy Technology (BRTT)

Suggestion: The BOS committee recommended the introduction of “**Bachelor of Science in Radiotherapy Technology (BRTT)**” and forward to Faculty Board and Academic Council for further approval.

Agenda 2: Introduction of New value added course for academic session 2024.

Suggestion: All the BOS Members discussed and agree to introduce a new value added course “**Personality Development and Entrepreneurship**” and forwarded to Faculty Board and Academic Council for further approval.

HOD, Department of Paramedical Sciences, has concluded the BOS meeting with the vote of thanks.



DC Saxena
Director (General)

DC SAXENA
Dir. (Gen.), SVSU



Dr. Pankaj Kishor Mishra
Prof. & Head



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Ref. No./SVSU/PMS/2024/1638

Date: 02.05.2024

Board of Studies Meeting (BOS)

Attendance Sheet

1. Dr Pankaj Kishor Mishra	Chairperson <i>Pankaj</i>
2. Dr Kishore Singh	External Expert <i>Kishore</i>
3. Dr. Umesh Kumar	Member <i>Umesh</i>
4. Dr. Anshu Kumar Singh	Member <i>Anshu</i>
5. Dr. Meenakshi Mishra	Member <i>Meenakshi</i>
6. Dr. Ravindra Kumar Manik	Member <i>Manik</i>
7. Mr. Akash Kumar	Member <i>Akash</i>
8. Mrs. Hiba	Member <i>Absent</i>
9. Mr. Rahul	Member <i>Rahul</i>
10. Mr Pushpendra Kumar Rajput	Member <i>Pushpendra Rajput</i>
11. Mr Ankit Kumar	Member <i>Ankit</i>
12. Ms Shmruti	Member <i>Shmruti</i>
13. Ms Yashika Bhardwaj	Member <i>Yashika</i>
14. Ms Zeba Naaz	Member <i>Zeba</i>
15. Ms Khushi Kansal	Member <i>Khushi</i>
16. Mr Viswanath Pratap Singh	Member <i>Viswanath</i>
17. Mr. Sumit Kumar Sagar	Member <i>Sumit</i>
18. Mr Navdeep Singh	Member <i>Navdeep</i>
19. Ms Laiba Siddiqui	Alumni Member <i>Laiba</i>

Pankaj
02.05.24
(Dr. Pankaj Kishor Mishra)
Professor & Head



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Ref. No-/SVSU/PMS/2024/1602

Date: 29/04/2024

NOTICE
(BOS Meeting)

A meeting of Board of Studies (BOS) of Department of Paramedical Sciences is scheduled to be held on **2nd May, 2024 (Thursday) at 02:00 PM** onwards in the departmental conference room. External member, all Faculty members and Alumni are requested to attend the meeting. Faculty members must come up with proposal in respect of different programs and their ordinance if any.

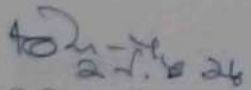
Agenda items to be discussed:

Agenda: 1. Introduction of New course Bachelor of Science in Radiotherapy Technology (BRTT).

Agenda: 2. To Introduce new value added courses for Academic session 2024-25.

Agenda: 3. Any change and modification in Ordinance.

Thanking you.


(D.C. Saxena)
Director (General)


(Dr. Pankaj Kishor Mishra)
Professor & Head

Copy to:

1. External Member
2. All Faculty Members
3. Notice Board

Ordinance No. (-----)

**Bachelor of Science
Radiotherapy Technology**



Faculty of Medicine

Department of Paramedical Sciences,

Subharti Medical College,

Swami Vivekanand Subharti University

**Subhartipuram, NH-58, Delhi-Haridwar Bypass Road, Meerut-250005, Uttar
Pradesh, India**

Ordinance No (-----)



Ordinance relating to Bachelor of Science in Radiotherapy Technology (B.Sc. RTT) Courses

Chapter - 1

General

1.1 The ordinance may be called the ordinance relating to "Bachelor of Science in Radiotherapy Technology (B.Sc. RTT) Course"

1.2 It shall into force with immediate effect.

Chapter - 2

Eligibility for Admission

2.1 For the admission of B.Sc. RTT course an applicant should be Intermediate (10+2) or its equivalent from a recognized board with minimum 50% marks in PCB with English as a subject of the course.

2.2 The students who are Foreign Nationals/Non-Resident Indians/Person of Indian Origin have passed an examination, which is equivalent to the Intermediate (10 +2) examination in India.

2.3 **Lateral entry**-Intermediate (10+2) + Diploma in Radiotherapy Technician (2 years), Highschool (10th) + Diploma in Radiotherapy Technician (3 years) Course passed from recognised board student may directly enter 2nd year of B.Sc. RTT course.

Chapter- 3

Teaching Course

3.1 The course will be of Three Years (3 Years) duration consisting of three academic years and six (6) months internship.

Medium of study- English

3.2 The Academic calendar shall be as follows

- **Session:** - July to April
- **Examination:** - May to June
- **Compulsory Internship** of Six (6) months duration
- The course for Practical Examination:- the course for practical exam enclosed with specific subject syllabus as a separate practical session.

Chapter- 4

Attendance

The students are expected to attend all the classes and should not have less than 75 % attendance in theory as well as in practical classes, wherever held, to become eligible to appear for the university examination. Short fall in attendance can, however be condoned in deserving cases to the extent of 10% by the Principal. If the short fall is more than 10% but not more than 15%, the Principal may recommend deserving cases to the Vice Chancellor for condonation. The order of the Vice Chancellor in this regard shall be final.

Chapter- 5

Examination

5.1 The examination in each semester shall be conducted in two parts:

A. Internal assessment will be of 30 marks as under:-

a. Internal assessment will be held twice in a year for both Theory and Practical examination. The candidate should be declared passed in internal assessment with minimum 40% marks separately in theory and practical.

b. A maximum of **10 marks** in each subject shall be awarded for attending classes (theory / practical) as per the following norms:

85% or more attendance	-	10 Marks
81% or more but less than 84% attendance	-	9 Marks
75% or more but less than 80% attendance	-	8 Marks
71% or more but less than 74% attendance	-	7 Marks
66% or more but less than 70% attendance	-	5 Marks
61% or more but less than 65% attendance	-	3 Marks
51% or more but less than 60% attendance	-	2 Marks
50% attendance	-	1 Mark
Less than 50% attendance	-	0 Mark

B. University Examination carrying 70 marks.

5.2 The entire course has to be completed within a maximum of six (06) years from the date of original admission in the course.

Chapter-6

Paper setting, Evaluation and Results

The work of setting the university examination question papers, conduct of the end semester and annual examinations, evaluation and declaration of results shall be as per the laid down examination policies / latest University Notifications.

Chapter – 7

Power to Modify

In the event of any emergent situation, if any deviation is considered necessary, the Vice Chancellor is authorized to modify the Ordinance. Subject to subsequent ratification by the Executive Council.

Chapter- 8

Compulsory Internship

Internship is a phase of training wherein a graduate is expected to conduct actual practice of Radiotherapy Technology and acquire skills under supervision so that he/she may become capable of functioning independently. It will be of Six (6) months duration. Candidate shall not be permitted to do internship from any other Institute.

Results

- a) Examination result shall be prepared at the end of each academic year by taking into account the marks obtained in all the year till date.
- b) A candidate shall be declared as passed at the end of an academic year if he/she secures minimum 50% marks in each theory paper and practical separately.
- c) The university shall issue a provisional B.Sc. RTT degree certificate on passing the final examination.
- d) The final result at the end of the course shall be prepared as below by aggregating the marks obtained in all the years.

AGGREGATE	DIVISION
60% and above in aggregate	1st
50% or above but below 59.9% in aggregate	2nd
Below 50% in aggregate	FAIL

- e) The Degree B.Sc. Radiotherapy Technology (B.Sc. RTT) shall be awarded to a candidate, indicating Division and the grading, after the candidate has successfully completed the following:
- He/she has passed all the three annual examinations and completes the 6 month internship.
 - Candidate work and conduct during the period of training have been satisfactory.

Distribution of Marks, Teaching subjects and Examination Evaluation Scheme
Program: Bachelor of Science in Radiotherapy Technology
Course Structure

Year	Course	Code	Credit (L+T+P)*
1 st	Human Anatomy and Physiology	BRTT-101	3+1+4
1 st	Basics of Medical Physics	BRTT-102	3+1+4
1 st	Medical Biochemistry	BRTT-103	3+1+4
1 st	Community Healthcare	BRTT-104	3+1+0
1 st	Computational Skills and Biostatistics	BRTT-105	3+1+4
1 st	General English and Communication Skills	AEC-1	2+0+2
1 st	Hospital Posting	BRTT-155P	0+0+4
2 nd	Pathology and Microbiology	BRTT-201	3+1+4
2 nd	Radiotherapy Equipments and Quality Assurance	BRTT-202	3+1+4
2 nd	Radiobiology	BRTT-203	3+1+0
2 nd	Radiation Protection and Safety	BRTT-204	3+1+4
2 nd	Radiotherapy Techniques	BRTT-205	3+1+0
2 nd	Hospital Posting	BRTT254P	0+0+4
3 rd	Medical Ethics and Patient Care	BRTT-301	3+1+4
3 rd	Recent Advances in Radiotherapy Techniques	BRTT-302	3+1+4
3 rd	Principles and Practice of Radiotherapy	BRTT-303	3+1+0
3 rd	Radiotherapy Treatment and Planning	BRTT-304	3+1+0
3 rd	Clinical Oncology	BRTT-305	3+1+0
3 rd	Hospital Posting	BRTT-353P	0+0+4

*L- Lecture, T-Tutorial, P- Practical

Distribution of Marks, Teaching subjects and Examination evaluation scheme
Program: Bachelor of Science in Radiotherapy Technology 1st year

S. No	Subject code	Subject Name	Hours Per Week				Examination Scheme				
			L	T	P	C	Theory Marks		Practical Marks		Grand Total
							UE	CCE	UE	CCE	
1.	BRTT-101	Human Anatomy and Physiology	3	1	-	4	70	30	-	-	100
2.	BRTT-102	Basics of medical Physics	3	1	-	4	70	30	-	-	100
3.	BRTT-103	Medical Biochemistry	3	1	-	4	70	30	-	-	100
4.	BRTT-104	Community Healthcare	3	1	-	4	70	30	-	-	100
5.	BRTT-105	Computational Skills and Biostatistics	3	1	-	4	70	30	-	-	100
6	AEC-1	General English and Communication Skills	2	-	-	2	35	15	-	-	50
7.	BRTT-151P	Human Anatomy and Physiology (Practical)	-	-	4	4	-	-	50	50	100
8.	BRTT-152P	Basics of medical Physics (Practical)	-	-	4	4	-	-	50	50	100
9.	BRTT-153P	Medical Biochemistry (Practical)	-	-	4	4	-	-	50	50	100
10	BRTT-154P	Computational Skills and Biostatistics (Practical)	-	-	4	4	-	-	50	50	100
12	AEC-1P	General English and Communication Skills(Practical)	-	-	2	2	35	15			50
13	BRTT-155P	Hospital Posting	-	-	4	4	-	-	-	100	100
Total Credit			19	5	20	44	420	180	200	300	1100

*L- Lecture, T-Tutorial, P- Practical, C- Credit, CCE- Continuous Comprehensive Evaluation,
UE- University External

Distribution of Marks, Teaching subjects and Examination evaluation scheme
Program: Bachelor of Science in Radiotherapy Technology 2nd year

S. No	Subject code	Subject Name	Hours Per Week				Examination Scheme				
			L	T	P	C	Theory Marks		Practical Marks		Grand Total
							UE	CCE	UE	CCE	
1.	BRTT-201	Pathology and Microbiology	3	1	-	4	70	30	-	-	100
2.	BRTT-202	Radiotherapy Equipments and Quality Assurance	3	1	-	4	70	30	-	-	100
3.	BRTT-203	Radiobiology	3	1	-	4	70	30	-	-	100
4.	BRTT-204	Radiation Protection and Safety	3	1	-	4	70	30	-	-	100
5.	BRTT-205	Radiotherapy Techniques	3	1	-	4	70	30	-	-	100
6.	BRTT-251P	Pathology and Microbiology (Practical)	-	-	4	4	-	-	50	50	100
7.	BRTT-252P	Radiotherapy Equipment and QA (Practical)	-	-	4	4	-	-	50	50	100
8.	BRTT-253P	Radiation Protection and safety (Practical)	-	-	4	4	-	-	50	50	100
9.	BRTT-254P	Hospital Posting	-	-	4	4	-	-	-	100	100
Total Credit			15	5	16	36	350	150	150	250	900

* L- Lecture, T-Tutorial, P- Practical, C- Credit, CCE- Continuous Comprehensive Evaluation,
UE- University External

Distribution of Marks, Teaching subjects and Examination evaluation scheme
Program: Bachelor of Science in Radiotherapy Technology 3rd year

S.No	Subject code	Subject Name	Hours Per Week				Examination Scheme				
			L	T	P	C	Theory Marks		Practical Marks		Grand Total
							UE	CCE	UE	CCE	
1.	BRTT-301	Medical Ethics and Patient Care	3	1	-	4	70	30	-	-	100
2.	BRTT-302	Recent Advances in Radiotherapy Techniques	3	1	-	4	70	30	-	-	100
3.	BRTT-303	Principles and Practice of Radiotherapy	3	1	-	4	70	30	-	-	100
4.	BRTT-304	Radiotherapy Treatment and Planning	3	1	-	4	70	30	-	-	100
5.	BRTT-305	Clinical Oncology	3	1	-	4	70	30	-	-	100
6.	BRTT-351P	Medical Ethics and Patient care (practical)	-	-	4	4	-	-	50	50	100
7.	BRTT-352P	Recent advances in Radiotherapy Techniques (practical)	-	-	4	4	-	-	50	50	100
8.	BRTT-353P	Hospital Posting	-	-	4	4	-	-	-	100	100
Total Credit			15	5	12	32	350	150	100	200	800

*L- Lecture, T-Tutorial, P- Practical, C- Credit, CCE- Continuous Comprehensive Evaluation, UE- University External

SUMMARY OF CREDIT SYSTEM

FOR BACHELOR OF RADIOTHERAPY TECHNOLOGY

S. No.	Year	NO. OF CREDIT
1	1 st	44
2	2 nd	36
3	3 rd	32
Lab Posting /MOOC Courses/Internship		-
GRAND TOTAL		112

(B.Sc. RTT)

INTRODUCTION

Radiotherapy is also called Radiation therapy. Radiotherapy is a cancer treatment that uses high doses of radiation to kill cancer cells and shrink tumours. Radiation therapy can treat many different types of cancer. It is possible to impart this knowledge to the radiotherapy students. However, there is acute shortage of radiotherapy technologists familiar with the newer techniques. Radiotherapy Technologist plays an important role in helping the Oncologist for radiotherapy procedure. Thus more and more job opportunities shall be available to the persons trained in Radiotherapy Technology.

With improving standards of medical care and for further up gradation, there is a need for highly qualified radiotherapy professionals in this field all over the country. Further, placements are being solicited by the multinational companies for the bright technologist and highly skilled students as application experts specializing in different field. Further, with many upcoming institutions for providing training for Radiotherapy, there shall be increasing requirement for Faculty who have passed B.Sc. in radiotherapy technology on regular basis. The B.Sc. R.T.T. course in radiotherapy is aimed at meeting this rising demand as well as at enhancing the quality of health care.

PROGRAM OBJECTIVES

Upon successful completion of the bachelor degree in Radiotherapy Technology, the student should be able to:

PO1- Conceptualise and apply the theories of applied sciences such as Physics, Chemistry, Anatomy, Physiology, Biochemistry, and Pathology relevant to Radiotherapy Technology.

PO2- Know the ethics and organization of radiotherapy department.

PO3- Perform various diagnostic and Prognostic Procedures of radiotherapy.

PO4- Do work efficiently with latest sophisticated modern Radiotherapy modalities.

PO5- Students will be aware about radiation safety, various national and international regulatory bodies, applying quality assurance measures, safety procedures & care and maintenance of Radiotherapy Equipments.

PO6- Analyzing the protocols in Radiotherapy Procedures and evaluating various pathological conditions.

Bachelor of Science in Radiotherapy Technology (B.Sc. RTT)

1st YEAR

PAPER-I: Human Anatomy and Physiology

Theory	Subject Code- BRTT-101
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

Course Objective

Students get to know in depth about human anatomy and physiology. In this subject students learn about basics of human anatomy, blood, parts and function of different body systems. Practices and demonstrations are also associated with this subject.

Course Outcomes (COs)

CO 1-Understanding different terminology and recognizing organs, organ system and different sample collection site and function and structure of cells, tissues and major human organs system/parts.

CO 2- Identifying and discussing the major structures of human body and explaining the interrelation between different organ systems to maintain biological equilibrium

CO 3- Demonstrating various organ systems and employ knowledge of human anatomy to solve questions regarding functions and diseases.

CO 4- Differentiating the various organ system and its related disorders and determining various experimental techniques related to physiology.

CO 5- Developing a holistic approach to human health and medical research.

COURSE CONTENTS:

Unit	Contents	Credit Hours
1	Part-A (Anatomy) Anatomy of Human body: Structure of cell and tissues of body: Epithelial tissue, connective tissue, muscle tissue and nervous tissue Classification of bones: Axial skeleton, Appendicular skeleton, Bones - Structure and functions , formation of bone, growth of skeleton, centres of ossification , fracture and dislocation,	30

	diseases of the bones , Radiological and Surface Anatomy. Joints: Classification of joints with examples, anatomy of various joints of head and neck, trunk and limbs Cardiovascular system: Anatomy of pericardium and heart, blood vessels, types of blood circulation	
2	Muscular system: Types of muscles, Position and actions of chief muscles of the body Respiratory system: Nasal passages and para -nasal sinuses, pharynx and larynx, trachea, bronchi, lungs and pleura Gastrointestinal system: Parts of GIT ,oral cavity ,salivary glands,oesophagus,stomach,small and large intestine,liver,gall bladder ,pancreas . Urinary system: Kidney, Ureters, urinary bladder and urethra Reproductive system: Parts of male and female reproductive system, location, functions, mammary gland Endocrine system: Location, structure and functions of Pituitary, Thyroid, Parathyroid, Suprarenal and Pancreas Nervous system and sense organs: Structure and function of Neuron, subdivisions of nervous system: central and autonomic nervous system- Parts, structure and functions, ventricles of the Brain, CSF circulation, spinal cord. Cranial nerve, Brachial plexus. Sense Organs: Structure and function of the eye, ear, tongue, nose, skin. Surface landmarks and topography of organs on the surface of body for radiographic positioning	30
3	Part-B (Physiology) Blood: Its composition and function – nerve tissue- muscular tissue and types.	10
4	Respiratory system: Nasal passages and Para nasal sinuses- pharynx and larynx- Trachea, Bronchus and lungs. The pleura- nature and functions of respiration. Lymphatic system: Lymph and tissue fluid- main glands and	30

	drainage areas in the lymphatic system- Lymphoid tissue and the tonsils. Cardiovascular system: General arrange, heart, arteries, veins and capillaries, heart structure and function, cardiac cycle, heart sounds, heart rate, blood pressure, mechanism of circulation, definition of hypertension and shock Reticulo-endothelial system: Liver and spleen- bone marrow, Life cycle of red and white corpuscles of the blood, Alimentary systems: Function of mouth, tongue and teeth, salivary glands- pharynx and esophagus- Stomach – small intestine (jejunum)- large intestine (colon)- Liver and Biliary tract- pancreas- functions of the alimentary system – digestion and absorption of food- metabolism- common terms used in connection with abnormalities of this system. Urinary tract: kidney, Ureters and bladder, urethra, urinary Excretion. Reproductive system: Male genitalia, Female genitalia, Mammary glands, Menstruation, pregnancy and lactation, common terms related to abnormalities of this system.	
5	Ductless glands (Endocrine system): Anatomical location of pituitary, thyroid, parathyroid, adrenal, thymus, pancreas and gonads – there function, common terms related to this system. Nervous system: Main subdivisions, lobes and ventricles of the brain- spinal cord- meninges and cerebro- spinal fluid- common terms used in abnormalities of this system. Organs of senses: Structure and function of the eye, Structure and function of the ear.	20

Reference Books:

1. Guyton, Arthur, Text Book of Physiology, Prism Publishers
2. Chatterjee, C C, Human Physiology, Medical Allied Agency
3. A.K Jain, Human Physiology
4. Anatomy and Physiology, Ross and Wilson
5. Human Anatomy, B D Chaurasia

Human Anatomy and Physiology Practical

Practical	Subject Code- BRTT-151P
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

Human Anatomy

S.No.	List of Experiment	Credit Hours
1.	Histology of types of epithelium, serous, mucous and mixed salivary gland Demonstration of the glands, Histology of pituitary, thyroid, parathyroid, suprarenal glands	120
2.	Histology of the 3 types of cartilage, Demo of all bones showing parts, radiographs of normal bones and joints, Histology of compact bone (TS and LS) Demonstration of heart and vessels in the body, Histology of large artery, medium sized artery and vein, large vein, Microscopic appearance of large artery, medium sized artery and vein, large vein, pericardium,	
3.	Demonstration of parts of respiratory system, Normal radiographs of chest, Histology of lung and trachea Demonstration of parts of urinary system, Histology of kidney, ureter, urinary bladder, Demonstration of section of male and female pelvis with organs in situ, Histology of testis, vasdeferens, epididymis, prostate, uterus, fallopian tubes, ovary	
4.	Demonstration of all part of brain, Histology of cerebrum, cerebellum and spinal cord, peripheral nerve and optic nerve. Histology of thin and thick skin Demonstration and histology of eyeball, Histology of cornea and retina	

5.	Haemoglobinometry, Determination of Blood Groups ,White Blood Cell Count and Red Blood Count Leishman's staining and Differential WBC count, Determination of packed cell Volume	
6.	Erythrocyte sedimentation rate [ESR] and Calculation of blood indices Determination of Clotting Time, Bleeding Time	
7.	Blood pressure Recording and Determination of vital capacity. Auscultation for Heart Sounds and Artificial Respiration	

Reference Books:

1. William Davis, Understanding Human Anatomy and Physiology, McGraw Hill.
2. B.D. Chaurasia's, Practical of Human Anatomy.
3. Principles of Anatomy and Physiology, Gerard J. Tortora and Bryan H. Derrickson.

PAPER-2: Basics of Medical Physics

Theory	Subject Code- BRTT-102
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

Course Objective

Students get to know in depth about Basics of medical Physics. In this subject students learn about structure of matter, electromagnetism, production of X-Rays, Production of Radionuclide

Course Outcomes (COs)

CO1- Understand about the basic concept of structure of matter and electromagnetism.

CO2- The end of the course students learn about the Basic concept of production of X-Rays.

CO3- Recognizing the fundamentals of radiography and patient care for geriatric and paediatric patients.

CO4- Knowing the fundamental ideas, theories, and procedures involved in the manufacturing of radionuclides.

CO5- Acquainted about uses of electronic devices in radiotherapy equipments.

Unit	Contents	Credit Hours
1	Structure of Matter: Constituents of atoms, atomic and mass energy, units, electron shells, atomic energy levels, Nuclear forces, Nuclear energy levels. Atomic structure Nucleus, Electromagnetic spectrum, Energy quantization, Relationship between wavelengths, Frequency, Energy. Physics Units and measurements Force, Work, Power, energy temperature and heat SI units of above parameters. Atomic Number, Mass No., electron orbit and energy levels Periodic table Ionization and excitation. Electromagnetic radiation	30
2	Electricity and magnetism: Electric charges, Coulomb's law Unit of charge Electric potential, unit of potential Electric induction, capacitance and capacitors, series and parallel connection - electric current, unit, resistance, ohm's law, electric power, Joule's law Magnetism: Magnetic induction magnetic properties Hysteresis magnetic effect of current Electrical instruments, Galvanometer, voltmeter, ammeter and multi meter	30

	Electronic: Introduction to Semiconductors- Extrinsic and Intrinsic Semiconductors- Formation of p-n Junction, p-n Junction diode-Half wave and Full wave rectifiers using diodes, Efficiency: Bipolar Junction Transistor-Forward and reverse bias characteristics, Amplifiers; Types of Amplifiers	
3	Production of X-rays: X-ray tube, anode, cathode construction, and working principles of transformers and autotransformers used in x-ray circuits, voltage rectification, and measurements in x-ray circuits. Physics of x-ray production (Bremsstrahlung and Characteristic x-rays Interaction of radiation with matter: ionization and excitation, various types of interaction processes (photoelectric effect, Compton scattering, pair production etc.) Interaction of charged particles and neutrons with matter. Comparative beam characteristics. Orthovoltage and megavoltage beam, their interactions and clinical applications	30
4	Nuclear Transformations : Radioactivity, decay constant, activity half life, mean life, radioactive series, radioactive equilibrium, modes of decay : α -decay, β -decay, γ - decay , Isobars, Isotopes, Isotones, Isomers, electron capture, internal conversion, isomeric transition. Nuclear reactions: (α , p) reaction, (α , n) reaction, proton bombardment, deuteron bombardment, neutron Bombardment, photodisintegration, fission, fusion, activation of nuclides, nuclear reactors.	18
5	Production of Radio nuclides: Reactor produced radionuclide, Reactor principles; Accelerator produced radionuclide, Radionuclide generators..	12

Reference Books

1. K.Thalayan, Basic of Radiological Physics.
2. They physics of radiation therapy, Faiz M. Khan, 4th edition (2010), Lippincott, Williams.
3. Fundamental of Xray and Radium Physics Joseph Selman.
4. Basic Medical Radiation Physics – Stanton.

Basics of Medical Physics Practical

Practical	Subject Code- BRTT-152P
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

S. No.	List of Experiment	Credit Hours
1.	Atomic theory	120
2.	Radioactivity	
3.	Production of Radionuclide	
4.	Interaction of Radiation with Matter	
5.	Demonstration radiotherapy equipments.	
6.	Demonstration of X-ray Machine	

Reference Books:

1. The physics of radiation therapy, Faiz M. Khan, 5th edition.
2. Christensen's Physics of Diagnostic Radiology – Christensen & Christensen.
3. Fundamental of Xray Fundamental of Xray and Radium Physics Joseph.
4. Basic Medical Radiation Physics – Stanton.

PAPER-3: Medical Biochemistry

Theory	Subject Code- BRTT-103
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

Course Objective

Students get to know in depth about Medical Biochemistry. In this subject students learn about chemistry of carbohydrates, lipids, enzymes, function and structure of cell. Practices and demonstrations are also associated with this subject.

Course Outcomes (COs)

CO 1- Understand about the concepts and theories of Biochemistry related to Radiotherapy.

CO 2- Summarizing the chemistry of carbohydrates, proteins, lipids and amino acids.

CO 3- Analyzing the mechanism of enzyme action and identify the classes and factors affecting action.

CO 4- Knowing the biochemical testing and analyzing the test result.

CO 5- To enable the students to about the equipments used in Radiotherapy lab and their applications, and develop the basic concepts of Lab diagnosis for Radiotherapy.

Unit	Contents	Credit Hours
1	Structure and Function OF Cell: Structure and function of cell, Prokaryote and Eukaryote cell organization, Fluid Mosaic Model of cell membrane, Transport Mechanism, Acid Base Balance-maintenance, PH Buffers, Henderson - Hasselbalch equation and its applications.	20
2	Composition and Metabolism of Carbohydrate: Types, structure , composition and function, Monosaccharides, Disaccharides, Oligosaccharides, Polysaccharides, Metabolism, Glycolysis, Gluconeogenesis, Tricarboxylic acid (TCA) cycle, Pentose phosphate pathways (HMP), Regulation of blood glucose level, Glucose investigations and their interpretations	20

3	Composition and Metabolism of Lipids: Types, Structure, Composition and function of fatty acids, Nomenclature, Roles and Prostaglandins, Triacylglycerols, phospholipids, Cholesterol. Metabolism of fatty acid : Breakdown, Synthesis Biosynthesis & its regulation: Bile salts & bilirubin, Vitamin D Lipoproteins and their functions, Transport of lipids, VLDLs, LDLs, HDLs, Atherosclerosis, Investigations and their interpretations	30
4	Composition and Function of Amino Acids and Proteins: Types, structure, composition and function of amino acid, Structural organization of proteins (basic understanding only), Classification and functions of proteins, Denaturation and Coagulation, Metabolism of Nitrogen, Fixation and Assimilation, Urea cycle Enzymes and Hormones: Enzymes and Co-enzymes, Classification and function, Factors effecting enzyme action, Coenzyme and Cofactor Glands: Exocrine and Endocrine, Hormones, Investigations and their interpretations	30
5	Radioactivity: Radioactivity, Radioisotopes, GM Counter, Colorimeter and Spectrophotometer, Chromatography, Electrophoresis, RIA, ELISA	20

Reference Books:

1. U. Satyanarayana, Text book for Biochemistry.
2. D.M Vasudevan, Text book for Biochemistry.
3. Illustrated Biochemistry by HARPER.
4. Lehninger Principles of Biochemistry.
5. Biochemistry by Stryer.
6. Biochemistry by Voet and Voet.

Medical Biochemistry Practical

Practical	Subject Code- BRTT-153P
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

S.No.	List of Experiments	Credit Hours
1.	Analysis of Normal Urine	120
2.	Liver Function tests	
3.	Lipid Profile	
4.	Renal Function test	
5.	Blood gas and Electrolytes	
6.	Demonstration of Glucometer with strips	

Reference Books:

1. Das, Debajyothi, Biochemistry, Academic Publishers, Calcutta.
2. Chatterjee, A Text book of Medical Biochemistry.
3. Satyanarayan, U., Medical Biochemistry.

PAPER-4: Community Healthcare

Theory	Subject Code- BRTT-104
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

Course Objective

Students get to know in depth about Community healthcare. In this subject students learn about health, different types of family, hospital acquired infection, infection types and its treatment.

Course Outcomes (COs)

CO 1- Understand and Remembering the Concept of Health.

CO 2- Recognize nutrition and the main issues related to it..

CO 3- Articulating and implementing schedules for universal vaccination and immunization.

CO 4- Analyzing the causes of various diseases.

CO 5- Understanding the family welfare.

Unit	Contents	Credit Hours
1	Health: Definition of Health, Determinants of Health, Health Indicators of India, Health Team Concept. National Health Policy: National Health Programmers (Briefly Objectives and Scope) Population of India and Family welfare programme in India.	25
2	Family: The family, meaning and definitions, Functions of types of family, Changing family patterns, Influence of family on Individuals Health, family and nutrition, the effects of sickness in the family and psychosomatic disease and their Importance to physiotherapy.	25
3	Community acquired infection: Control of infection, Hospital acquired infection. (HAI)	20
4	Hygiene: Life style disorder, Nosocomial infection	20

5	Community: Rural community: Meaning and features – Health hazards to rural communities, health hazards to tribal community, Urban community – Meaning and features – Health hazards of urbanities	30
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Reference Books:

1. K. Perks ,Textbook of Preventive Social Medicine.
2. Sunder Lal, Adarsh, Pandey, Textbook of community health.
3. Park & Park, Textbook of Social Medicine.
4. Harshmohan, Textbook of Pathology.

PAPER-5: COMPUTATIONAL SKILLS AND BIOSTATISTICS

Theory	Subject Code- BRTT-105
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

Course Objective

Students get to know in depth about Computer and biostatistics. In this subject students learn about basic computer fundamentals, use of network terminology and calculate the central tendency and use different test of significance.

Course Outcomes (COs)

CO1- Understand the basic fundamentals of computers, computer organization and representation of data

CO2- Understand the network terminology and application of multimedia

CO3- Apply the stepwise methodology of developing an algorithm and general awareness in information technology.

CO4- To demonstrate the central tendency and calculate the measure of dispersion in biostatistics.

CO5- To Apply the use of different types of test of significance.

Unit	Contents	Credit Hours
1	Part A: COMPUTATIONAL SKILLS Computer Fundamentals: Introduction to Computers: Characteristics of Computers, Uses of computers, Types and generations of Computers. Basic Computer Organization - Units of a computer, CPU, ALU, memory hierarchy, registers, I/O devices. User Interface with the Operating System, System Tools Data Representation: Binary representation of integers and real numbers, 1's Complement, 2's Complement, Addition and subtraction of binary numbers, BCD, ASCII, Unicode	30
2	Networks terminology: Types of networks, router, switch, server-client architecture Multimedia: Introduction, Characteristics, Elements,	20

	Applications	
3	Problem Solving: Notion of algorithms, stepwise methodology of developing an algorithm, developing macros in spread sheet, M.S. Office: word, excel, power point, Internet, e-mail, search engine, General Awareness: IT Act, System Security (virus/firewall etc.), I-Tax, Reservations, Banking.	25
4	Part B: Biostatistics Measure of central tendency: Mean, median and mode and their relationship. Measure of dispersion: quantitative deviations, mean deviation, standard deviation, coefficient of variations, Concept of Standard errors.	25
5	Tests of significance: Hypothesis testing (null and alternative hypothesis) Tests of significance (non-parametric): T- test and Chi-square test for independence; P-value of the statistic; Confidence limits	20

Reference Books:

1. Wayne W. Daniel, Biostatistics: A foundation for Analysis in the Health Sciences, 8th Edition, Wiley, 2004.
2. Prem S. Mann, Introductory Statistics, 6th Edition, Wiley, 2006.
3. John A. Rice, Mathematical Statistics and Data Analysis, 3rd Edition, John A. Rice, Duxbury Press, 2006.

COMPUTATIONAL SKILLS AND BIOSTATISTICS PRACTICAL

Practical	Subject Code: BRTT-154P
Total Marks for Evaluation:100	No. of Credit Hours: 120, Credits:4

S.No.	List of Experiments	Credit Hours
1	Collection and tabulation of data	120
2	Graphical representation of data	
3	Correlation and regression analysis	
4	Student's 't' test	
5	Chi-square test	
6	ANOVA	
7	Use of MS EXCEL	
8	Use of in-built statistical functions for computations Mean, S.D., Correlation, regression coefficients	
9	Use of bar diagram, histogram, scatter plots, etc.	
10	Graphical tools in EXCEL for presentation of data	

Reference Books:

- Fundamentals of Biostatistics Bernard Rosner 5th Edition, Duxbury Thomson Learning, 8th, Ed, (2015)
- Introductory Biostatistics, Chap T. Lee, Wiley, 1st Ed., (2003)
- Comdex computer course kit, Vikas Gupta, Dreamtex press ND.
- Introduction to computer, Pooja Jai n and NeelamKumari, Vikas publishing house Pvt ltd.
- Biostatistics for medical students and research workers 9th Ed., Bratati Banerjee, JaypeeBrthors Medical Publishers.

PAPER-6: GENERAL ENGLISH AND COMMUNICATION SKILLS

Theory	Subject Code- AEC-1
Total Marks for Evaluation- 50	No. of Contact Hours- 60, Credits:2

Course Objective

Students get to know in depth about general English and communication. In this subject students learn about to basic of English grammar, vocabulary and enhance their communication skills from use of different types of skills.

Course Outcomes (COs)

- CO1-** Remembering and understanding the basics of English Grammar and Vocabulary
CO2- Applying correct vocabulary and grammar in sentence construction while writing and delivering presentations
CO3- Understanding the art of public speaking and strategies of reading comprehension.
CO4- Applying correct vocabulary and grammar in sentence construction while writing and delivering presentations
CO5- Analyzing different types of listening, role of Audience and Locale in Presentation

Unit	Content	Credit Hours
1	Essentials of grammar: Part of speech, noun, pronoun, adjective, verb, preposition, articles, Sentences (kind) transformation of sentences, tense (present, past, future), Active and passive, Direct and indirect, Vocabulary, synonyms, antonyms, idioms and phrase, one word substitution.	10
2	Technical writing skills: Definition, requisites of good paragraph writing, scientific writing skills and forming abstracts, Reading comprehension skills, passage for communication (oral), Effective listening, importance of listening and hearing, Letter writing: official letters, business letters, personal letters.	15
3	Interview tips: what student is supposed to do before the interview, during the interview and after the interview and on, Importance of non-verbal communication, debates, role-plays, corporate behaviour, office etiquettes, Importance of body language, Group discussion (G.D.), G.D. tips	12
4	Report writing skills: Types of reports, layout of formal report, scientific writing skills, problems while writing a scientific	13

	report/document. Plagiarism, element of scientific paper, abstract writing, Internet as a medium of interaction. Effective e-mail strategy using the right tone and conciseness, Presentation skills: Formal presentation skills, Preparing and presenting using Over Head Projector, Power Point presentation, Defending Interrogation; Scientific poster preparation and presentation; Participating in group discussions.	
5	Presentation skills: Importance of Presentation Skills, Capturing Data, Voice and Picture Integration, Guidelines to make Presentation Interesting, Body Language, Voice Modulation, Audience Awareness, Presentation Plan, Visual Aids, Forms of Layout, Style of Presentation.	10

Reference Books:

1. Wren and Martin H- "High school grammar and composition" S. Chand and co
2. Robbins's "organization behavior"
3. Sharma R C and Krishan Mohan – Business correspondence and report writing. New Delhi Tata MCgrahill.
4. Banerji, Meera and krisan Mohan- Developing communication skills, Macmillan publishers India.
5. Raman ,Meenakshi and ShasmeSangeeta- "Technical communication – principles and practices " Oxford University Press.

General English and Communication Skills

Practical	Subject Code- AEC-1
Total Marks for Evaluation- 50	No. of Contact Hours- 60, Credits-2

S. No.	List of Experiment	Credit Hours
1.	Personal letter writing	120
2.	Business letter writing	
3.	Official letter writing	
4.	Interview	
5.	Report writing	
6.	Presentation skill	

Reference Books:

1. Wren and Martin H- "High school grammar and composition" S. Chand and co
2. Robbins's "organization behavior"
3. Sharma R C and Krishan Mohan – Business correspondence and report writing. New Delhi Tata mcgram hill
4. Banerji, Meera and krisan Mohan- Developing communication skills, Macmillan publishers India
5. Raman ,Meenakshi and ShasmeSangeeta- "Technical communication – principles and practices " Oxford University Press
6. Mohan Krishna and N.P. Singh, Speaking English effectively, 2nd edition, Macmillan, 2009.
7. Allen R., How to Write Better English, Penguin Writers' Guides, 2005.
8. Ros Jay and Antony Jay, Effective Presentation: How to Create and Deliver a Winning Presentation, Financial Times Prentice Hall; 2nd Edition, 1999.

Hospital Postings

Practical	Subject Code- BRTT-155P
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

S.No.	List of Experiments	Credit Hours
1.	Students shall be deputed to various labs of Radiotherapy department wherein they shall undergo practical	120
2.	Training of handling patients, Radiotherapy procedures, etc. and equipments.	
3.	Identification of patient's	
4.	Student will practice about Radionuclide's.	
5.	Process of performing various radiotherapy Procedures from different equipments.	
6.	Each student is required to maintain a logbook of the various posting. s	
7.	Evaluated on continuous basis by the faculty posted in various sections.	
8.	Assessment records of each student posted in his/her section on monthly basis to the HOD. Marks will be awarded out of 100.	

Bachelor of Science in Radiotherapy Technology (B.Sc. RTT)

YEAR-2

PAPER-1: Pathology and Microbiology

Theory	Subject Code- BRTT-201
Total marks for evaluation- 100	No. of contact hours- 120, Credits:4

Course Objective

In this subject students learn about the Pathology and Microbiology that is related to Radiotherapy.

Course Outcomes (COs)

CO1- The end of the course, the students learn about basics of pathology and microbiology.

CO2- At course's conclusion, students gain knowledge of haematology. Histopathology as well as blood banking

CO3- The students learn about Infections caused by virus.

CO4- Learn about the Infection caused by Bacteria.

CO5- By the end of the course, the students have gained knowledge about hospital infections, immunology, sterilization, disinfection, and microscopy.

Unit	Contents	Credit Hours
1	Histopathology Introduction to Histopathology ,Receiving of Specimen in the laboratory ,Use & care of Microscope ,Various Fixatives, Mode of action, Preparation and Indication, Tissue processing for routine paraffin sections , Section Cutting , Staining of tissues - H& E Staining , Bio-Medical waste management	20
2	Haematology Introduction to Haematology , Normal constituents of Blood, their structure and function, Collection of Blood samples Various Anticoagulants used in Haematology Laboratory safety guidelines , SI units and conventional units in Hospital Laboratory Hb, PCV, ESR Diseases of Esophagus, Stomach and Intestine , Diseases of Liver and Pancreas Blood Bank Introduction to blood bank, ABO and Rh blood grouping.	25

3	Microscopy Working principle, techniques and application of various types of microscope (light microscope, dark field microscope, phase contract microscope, fluorescent microscope, confocal microscope and electron microscope).	20
4	Morphology & Classification Nomenclature and Classification of microbes (in brief), Size and Shape, morphology of bacteria: Structures of a bacterial cell and their functions, physiology of Bacteria: nutrition, gaseous requirement, temperature requirement and other growth requirements. Immunology Immunity and types of immunity, Infection: sources of infection, modes of transmission, factors predisposing to microbial , pathogenicity, types of infectious diseases types of vaccine and Immunization schedule Sterilization and Disinfection sterilization and Disinfection in detail, principles and use of equipments of sterilization (Namely Hot Air Oven, Autoclave, Inspissrator and Pasteurization) antiseptic and disinfectants	35
5	Hospital infection Causative agents, transmission methods, prevention and control hospital infection, blood born infections, virology viral infections with special mention of hepatitis, poliomyelitis, HIV and rabies, FLU (Influenza) , Dengue, Chikungunya, basics of parasitology.	20

Reference Books:

1. Text book of pathology by Harsh Mohan.
2. Practical Haematology by DACIE & LEWIS.
3. Monika Chesbrow District laboratory practice in Tropical countries II volume.
4. Baveja Medical Paracytology.

Pathology and Microbiology

Practical	Subject Code- BRTT-251P	
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4	
S.No.	List of Experiments	Credit Hours
1.	Blood Grouping Rh typing, Hb Estimation, Packed Cell Volume (PCV), Erythrocyte Sedimentation Rate (ESR).	120
2.	Bleeding Time, Clotting Time.	
3.	Parts of Microscope. Grams stain and Acid Fast staining.	
4.	Demonstration and sterilization of equipments – Hot Air oven, Autoclave, Bacterial filters , Demonstration of commonly used culture media, culture methods: Nutrient broth, Nutrient agar, Blood agar, Chocolate agar, Mac-Conkey medium, LJ media, Robertson Cooked meat media.	
5.	Visit to hospital for demonstration of Biomedical waste management.	

Reference Books

1. Bancroft : Theory and Practical of Histology techniques.
2. Textbook of Clinical Blood Banking Science by Zmijewski.
3. Manual for Clinical Pathology by Sabitry Sanyal.
4. Practical Pathology by Dr.P.Chakraborty & Gargi Chakraborty.
5. Haematology for students and practitioners by Ramnik Sood.

PAPER-2: Radiotherapy Equipments and Quality Assurance

Theory	Subject Code- BRTT-202
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

Course Objective

Students learn in this subject about role of linear Accelerator, Isotopic Teletherapy Machines. Students also learn in this chapter about mould room equipment and simulators.

Course Outcomes (COs)

CO 1- Use linear Accelerator for Radiotherapy Procedure.

CO 2- Students get knowledge of the evolution of radiotherapy equipment throughout history.

CO 3- Use of mould room equipments and simulator.

CO4- The end of the course students learn about quality Assurance of Radiotherapy equipments.

CO 5- Students perform radiotherapy procedure by cobalt 60.

Unit	Contents	Credit Hours
1	Historical Development Kilo voltage Unit- Grenz Ray Therapy, Contact therapy, superficial therapy, deep therapy, megavoltage therapy, vande graff generator ,Isotopic teletherapy machines ,Linear accelerator Betatron microtron , cyclotron- Heavy particle beams.	20
2	Isotopic teletherapy machines Radio isotope units ,physical components of cobalt 60 unit, source housing beam collimation and penumbra , cesium 137 units , advantages and disadvantages ,shutter system ,primary and secondary collimator, trimmers , penumbra , optical distance indicator ,source housing ,control panel , T rod and its function ,beam modifiers ,wedges.	20
3	Linear accelerators: linear accelerator, electron gun, wave guide, magnetron , klystron , bending magnet, target materials, beam flattening filters, sealed ion chambers , scattering foil , carousal , multi leaf collimator wedges, dynamic wedge, enhanced dynamic wedge , motorized wedge , accessory tray, Couch Optical system, Laser systems, relative merits and demerits of Co 60 and linac units.	30

4	Mould room equipments and simulators immobilization devices, plaster of paris mould (POP), thermoplastic mould, acrylic mould, vacuum immobilization cushion blocks, custom blocks, electron cut-outs, hot wire cutter role of simulators, virtual simulator, CT simulator, electronic portal imaging device (EPID), cone beam computed tomography (CBCT), kilo voltage cone beam computed tomography (kV-CBCT), mega voltage cone beam computed tomography (MV-CBCT)	20
5	QA in Radiotherapy accessories and tools used for QA tests in radiotherapy, optical and radiation field congruence, beam shaping blocks, beam shaping jaws, delineator/diaphragm movements, isocentre alignment, Patient support system, beam on and Off mechanisms, technician's role in QA tests on telecobalt/linear accelerator/simulator/CT simulator machines.	20

Reference Books:

1. The Physics of Radiology Harold Elford Johns & Jonh Robert Cunningham.
2. The Physics of Radiation Therapy Faiz M. Khan.
3. Radiation Oncology physics A Handbook for Teachers and Students – E.B. Podgorsak.

Radiotherapy Equipment's and Quality Assurance

Practical	Subject Code- BRTT-252P
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

S.No.	List of Experiments	Credit Hours
1	Linear Accelerator	120
2	Isotopic Teletherapy Machines	
3	CT simulators	
4	Cyclotron , Betatron	
5	Microtran	
6	Cyclotron	
7	QA for Radiotherapy equipments	

Reference Books:

1. The Physics of Radiology Harold Elford Johns & Jonh Robert Cunningham.
2. The Physics of Radiation Therapy Faiz M. Khan.
3. Radiation Oncology physics A Handbook for Teachers and Students – E.B. Podgorsak.

PAPER-3: Radiobiology

Theory	Subject Code- BRTT-203
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

Course Objective

In this Subject students learn about the mechanism of radiation effects in human body and its application in radiotherapy.

Course Outcomes (COs)

CO 1- Students will have learned about cell injury, inflammation, and healing by the end of the course.

CO 2- The end of the course the students learn about biological effect of radiation.

CO 3- comprehends how radiation interacts with materials.

CO 4- The students learn about cell kinetics after the end of the course.

CO 5- Understand about basic cell biology & Radiobiology.

Unit	Content	Credit Hours
1	Interaction of radiation with matter : Photoelectric absorption, Compton scattering, pair production, dependence on the nature and atomic number of the absorber and on the radiation energy, range of secondary electron and its practical importance. Biological effects of radiation I: Direct effect and indirect effects of radiation, radiolysis of water, effects of various radiation on normal tissues and malignant tumor, early and late reaction on Skin, mucous membrane, GI tract, genito urinary system, respiratory system, CNS, effects of radiation on living cell, action on cancer tissue, radio sensitivity of different tissues, skin reaction and their treatment, reaction on muscle membrane, late effects on workers, effects on blood, effects on reproductive organs, effects on other organs, radiation sickness, effect of low LET and high LET radiation on cell, cell survival curves, effect of sensitizing and protective agents.	30
2	Biological effects of radiation II: Dose modifying factors and their determination, variation of response with growth and the progression of cell through the phases of cell cycle, hyperthermic and photodynamic injury, chromosomal aberration and	20

	application for the biological dosimetry.	
3	Biological Hazards: Acute and chronic exposure, LD50/60 biological hazards of irradiation, effects on the embryo and the fetus, life shortening, leukaemogenesis and carcinogenesis, genetic and somatic hazards for exposed individuals and population, biological basis of radiological protection, importance of correct dosage, blood supply, time factor, fractionation, quality radical and palliative treatment	30
4	Factors influencing radiation response: Physical factors: dose, dose quality, dose rate temperature. Chemical factor: oxygen, radio sensitizers, radioprotectors. Biological factors: Type of organism, cell type and stage, cell density and configuration, age, sex. Host factors: partial and whole body exposure, 4 R's of radiobiology, tumor doubling time.	15
5	Cell kinetics: cell cycle regulatory control mechanisms , tumor biology, cell , survival curve, LET, RBE , OER, The four 'R's of radiobiology , tissue structure and radiation effect , the linear quadratic (LQ) model , tumor control probability (TCP), normal tissue complications probability (NTCP)	25

Reference Books:

1. Radiobiology for the radiologist. Eric J Hall; Amato J Giaccia; Publisher: Philadelphia : Wolters.
2. Kluwer Health/Lippincott Williams & Wilkins, ©2012.
3. Basics of Oncology, Fred Stephens; K Aigner; Publisher: Cham, Springer International Publishing.

PAPER-4: Radiation Protection and Safety

Theory	Subject Code- BRTT-204
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

Course Objective

In this subjects students study about the units and quantity of radiation, Personnel and area monitoring devices, regulatory requirements and radiation Hazards.

Course Outcomes (COs)

CO1- Understand about unit & quantity of radiation.

CO2- The end of the course students learn about radiation hazards.

CO3- Students are aware of area and personal monitoring equipment.

CO4- Students have knowledge of TLD and a film badge.

CO5- Apply ALARA principle during radiotherapy procedure.

Unit	Content	Credit Hours
1	Radiation Units and Quantity Roentgen, rad, Gy, REM, Sievert, quantities used in radiological protection, radiation , weighing factors , equivalent dose , tissue weighing factors – Effective dose. Radiation exposure control, time, distance and shielding, concept of “As Low As reasonable achievable” (ALARA), biological effects of radiation exposure, somatic, genetic, acute chronic, stochastic and Deterministic effects.	20
2	Personnel and Area Monitoring Device: Need for personnel monitoring, film badge and TLD badge, pocket dosimeter, need for area monitoring, gamma zone monitors, survey meters, pocket dosimeter-radiation survey meter wide range survey meter, zone monitor, contamination monitor, their principle, function and uses.	20
3	Regulatory requirements National regulatory body, responsibilities, organization, safety standards, codes and guides, responsibilities of licensees, registrants and employers and enforcement of regulatory requirements.	20

4	Radiation hazard evaluation and control Philosophy of radiation protection, effect of time, distance and shielding, weekly dose to the radiation worker and general public, good work practices in diagnostic radiology and radiotherapy practices, Planning consideration for radiology and radiotherapy installation, operational limits, personnel monitoring.	30
5	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 radiation emergencies.	30

REPORTS RECOMMENDED:

Latest reports on:

1. AERB safety code.
2. Safety code for Medical diagnostic x-ray.
3. Safety code for Radiation Therapy Sources, Equipment and Installations.

Reference Book:

1. Physics for Radiation Protection, 2nd Edition – James E.Martin

Radiation Protection and Safety

Practical	Subject Code- BRTT-253P
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

S.No.	List of Experiments	Credit Hours
1	Personal Monitoring device	120
2	Area monitoring device	
3	Units and Quantity of Radiation	
4	Radiation Hazards Evaluation and Control	
5	Biological effect of radiation protection	
6	Philosophy of radiation protection, TDS rule	
7	Role of technicians in handling radiation emergencies	

Reference Book:

1. Physics for Radiation Protection, 2nd Edition – James E.Martin

PAPER-5: Radiotherapy Techniques

Theory	Subject Code- BRTT-205
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

Course Objective

This subject covers the Immobilization Devices, Beam Modifying and shaping devices, electron beam therapy, external beam therapy and mould room technique.

Course Outcomes (COs)

CO 1- Understanding of the basic concepts, theories & method of immobilisation devices in radiotherapy.

CO 2- The students understand about beam modifying and shaping devices after the end of the course.

CO 3- The end of the course the students learn about electron beam tele therapy.

CO 4- students understand about the mould room technique

CO5- Evaluating the quality management of different imaging modalities in radiotherapy Department.

Unit	Content	Credit Hours
1	Immobilization devices : Importance of immobilization in radiotherapy, immobilization methods , method of beam alignment ,treatment execution, treatment verification ,changes in patient position , target volume and critical volume during course of treatment, body in homogeneities: effects of patient contour, bone, lung cavities, prosthesis on dose distribution. dose within bone, lung cavities, interface effects, electronic disequilibrium.	20
2	Beam modifying and shaping devices: Wedge filters and their use, wedge angle , wedge factors , wedge systems ,wedge isodose curves bolus, build-up material, compensators , shielding of dose limiting tissue, Non-divergent and divergent beam blocks, Independent jaws, multileaf collimators.	20
3	Electron Beam Therapy Production of electron beams: using accelerators-characteristics of electrons, Surface dose, percentage depth dose, beam profiles,	30

	Isodose curves and charts, Flatness and symmetry, beam collimation, variation of percentage depth dose and output with field size, and SSD, photon contamination, energy spectrum-energy and field size choice, air gaps, and obliquity, tissue in homogeneity lung, bone, air filled cavities. Field junctions , external and internal shielding, Arc therapy, use of bolus in electron beam, total skin electron irradiation, intraoperative radiation therapy. External beam therapy practical experience Technique of fixed beam treatments, single field, parallel fields, multiple fields, regional fields, the use of wedge filters, compensators and shaping blocks, diaphragms and applicators. immobilization of the patient, rotation and arc therapy- beta ray and electron beam therapy, care of machine-Set up single, multiple fields, use of wedges, shields and tissue compensators, use of beam directional devices, methods of patient immobilization, knowledge of technique involving electron beam therapy-moving beam therapy, conformal therapy, stereo tactic radio surgery and radiotherapy, handling emergencies in teletherapy.	
4	Mould room technique: Construction of casts, construction of applicator and moulds, construction of shields.	25
5	Chemotherapy: Chemo-radiation, concepts of combined modality treatment and the significance of radiation and chemotherapy in comprehensive management of cancer, sequelae associated with multimodality therapy and their management.	25

Reference Books:

1. Technical basics of Radiation Therapy Levitt S H, Purdy JA.
2. Radiation Oncology –Rationale, technique, & results – Moss.
3. Short text book of radiotherapy; Walter and Miller.
4. Principles and practice of Radiation Oncology= Perez & Brady.
5. Radiation Oncology –Rationale, technique, & results – Moss.

Hospital Postings

Practical	Subject Code- BRIT-254P
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits: 4

S. No.	List of Experiments	Credit Hours
1.	Perform Mould room techniques in radiotherapy department	120
2	Perform External beam therapy in radiotherapy department	
3.	Perform Internal beam therapy in radiotherapy department	
4.	Beam modifying and shaping devices use during exposure	
5.	Uses Immobilization devices for radiotherapy procedure	

Bachelor of Science in Radiotherapy Technology (B.Sc. RTT)

YEAR-3

PAPER-1: Medical Ethics and Patient Care

Theory	Subject Code- BRTT-301
Total Marks for Evaluation- 100	No. of Contact Hours- 120, Credits:4

Course Objective

In this subject students will study about values of life, history of medical ethics and preparation of patient for radiotherapy procedure.

Course Outcomes (COs)

CO 1- After the completion of the course students able to use code of ethics.

CO 2- Students learn about good communication skills.

CO 3-The end of the course student learns about patient preparation for radiotherapy procedure.

CO 4- Students able to care the patient during and after the radiotherapy procedure.

CO 5- Students get knowledge of the medication used in the radiotherapy department.

Unit	Content	Credit Hours
1	History of Medical Ethics: Indian perspectives charaka, susruta, the Hippocratic Oath, declaration of Helsinki , WHO declaration of Geneva, International code of Medical Ethics, Values of life (Philosophy) in clinical practice & Definition of medical ethics. Ethical problems of life: Right to life, prenatal screening / sex selection, abortion, feticide , assisted reproductive technologies, genetic testing , genetic engineering, cloning, care of terminally ill, death and dying, euthanasia, etiquette and mannerism, good communication skill, truthfulness, building trust, honesty with patients, communication with colleagues, seniors and subordinates.	25
2	Confidentiality : Malpractice, negligence, Medical ethics and law Code of ethics: (Please refer Annexure for elaborations) Duties to patients, duties to colleagues and other professionals, duties to yourself, duties to society, duties to your profession,	25

	specific issues.	
3	Preparation of patients for general radiotherapy procedures: Departmental instructions to outpatients or ward staff- use of aperients; enemas and colonic irrigations flatulence and flatus, causes and methods of relief principles of catheterization and intubation, premedication. Its uses and methods; anesthetized patients; diabetic patients' special attention to food hazards of trauma. Preparation of the patients of biopsy and trolley set up; trolley set up for ENT examination, preparation of the patients for pelvic examination and trolley set up, general welfare of the patients during and after the treatment including the care of any inter current diseases (diabetes, tuberculosis, arthritis), diet and fluid intake.	20
4	Radiotherapy procedures: The observation and reporting any change in the signs and symptoms of patients receiving treatment, the use of blood count in the control of certain treatment, the care of blood counts, the care of local and systematic reaction, local reaction showed include those in the ear, nose, throat and eye and those arising from treatment given to the pelvis, instrumentation the absolute necessity for accuracy in every aspects of each individual treatment, the terminal care of dying patients.	30
5	Organization of radiotherapy: Department practice, appointment organization in the planning room, treatment area. Management of waiting patients. Drugs used in Radiotherapy: Basic knowledge on drugs used in the department.	30

Reference Books:

1. Nursing foundation by Anuradha
2. Medical Surgical nursing by Javed Ansari and Lewis 3- Stewart C B., MRI Physics and Biological Principle

Medical Ethics and Patient Care

Practical	Subject Code- BRTT-351P
Total marks for evaluation- 100	No. of contact hours- 120, Credits: 4

S. No.	List of Experiments	Credit Hours
1.	Values of life And history of medical ethics	120
2.	Code of ethics	
3.	Patient preparation for general radiotherapy procedure	
4.	Drug used in radiotherapy	
5.	Good communication Skills	

Reference Books:

1. Nursing foundation by Anuradha
2. Medical Surgical nursing by Javed Ansari and Lewis 3- Stewart C B., MRI Physics and Biological Principle

PAPER-2: Recent Advances in Radiotherapy Techniques

Theory	Subject Code- BRTT-302
Total marks for evaluation- 100	No. of contact hours- 120, Credits:4

Course Objective

In this subject students learn about conformal radiotherapy, IMRT radiotherapy and Stereo tactic irradiation methods.

Course Outcomes (COs)

CO 1- Students able to perform Conformal Radiotherapy.

CO 2- Understand about Special techniques in Radiotherapy

CO 3- Students able to apply IMRT in Radiotherapy.

CO 4- Knowing about radiation therapy with high LET radiation.

CO 5- Students able to apply stereo tactic method for treatment of the cancer.

Unit	Contents	Credit Hours
1	Introduction to Special techniques in Radiotherapy such as SRS, SRT, IMRT, IGRT & Helical Tomotherapy, and Volumetric modulated arc therapy, Robotic radiotherapy, PET in radiotherapy treatment planning, Particle therapy with proton beam and heavy ions and challenges in technologists job due to the introduction of new technologies. Conformal radiotherapy ((CRT): Principles, Advantages over conventional methods Virtual Simulation: Principles, CT simulation, TPS based simulation, Differences, Merits and Demerits, Practical considerations Essential requirements for conformal radiotherapy Various methods of CRT Modulated Radiation Therapy (IMRT) Using 3D compensators Static IMRT dynamic IMRT Dynamic arc IMRT Micro MLC Tomtherapy methods time gated (4 D) radiotherapy merits and demerits of IMRT	20
2	Stereo tactic irradiation methods: Physics principles merits and demerits, stereotactic radio surgery (SRS) and stereotactic radiotherapy (SRT), whole body stereo tactic frame. Combination Radiation Surgery Pre, post and intraoperative radiation rationale, radiobiological factors, current clinical results. Combination Radiation –Chemotherapy	20

	Definitions of radio sensitizers, synergism, potentiation, antagonism radio sensitizer type mechanism.	
3	High LET Radiation Comparison and contrast with low LET radiation. Proton therapy, Neutron source and boron neutron capture advantages and disadvantages, RBE values, hazards of low dose and low energy neutrons, RBE values, hazards of low dose and low energy neutron, use in radiotherapy, combination with low LET, current clinical results. Other high LET particles: protons, high energy heavy nuclei, application to radiotherapy, current clinical results.	30
4	Hyperthermia Sources, rationale, advantages and disadvantages, thermo tolerance. Cellular damage, comparison and contrast with radiation, thermal and non-thermal effects of ultrasound, microwaves, radiofrequency, etc. General host responses use along with radiotherapy and chemotherapy: optimum sequencing of combined modalities. Current limitations to the clinical use of hyperthermia.	25
5	Immunotherapy Monoclonal antibody therapy radioimmunotherapy. Radioactive isotopes used for diagnosis and therapy Molecular and Genetic Oncology Somatic correction of gene defect genetic pro-drug activation Genetic immunomodulation. Gene therapy, molecular therapy, cancer vaccines. Information Technology/ Networking in radiotherapy: Networking of planning and treatment units in a radiotherapy department including picture archival communication System (PACS), advantages, patient data management. Know the Cancers prevalent in Indian subcontinent Basics of Palliative & supportive care – Care of terminally ill cancer patients. Specialized oncology care pertaining to the needs of cancer patients– Palliation pain management patient's and relatives counseling on end stage management.	25

Reference Books:

1. New Technologies in Radiation Oncology – L. W. Brady.
2. IMRT, IGRT, SBRT–Advances in treatment planning Meyer JL.
3. Targeted Radionuclide Therapy Speer T W.

Recent Advances in Radiotherapy Techniques

Practical	Subject Code- BRTT-352P
Total marks for evaluation- 100	No. of contact hours- 120, Credits: 4

S.No.	List of Experiments	Credit Hours
1.	Immunotherapy	120
2.	Molecular and genetic oncology	
3.	Hyperthermia	
4.	High Let radiation therapy	
5.	Conformal Radiotherapy	

Reference Books

1. New Technologies in Radiation Oncology – L. W. Brady.
2. IMRT, IGRT, SBRT –Advances in treatment planning Meyer JL.
3. Targeted Radionuclide Therapy Speer T W.

PAPER-3: Principles and Practice of Radiotherapy

Theory	Subject Code- BRTT-303
Total marks for evaluation- 100	No. of contact hours- 120, Credits:4

Course Objective

In this subject students learn about cancer registry, spread of cancer, choice of Radiotherapy and tumors of bone and soft tissue.

Course Outcomes (COs)

CO 1- The end of the course students is able to prevent of cancer by radiotherapy.

CO 2- The end of the course students understands about the Cancer.

CO 3- Recognize the choices for radiation therapy after the course is over.

CO 4- Understand about the chemotherapy and hormone therapy.

CO 5- By the completion of the course, students will have knowledge about soft tissue and bone malignancies.

Unit	Contents	Credit Hours
1.	Cancer registry - epidemiology and prevention of cancer, methods of treatment of malignant disease, chemotherapy, hormone therapy, radiotherapy and surgery - relative value of each method for individual tumors or tumor sites.	20
2.	Spread of cancer – local Spread, spread by lymph nodes, spread by bloodstream, cavity spread staging of cancer choice of treatment: Anatomical site, relation to other tissue, extent of tumor and histology, place of previous treatment, place of radical and palliative therapy	25
3.	Choice of Radiotherapy: Tumor sensitivity, anatomical site, relation to other structure availability of equipment, concepts of combined modality treatment, sequel associated with multimodality therapy and their management , Hypothermia , Immunotherapy	30
4.	A Radiotherapeutic Management of the following Cancer and occasional Benign Diseases: Skin cancers: squamous cell	

	carcinoma, basal cell carcinoma, malignant melanoma, skin and its appendage tumors. Head and neck tumors: oral cavity, nasal cavity and paranasal sinuses, nasopharynx, oropharynx, laryngopharynx, larynx, salivary glands, ears. Thoracic tumors : lung, esophagus, thymus. Gastrointestinal tumors: stomach pancreas, liver, gall bladder, colon, rectum anal canal. Urological tumors: kidney, ureter, urinary bladder, urethra Gynecological cancer: uterus, ovary, cervix, vagina, vulva Male genital tumors: prostate, testis, penis, breast cancer.	25
5.	Tumors of bone and soft tissue : osteosarcoma, Ewing's tumor, fibro sarcoma, Lympho reticular tumors : Hodgkin's disease, non-Hodgkin's lymphoma Hematological malignancies : Leukemia, multiple myeloma. CNS tumors : Gliomas, meningioma, medulloblastoma cancer in children: retinoblastoma, Wilm's tumor, neuroblastoma, rhabdomyo sarcoma Endocrine tumors: thyroid, pituitary, adrenal orbital and ocular tumors, metastasis of unknown primary site.	20

Reference Books:

1. Radiotherapy Treatment Planning – Richard F Mould .
2. Practical Radiotherapy planning - Jane Dobbs, Ann Barrett, Daniel Ash.
3. Radiation Therapy Planning – G.C. Bentel.

PAPER-4: Radiotherapy Treatment Planning

Theory	Subject code- BRTT-304
Total marks for evaluation- 100	No. of contact hours- 120, Credits:4

Course Objective

This subject covers beam therapy, two dimensional planning, three dimensional planning and electron beam therapy.

Course Outcomes (COs)

CO1- The student will be able to perform beam therapy after end of the course.

CO2- The learner will be able to perform two dimensional planning in radiotherapy.

CO3- The end of the course students learn about electron beam therapy.

CO4- The end of the course will be able to perform three dimensional planning in radiotherapy.

CO5- Understand about Tissue air Ratio off axis ratio Percentage depth dose.

Unit	Content	Credit Hours
1	Beam Therapy: Physics of Photons, electrons, protons and neutrons in Radiotherapy, Dosimetric Parameters, Percentage Depth Dose (PDD), Tissue Air Ratio (TAR), Off Axis Ratio (OAR), Tissue Maximum Ratio (TMR), Tissue Phantom Ratio (TPR), Back Scatter Factor (BSF), Scatter Air Ratio (SAR), SSD and SAD techniques, Rotation Technique, Time and Dose calculations in SSD, SAD and Rotation Techniques. Isodose distributions, Isodose charts, measurement of isodose curves, parameter of isodose curves, Wedge filters, design compensators.	30
2	Two Dimensional Planning : Single field, Parallel opposed, Multiple fields, integral dose, isocentric technique, stationary therapy, rotation therapy – wedged field techniques, open and wedged field combinations. Physics of Bolus, Phantom materials, compensators, wedges and custom blocks.	25
3	Three Dimension (3D) planning: Conformal Therapy Basic calculations, Description of a treatment planning system (TPS) - 2D and 3D TPS, Beam data input, Patient data with CT/MRI/Ultrasound, ICRU volumes, GTV, CTV, PTV, ITV, OAR, PRV, Tumour dose prescription and	20

	specification	
4	Treatment Planning: Mean, maximum, minimum, median and modal doses ,Number of fractions , Treatment time , Monitor unit (Photon & Electron) Manual and computerized planning ,Beams Eye view , DRR , color wash Dose Volume histogram Treatment verification ,port films ,EPID CBCT , kVCBCT , MVCBCT	20
5	Electron Beam Therapy: Characteristics of electrons beams - Surface dose, percentage depth dose, beam profiles, Isodose curves and charts, Flatness and symmetry, Beam collimation, variation of percentage depth dose and output with field size, and SSD, photon contamination, Energy spectrum-Energy and field size choice, air gaps, and obliquity, Tissue in homogeneity lung, bone, air filled cavities. Field junctions ,External and internal shielding	25

Reference Books:

1. The Physics of Radiation Therapy Faiz M. Khan.
2. Radiation Oncology physics A Handbook for Teachers and Students – E.B. Podgorsak.
3. Radiotherapy Treatment Planning – Richard F Mould.
4. Practical Radiotherapy planning - Jane Dobbs, Ann Barrett, Daniel Ash.
5. Radiation Therapy Planning – G.C. Bentel.

PAPER-5: Clinical Oncology

Theory	Subject Code- BRTT-305
Total marks for evaluation- 100	No. of contact hours- 120, Credits:4

Course Objective

In this subject student learn about tumors staging and grading, non-malignant disease and national programme against cancer.

Course Outcomes (COs)

CO1- The students learn about imaging methods and other diagnostics staging and prognostic testing.

CO2- The end of the course students is able to staging and grading of tumours.

CO3- Students get to learn about the early and late side effects of cancer treatment.

CO4- Students learn about national programmes against cancer.

CO5- To performs patient handling in the radiotherapy department.

Unit	Content	Credit Hours
1	Basic Clinical examination & Performance status: General observation of a patient including various objective scoring- Karnofsky Performance Score, ECOG score, Glasgow-Coma-Scale, Quality of Life score (EORTC, RTOG), body weight, height, body surface area, food intake abilities and stomas. Biopsy: Invasive tissue retrieval methods for diagnosis like biopsy (core-needle, punch, wedge, excision), FNAC, liquid biopsy etc.	15
2	Imaging methods & other diagnostic, staging and prognostic testing: Imaging using CT, MRI, PET, Ultrasound etc. and tumour biomarkers. Tumour Staging and grading: AJCC-TNM staging, FIGO and other commonly used systems. Tumour grading Non-malignant diseases: Radio-therapeutic management of Keloids, Meningiomas, Craniopharyngiomas, Fibrotic	25

	tumours and other benign tumours. Primary management of malignancy: The epidemiology, aetiology, detection, diagnosis, patient condition, treatment and prognosis of tumours of the thorax, gynecologic cancer, lymphomas, breast, paediatric Neoplasms, genitourinary tract, gastrointestinal tract, and leukaemia, skin cancer, endocrine system, head and neck cancer, eye and orbit, central nervous system, bone and soft tissue tumours will be discussed.	
3	Acute & late toxicities of cancer treatment: Side effects related to radiation and dose - Acute and Late side effects - Monitoring of side effects - Information and Communication - Documentation of side effects- Concepts of reirradiation. Radiation-induced second malignancies- Role of Nutrition.	25
4	National Programmes against cancer: National Cancer Control Programme, NCPCCS, ICMR Cancer Registry Cancer prevention : Primordial prevention, Primary prevention, Secondary prevention, Tertiary prevention, Screening programme, Breast - Prostate - Colorectal - Skin - Cervix cancers, Signs and symptoms, Public awareness on early signs and symptoms.	25
5	High risk groups: Population at high risk of developing cancer especially preventable cancers like cervical cancer, Head & Neck Lung cancers, Liver cancers. Patient handling & Care: General of the patient, Handling patients and assisting in their body movements for simulation, treatment setup and verification, preparation for patient setup and treatment delivery, skin care, nutrition, dietary advice, care of body tubes like nasogastric tubes-tomas-wound care, handling special situations like unconscious patient, mobility issues etc.	30

Reference Books:

1. Fletcher Diagnostic and Histopathology of tumors.
2. Introduction to Clinical Pathology – Harsh Mohan.
3. Short text book of radiotherapy Walter and Miller:
4. Cancer explained; Sultan and Maurice.
5. Radiation therapy in the management of cancers; Fletcher, Gilbert.

Hospital Postings

Practical	Subject code- BRIT-353P
Total marks for evaluation- 100	No. of contact hours- 120, Credits:4

S.No.	List of Experiments	Credit Hours
1.	Students shall be deputed to various labs of Radiotherapy department wherein they shall undergo practical	120
2.	Training of handling patients, report collection treatment planning.	
3.	Identification of patient's particulars based on CR number, patient monitoring, history taking.	
4.	Operating various radiotherapy modalities	
5.	Process of performing various procedures in different posting area	
6.	Students perform advance radiotherapy technique	
7.	Each student is required to maintain a logbook of the various posting. Student's performance shall be evaluated on continuous basis by the faculty posted in various sections.	
8.	Assessment records of each student posted in his/her section on monthly basis to the HOD. Marks will be awarded out of 100.	

Ordinance No.

Ordinance of Value Added Course on Personality Development and Entrepreneurship
(Course Code- 24VACPDEC1)

Chapter-1

General Criteria

1. This ordinance is related to value added course '**Personality Development and Entrepreneurship**'
2. It shall be come into force from the academic session 2024-25.
3. This course is offered to PG students only.
4. This value added course fulfils the demand of NEP-2020 and other competitive domains of career enhancement.
5. The duration of course is- **40 hrs.**
6. Total Credits- **02**

Chapter-2

Course Curriculum

Name of Department	Department of Paramedical Sciences	Name of Course Coordinator	Dr. Anshu Kumar Singh
Name of the Value Added Course	Personality Development and Entrepreneurship	Course Code	24VACPDEC1
Duration of Course	40hrs	Credits	02
Max. Marks	50	Time for End Term Examination	01:30 hrs

Note: - The questions from the both I & II units have to cover in the assessment of said value added course. The examiner has to set the 08 questions from both units each carrying the 10 marks and candidate has to attempt five questions 02 from unit and 03 from form unit 02.

Course Objectives:-

1. **Enhance Self-Confidence and Self-Esteem:** The course might aim to build your confidence through activities and exercises. This can help you project yourself positively in various situations.
2. **Improve Communication Skills:** You might learn effective communication techniques, both verbal and non-verbal, to express yourself clearly and connect with

others.

3. **Develop Soft Skills:** The program could target essential soft skills like teamwork, leadership, time management, and problem-solving, all valuable assets in both personal and professional life.
4. **Positive Self-Image:** The course might help you identify your strengths and weaknesses, build a positive self-image, and develop a growth mindset.

Course Outcomes:-

1. **Business Fundamentals:** You might gain an understanding of core business concepts like marketing, finance, and operations.
2. **Opportunity Recognition:** The program could help you develop an eye for spotting business opportunities and assess their feasibility.
3. **Business Planning:** You might learn how to create a business plan, a roadmap for launching and running your venture.
4. **Entrepreneurial Mindset:** The course could aim to cultivate essential characteristics of an entrepreneur, such as creativity, innovation, resilience, and risk-taking ability.

Unit-I

Personality Development:-

- Understanding personality and its components.
- Importance of personality development in personal and professional life.
- Setting goals for self-improvement.
- Identifying and overcoming negative self-talk.
- Recognizing your strengths and achievements.
- Developing a positive body image.
- Building self-acceptance and self-compassion.
- Effective verbal communication techniques (active listening, clear articulation, confident body language).
- Non-verbal communication skills (eye contact, posture, facial expressions).
- Public speaking skills – overcoming stage fright and delivering impactful presentations.
- Identifying sources of stress.
- Exploring healthy coping mechanisms for dealing with stress.
- Techniques for relaxation and mindfulness.
- Understanding emotions and their impact on behavior.
- Developing self-awareness and managing emotions effectively.
- Building empathy and improving interpersonal relationships.

Unit-II

Entrepreneurship

- Definition, history, and evolution of entrepreneurship.

- Role of entrepreneurs in economic development.
- Myths and realities of starting a business.
- Identifying entrepreneurial traits and characteristics.
- Techniques for brainstorming and generating business ideas.
- Identifying market needs and problems.
- Evaluating business ideas for feasibility and potential.
- Conducting market research and competitor analysis.
- Importance and components of a business plan.
- Writing a compelling mission statement and value proposition.
- Developing market analysis and marketing strategies.
- Creating financial projections and securing funding.
- Legal considerations for starting a business.
- Understanding your target audience and customer segmentation.
- Developing effective marketing strategies and tactics.
- Utilizing digital marketing tools and social media platforms.
- Building a strong brand identity and creating a competitive advantage.
- Understanding financial statements (income statement, balance sheet, cash flow statement).
- Financial forecasting and budgeting for your business.
- Exploring funding options (bootstrapping, loans, angel investors, venture capitalists).
- Managing finances and ensuring financial sustainability.
- Understanding the core business processes of a startup.
- Designing and optimizing your production or service delivery system.
- Managing inventory, supply chain, and logistics.
- Building a strong operational infrastructure.
- Developing a business launch strategy and timeline.
- Building a strong team and delegating tasks effectively.
- Customer service strategies and building customer loyalty.
- Adapting to challenges and managing risks.
- Business idea development and feasibility analysis project.
- Case studies and group discussions.
- Business plan development and presentation.
- Class participation and engagement.
- Entrepreneurships idea and implementation in medical laboratory technology.
- Entrepreneurships idea and implementation in medical imaging technology.
- Guest speaker Q&A sessions.

Reference Books:-

- **Quiet: The Power of Introverts in a World That Can't Stop Talking" by Susan**

Cain

This book explores the strengths and challenges of introverts and how they can leverage their unique qualities to thrive in a world that often favors extroverts.

- **Emotional Intelligence 2.0" by Travis Bradberry and Jean Greaves**

This book delves into the concept of emotional intelligence (EQ) and provides strategies for improving your EQ skills, which are essential for effective communication, building strong relationships, and managing stress.

- **The Happiness Project" by Gretchen Rubin**

This is a personal growth memoir where the author details a year-long experiment where she focused on different aspects of happiness to find what worked best for her. It can serve as a guide for self-reflection and positive change.

- **Mindset: The New Psychology of Success" by Carol Dweck**

This book explores the concept of mindset and how our beliefs about our abilities can shape our success. It emphasizes the importance of a growth mindset for learning, resilience, and achieving goals.

- **The Lean Startup" by Eric Ries**

This book is a popular guide to the Lean Startup methodology, which emphasizes iterating, testing, and pivoting your business idea based on customer feedback.

- **Business Model Generation" by Alexander Osterwalder and Yves Pigneur**

This book provides a framework for developing and documenting your business model, which is a blueprint for how your business will create, deliver, and capture value.

- **Start with Why: How Great Leaders Inspire Everyone to Take Action" by Simon Sinek**

This book emphasizes the importance of having a clear vision and purpose (the "why") behind your business to inspire and motivate yourself and others.

- **Zero to One: Notes on Startups, or How to Build the Future" by Peter Thiel**

This book discusses how to create innovative businesses and avoid competition by focusing on creating unique value.