SHRI GURU RAM RAI UNIVERSITY

[Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized by UGC u/s (2f) of UGC Act 1956]

SYLLABUS FOR

Bachelor Of Medical Radio Imaging and Technology

With CO and PO Mapping

School of Paramedical and Allied Health Sciences

(W.E.F 2024-2025)

BACHELOR OF MEDICAL RADIO IMAGING AND TECHNOLOGY

OUTCOME BASED EDUCATION

Programme outcome (POs)

Students will be able to

PO 1	Develop basic knowledge of anatomical and physiological composition of body.
PO2	Identify, understand, formulate and solve problems related to radiological equipment
PO3	Design and develop solutions in case of emergency condition during radiological examination and identify various pathological conditions.
PO4	Develop an understanding to emphasize the ability to communicate effectively in different contexts, including academic, professional, and everyday situation.
PO5	Apply the basic and advanced knowledge of hardware, software and applications of computers in health care systems.
PO6	Develop an understanding to evaluate the factors affecting technical quality of images and various pathological conditions.
PO7	Develop an understanding of the impact of radiation on society.
PO8	Analyse and evaluate contemporary environmental issues and their impacts on natural and human systems Understand their ethical and legal responsibilities as a radiographer.
PO9	Understand the importance of team work while handling patients with drugs & equipment in general as well as in emergency situations.
PO10	Develop understanding of laws/provisions for radiation safety by various regulatory bodies.
PO11	Implement and follow standard protocols while doing various radiological procedures and scans to avoid any reaction.
PO12	Maintain quality assurance, quality control measures, safety procedures and maintenance of radiological equipment.

SHRI GURU RAM RAI UNIVERSITY DEHRADUN (UTTARAKHAND)

REGULATIONS OF THE UNIVERSITY FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE ON MEDICAL RADIO & IMAGING TECHNOLOGY

In exercise of the powers conferred by section of the SGRR University Act no.3 of 2017.Academic Council of the Shri Guru Ram Rai University Dehradun hereby makes the following regulations:

SHORT TITLE AND COMMENCEMENT

(1) These regulations shall be called "THE REGULATIONS FOR THE BACHELOR OF SCIENCE IN MEDICAL RADIO & IMAGING TECHNOLOGY OF THE SHRI GURU RAM RAI UNIVERSITY, DEHRADUN".

(2) They shall come into force from the 2024-2025 academic sessions.

(3) The regulations framed are subject to modification from time to time by the sending them to the Academic Board of the University.

ADMISSION, SELECTION, MIGRATION AND TRAINING
ADMISSION TO THE B. Sc, MEDICAL RADIO & IMAGING TECHNOLOGY COURSE.

'ELIGIBILITY CRITERIA'

No Candidate shall be allowed to be admitted to the B.Sc. Medical Radio Imaging Technology (BMRIT) until: -

1) He/she has completed the age of 17 years on or before first day of July of the year commencing the prescribed academic session of the said course;
2) He/she has passed qualifying examination as under:

a) The Indian school Certificate Examination which is equivalent to 10+2 Higher Secondary Examination after a period of 12 years study, the last two years study comprising of Physics, Chemistry, Biology or Mathematics or any other elective subject with English at a level not less than the core course for English as prescribed by the National Council for Educational Research and training after the introduction of the introduction of the 10+2+3 years educational structure as recommended by the National Committee on education;

OR

b) The Intermediate examination in science of an Indian University/Board or other recognized examine body with Physics, Chemistry, Biology /Maths which shall include a practical test in these subjects and also English as a compulsory subject.

OR

c) The pre-professional or medical examination with Physics, Chemistry and Biology after passing either the higher Secondary school examination, or the pre-university or an equivalent examination. The pre-professional/pre-medical examination shall include a practical test in physics, Chemistry and Biology/and also English as a compulsory subject.

OR

d) The first year of the three years degree course of recognized University, with Physics, Chemistry and Biology/ including a practical test in these subjects provided the examination is a 'University Examination' and candidate has passed 10+2 with English at a level not less than a core course;

OR

e) B.Sc. examination of an Indian University, provided that he/she has passed the B.Sc. examination with not less than two of the following subjects-Physics, Chemistry (Botany, Zoology) and further that he/she has passed the earlier qualifying examination with the following subjects Physics, Chemistry/Biology and English (10+2 level);

OR

f) Any other examination which in scope and standard is found to be equivalent to the intermediate science examination of an Indian University/Board, taking Physics, Chemistry and Biology including a practical test in each of these subjects and English.

OR

10+2 with vocational training in Radiology/ Medical Microbiology/MLT/Diploma in Radiology/ Diploma in MLT are also eligible.

MIGRATION/TRANSFER OF CANDIDATE

1) Migration/ Transfer of candidate from one recognized institution to another institution of this University or from another University will not generally be considered.

2) However, under extra ordinary circumstances, the Vice –Chancellor shall have the power to place any migration/ transfer he deems fit I the Governing Council and get its approval for grant of permission for migration/ transfer to candidates to candidates undergoing course of study in affiliated institutes of this university.

TRAINING PERIOD AND TIME DISTRIBUTION

1) The course of BMRIT shall be Three and a Half academic years including 6 months compulsory internship. The practical training should be in SMI hospital. Apart from practical training in non-clinical subjects, the students shall also undergo practical training in the said hospital equipped with X-rays, Ultra Sound & CT scan, MRI in Dept. of Radiology of the said hospital.

2) The period of Three & a Half years is divided into phase as follows: -

(a) Phase I- First Semester B.Sc. Medical Radio & Imaging Technology (BMRIT) (Six Months duration)

i)	Human Anatomy-I	**BMRT-101**
ii)	Human Physiology-I	**BMRT-102**
iii)	Basic & Radiation Physics-I	**BMRT-103**
iv)	Orientation of Diagnostic Radiology & Radiological Imaging-I	**BMRT-104**
v)	Medical Laws & Radiation Protection-I	**BMRT-105**
vi)	English Communication-I	**BMRT-106**
vii)	Biology **(Only for Maths students as per PMC guidelines)**	**BMRT-107**
viii)	Human Anatomy-I **(Practical)**	**BMRT-101P**
ix)	Human Physiology-I **(Practical)**	**BMRT -102P**
x)	Basic & Radiation Physics-I (**Practical)**	**BMRT -103P**
xi)	Orientation of Diagnostic Radiology & Radiological Imaging-I **(Practical)**	**BMRT -104P**
xii)	Medical Laws & Radiation Protection-I	**BMRT-105P**

(b) Phase II- Second Semester B.Sc. Medical Radio & Imaging Technology (BMRIT) (Six Months duration)

i)	Human Anatomy-II	**BMRT-201**
ii)	Human Physiology-II	**BMRT-202**
iii)	Basic & Radiation Physics-II	**BMRT-203**
iv)	Orientation of Diagnostic Radiology & Radiological Imaging-II	**BMRT-204**
v)	Medical Laws & Radiation Protection-II	**BMRT-205**
vi)	Preventive Medicine and Health care	**BMRT-206**
vii)	English Communication-II	**BMRT-207**
viii)	Human Anatomy-II **(Practical)**	**BMRT-201P**
ix)	Human Physiology-II **(Practical)**	**BMRT -202P**
x)	Basic & Radiation Physics-II (**Practical)**	**BMRT -203P**
xi)	Orientation of Diagnostic Radiology & Radiological Imaging-II **(Practical)**	**BMRT -204P**
xii)	Medical Laws & Radiation Protection-II	**BMRT-205P**
xiii)	Clinical Education	**VACMRT-101**

(c) Phase III- Third Semester B. Sc Medical Radio & Imaging Technology (BMRIT) (Six Month duration)

i)	Orientation in Para clinical Sciences	**BMRT - 301**
ii)	Special radiological equipment-I	**BMRT - 302**
iii)	Radiographic Techniques-I	**BMRT - 303**
iv)	Special Radiological Procedures-I	**BMRT - 304**
v)	Computed Tomography-I	**BMRT – 305**
vi)	Magnetic Resonance Imaging-I	**BMRT – 306**
vii)	Environmental Sciences	**BMRT – 307**
viii)	Orientation in Para clinical Sciences **(Practical)**	**BMRT – 301P**
ix)	Special radiological equipment-I **(Practical)**	**BMRT – 302P**
x)	Radiographic Techniques-I **(Practical)**	**BMRT – 303P**
xi)	Special Radiological Procedures-I **(Practical)**	**BMRT – 304P**
xii)	Computed Tomography-I **(Practical)**	**BMRT – 305P**
xiii)	Magnetic Resonance Imaging-I **(Practical)**	**BMRT – 306P**

(d) Phase IV- Fourth Semester B. Sc Medical Radio & Imaging Technology (BMRIT) (Six Month duration)

i)	Pharmacology	**BMRT - 401**
ii)	Special radiological equipment-II	**BMRT - 402**
iii)	Radiographic Techniques-II	**BMRT - 403**
iv)	Special radiological procedures-II	**BMRT - 404**
v)	Computed Tomography-II	**BMRT – 405**
vi)	Magnetic Resonance Imaging-II	**BMRT – 406**
vii)	Special radiological equipment-II **(Practical)**	**BMRT – 402P**
viii)	Radiographic Techniques-II **(Practical)**	**BMRT – 403P**
ix)	Special radiological procedures-II **(Practical)**	**BMRT – 404P**
x)	Computed Tomography-II **(Practical)**	**BMRT – 405P**
xi)	Magnetic Resonance Imaging-II **(Practical)**	**BMRT – 406P**
xii)	Hospital Practice and Patient Care	**VACMRT-102**

(e) Phase V- Fifth Semester B. Sc Medical Radio Imaging Technology (BMRIT) (Six Months Duration)

i)	General Pathology in Diagnostic Radiology-I	**BMRT -501**
ii)	Radiotherapy Planning, Procedure and Equipment-I	**BMRT -502**
iii)	Advanced Modalities	**BMRT -503**
iv)	Interventional Radiological Procedures and Techniques-I	**BMRT -504**
v)	Basics of Medical Emergency	**BMRT -505**
vi)	Clinical Support in Healthcare Industry	**BMRT -506**
vii)	Patient Care and Radiation Protection in Diagnostic Radiology-I	**BMRT -507**
viii)	General Pathology in Diagnostic Radiology-I **(Practical)**	**BMRT -501P**
ix)	Radiotherapy Planning, Procedure and Equipment**-I (Practical)**	**BMRT -502P**
x)	Advanced Modalities **(Practical)**	**BMRT -503P**
xi)	Interventional Radiological Procedures and Techniques-I **(Practical)**	**BMRT -504P**

(f) Phase VI- Sixth Semester B. Sc Medical Radio Imaging Technology (BMRIT) (Six Months Duration)

i)	General Pathology in Diagnostic Radiology-II	**BMRT -601**
ii)	Radiotherapy Planning, Procedure and Equipment-II	**BMRT -602**
iii)	Advanced Radiological Procedures	**BMRT -603**
iv)	Interventional Radiological Procedures and Techniques-II	**BMRT -604**
v)	Patient Care and Radiation Protection in Diagnostic Radiology-II	**BMRT-605**
vi)	Hospital Procedure	**BMRT-606**
vii)	Hospital Administration	**BMRT-607**
viii)	General Pathology in Diagnostic Radiology-II **(Practical)**	**BMRT-601P**
ix)	Radiotherapy Planning, Procedure and Equipment-II **(Practical)**	**BMRT-602P**
x)	Advanced Radiological Procedures **(Practical)**	**BMRT-603P**
xi)	Interventional Radiological Procedures and Techniques-II **(Practical)**	**BMRT-604P**
xii)	Professionalism values of a Radiographer	**VACMRT-103**

(g) Phase VII - Six –months compulsory internship in SMI Hospital.

Examination criteria:

A student should obtain 40% of the marks individually in each paper, including Internal and external, whereas a requirement of total of aggregate marks should be 50% and will be considered to passed the semester examination and will be promoted to next semester.

There shall be two internal examination and one end semester examination in each semester system.
All the examination criteria have been under the norms and regulation of SGRR University

THEORY & PRACTICAL EXAMINATION: All the theory and practical examination papers of every semester carrying 100 marks out of which 40 marks will be internal assessment and 60 marks for external assessment.

ATTENDANCE: 75% of attendance in each subject is compulsory for appearing in the internal as well as external examination.

INTERNAL ASSESSMENT

(a) It shall be based on day-to-day assessment (see note), evaluation of student assignment, preparation for seminar. Clinical case presentation etc.

(b) Two Sessional examinations should be conducted in each semester and compulsory to appear in the examination.

(c) Day to day records should be given importance during internal assessment.

(d) Student must secure at least 40% marks for internal Assessment in Particular subject in order to eligible to appear in final university examination.

(e) 75% attendance is must for Internal Examination.

Note: Internal Assessment shall be different ways in which students' participation in learning process is evaluated. Some examples are as follows-

(i) Preparation of subject for student's seminar.
(ii) Preparation of a clinical case for discussion.
(iii) Clinical case study problem solving exercise.
(iv) Proficiency in carrying out a practical or a skill in small research project.
(v) Multiple choice questions (MCQ) test after completion of a system/ teaching. Each item tested shall be objectively assessed and recorded. Some of the items can be assigned as homework'/Vacation work.

EXTERNAL ASSESSMENT

Theory Papers will be prepared by examiners as prescribed. Nature of question will be short answer type / objective type/Long answer type and marks for each part indicated separately.
Practical/ clinical will be conducted in the laboratories or hospital wards. Objective will be to assess proficiency in skills Conduct of experiment, interpretation of data and logical conclusion. Clinical cases should preferably include for assessment. Emphasis should be on candidate's capability in eliciting physical signs and their interpretation. Viva/ Oral evaluation is compulsory in theory/ practical/case study.

Clinical cases/ practical shall take into account common diseases, which the student is likely to come in contact in practice.
During evaluation (both external and internal) it shall be ascertained if the candidate has acquired the skills.

DURATION OF EXAMINATION

(i) Internal examination should be based on written paper and are of One-hour duration.
(ii) External End Semester theory examination should be based on written paper and are of Three-hour duration.
(iii) A clinical / practical examination in any subject for student shall not be for more than a day.

INTERNSHIP

GENERAL

Internship is a phase of training wherein a graduate is expected to conduct actual practice of Medical Radio Imaging & Technology and acquired skills under supervision so that he/she may become capable of functioning independently.

SPECIFIC OBJECTIVES

At the end of internship training the graduate shall be able to:

(i) Perform all the diagnostic techniques.

(ii) Use discretely the essential diagnostic services.

(iii) Manage all type of clinical diagnostic methods (X-ray, Fluoroscopy, Mammography, CT and MRI)

(iv) Demonstrate skills in handling the modern equipment in Medical Radio Imaging & Technology.

(v) Develop leadership qualities to function effectively as a reader of the Laboratory environment.

(vi) Render service of the Laboratory setup and to communicate effectively with the Doctors and the hospital management.

INTERNSHIP TIME DISTRIBUTION

Total Period of Internship: 6 Months

OTHER DETAILS

(1) All parts of internship shall be done at SMI hospital.

(2) Every candidate will be required after passing the final B.Sc. Medical Radio Imaging Technology, Examination to undergo compulsory rotatory internship to the satisfaction of the college Authorities and University concerned for a period of 6 months so as to be eligible for the award of the degree of Bachelor of Science in Medical Radio & Imaging Technology.

(3) The University shall issue a provisional B.Sc. Pass Certificate on passing the final examination after the internship completion on demand by the candidate.

(4) The intern shall be entrusted with responsibilities under direct Supervision of Senior Radiotechnologist. They shall not be working independently.

(5) Interns will not issue certified reports or other related documents under their signature.

ASSESSMENT OF INTERNSHIP

(1) The interns maintain the record of work, which is to be verified and certified by the senior Radiotechnologist under whom he/she works. Apart from scrutiny of the record of work, assessment and evaluation of training shall be undertaken by an objective approach using situation test in knowledge, skills and attitude during and at the end of training. Based on the record of work and date of evaluation the Director / Principal shall issue 'Certificate of Satisfactory Completion" of training following which the University shall award the B.Sc. (MRIT) Degree and declare the candidate eligible for the same.

(2) Satisfactory completion shall be determined on the basis of the following:

(a) Proficiency of knowledge required for each Diagnostic Techniques

(b) The competency in skills expected to manage each Diagnostic Technique.

- Competency for performance of self –performance
- Of having assisted in procedures
- Of having observed.

(c) Responsibility, Punctuality, workup Diagnostic Techniques, involvement in procedures, follows of report.

(d) Capacity to work in a team (behaviour with colleagues, nursing staff and relationship with Medical and Para medicals.

(e) Initiating, participation in discussions, research aptitude.

MEDIUM OF INSTRUCTION

English shall be the Medium of Instructions for all the subject of study and for examinations of Bachelor of Medical Radio Imaging Technology course.

CONDITION OF LACK OF ATTENDANCE

As per the existing rules and regulations of SGRR University, Dehradun

SUBMISSION OF RECORD NOTE BOOKS

At the time of practical examination, each candidate shall submit all their examination record notebooks duly certified by the Head of the Department as a Bonafide record of work done by the candidate.

BMRIT: Three Year (6 Semester) Programme							
Basic Structure: Distribution of Courses							
S. No	**Type of Course**	**Total Courses**	**No. of Courses**	**Credits**	**Credit Hours**	**Total Credits Hours**	**Total Credits**
1	Core Course (CC)	09	09	04	04	36	36
2	Ability-Enhancement Compulsory Course (AECC)	03	03	04	04	-	-
3	Discipline Specific Course (DSC)	24	24	04	04	96	96
4	Skill Enhancement Course (SEC)	29	29	02	04	116	58
5	Discipline Specific Elective Course (DSEC)	02	02	04	04	08	08
6	Foundational Course for Maths students only (FC)	01	01	04	04	-	-
	TOTAL	68				256	198

DISTRIBUTION OF PAPERS & MARKS IN VARIOUS SEMESTERS

IST SEMESTER

S.No	Category	Course Code	Course title	Periods			Credit	Evaluation Scheme		
				L	T	P		IA	ESE	Total
1	CC-1	BMRT 101	Human Anatomy-I	3	1	-	4	40	60	100
2	CC-2	BMRT 102	Human Physiology-I	3	1	-	4	40	60	100
3	DSC-1	BMRT 103	Basic & Radiation Physics-I	3	1	-	4	40	60	100
4	DSC-2	BMRT 104	Orientation of Diagnostic Radiology & Radiological Imaging-I	3	1	-	4	40	60	100
5	DSC-3	BMRT 105	Medical Laws and Radiation Protection in Diagnostic Radiology-I	3	1	-	4	40	60	100
6	AECC-1	BMRT 106	English Communication I	1	-	-	1	-	-	-
7	SEC-1	BMRT 101P	Human Anatomy-I	-	-	4	2	40	60	100
8	SEC-2	BMRT 102P	Human Physiology-I	-	-	4	2	40	60	100
9	SEC-3	BMRT 103P	Basic & Radiation Physics-I	-	-	4	2	40	60	100
10	SEC-4	BMRT 104P	Orientation of Diagnostic Radiology & Radiological Imaging-I	-	-	4	2	40	60	100
11	SEC-5	BMRT 105P	Medical Laws and Radiation Protection in Diagnostic Radiology-I	-	-	4	2	40	60	100
			TOTAL	16	5	20	30	400	600	1000

(Additional compulsory grid for Maths Students as per PMC Guidelines)

12	**Foundational Course**	BMRT-107	Remedial Biology	4	-	-	4	-	-	-

IIND SEMESTER

S.No	Category	Course Code	Course title	Periods			Credit	Evaluation Scheme		
				L	T	P		IA	ESE	Total
1	CC-3	BMRT 201	Human Anatomy-II	3	1	-	4	40	60	100
2	CC-4	BMRT 202	Human Physiology-II	3	1	-	4	40	60	100
3	DSC-4	BMRT 203	Basic & Radiation Physics-II	3	1	-	4	40	60	100
4	DSC-5	BMRT 204	Orientation of Diagnostic Radiology & Radiological Imaging-II	3	1	-	4	40	60	100
5	DSC-6	BMRT 205	Medical Laws and Radiation Protection in Diagnostic Radiology-II	3	1	-	4	40	60	100
6	CC-5	BMRT 206	Preventive Medicine and Health Care	3	1	-	4	40	60	100
7	AECC-2	BMRT 207	English Communication II	1	-	-	1	-	-	-
8	SEC-6	BMRT 201P	Human Anatomy-II	-	-	4	2	40	60	100
9	SEC-7	BMRT 202P	Human Physiology-II	-	-	4	2	40	60	100
10	SEC-8	BMRT 203P	Basic & Radiation Physics-II	-	-	4	2	40	60	100
11	SEC-9	BMRT 204P	Orientation of Diagnostic Radiology & Radiological Imaging-II	-	-	4	2	40	60	100
12	SEC-10	BMRT 205P	Medical Laws and Radiation Protection in Diagnostic Radiology-II	-	-	4	2	40	60	100
			TOTAL	19	6	20	34	440	660	1100
13	VAC	VACMRT-101	Clinical Education							

IIIRD SEMESTER

S.No	Category	Course Code	Course title	Periods			Credit	Evaluation Scheme		
				L	T	P		IA	ESE	Total
1	CC-6	BMRT 301	Orientation in Paraclinical Sciences-I	3	1	-	4	40	60	100
2	DSC-7	BMRT 302	Special Radiological Equipment-I	3	1	-	4	40	60	100
3	DSC-8	BMRT 303	Radiographic Techniques-I	3	1	-	4	40	60	100
4	DSC-9	BMRT 304	Special Radiological Procedures-I	3	1	-	4	40	60	100
5	DSC-10	BMRT 305	Computed Tomography-I	3	1	-	4	40	60	100
6	DSC-11	BMRT 306	Magnetic Resonance Imaging-I	3	1	-	4	40	60	100
7	AECC-3	BMRT 307	Environmental Sciences	2	-	-	2	-	-	-
8	SEC-11	BMRT 301P	Orientation in Paraclinical Sciences-I	-	-	4	2	40	60	100
9	SEC-12	BMRT 302P	Special Radiological Equipment-I	-	-	4	2	40	60	100
10	SEC-13	BMRT 303P	Radiographic Techniques-I	-	-	4	2	40	60	100
11	SEC-14	BMRT 304P	Special Radiological Procedures-I	-	-	4	2	40	60	100
12	SEC-15	BMRT 305P	Computed Tomography-I	-	-	4	2	40	60	100
13	SEC-16	BMRT 306P	Magnetic Resonance Imaging-I	-	-	4	2	40	60	100
			TOTAL	20	6	24	36	480	720	1200

IVTH SEMESTER

S.NO	Category	Course Code	Course title	Periods			Credit	Evaluation Scheme		
				L	T	P		IA	ESE	Total
1	CC-7	BMRT 401	Pharmacology	3	1	-	4	40	60	100
2	DSC-12	BMRT 402	Special Radiological Equipment-II	3	1	-	4	40	60	100
3	DSC-13	BMRT 403	Radiographic Techniques-II	3	1	-	4	40	60	100
4	DSC-14	BMRT 404	Special Radiological Procedures-II	3	1	-	4	40	60	100
5	DSC-15	BMRT 405	Computed Tomography-II	3	1	-	4	40	60	100
6	DSC-16	BMRT 406	Magnetic Resonance Imaging-II	3	1	-	4	40	60	100
7	SEC-17	BMRT 402P	Special Radiological Equipment-II	-	-	4	2	40	60	100
8	SEC-18	BMRT 403P	Radiographic Techniques-II	-	-	4	2	40	60	100
9	SEC-19	BMRT 404P	Special Radiological Procedures-II	-	-	4	2	40	60	100
10	SEC-20	BMRT 405P	Computed Tomography-II	-	-	4	2	40	60	100
11	SEC-21	BMRT 406P	Magnetic Resonance Imaging-II	-	-	4	2	40	60	100
			TOTAL	18	6	20	34	440	660	1100
12	VAC	VACMRT-102	Hospital Practice and Patient Care							

VTH SEMESTER

S.NO	Category	Course Code	Course title		Periods			Credit	Evaluation Scheme		
					L	T	P		IA	ESE	Total
1	CC-8	BMRT-501	General Pathology in Diagnostic Radiology-I		3	1	-	4	40	60	100
2	DSC-17	BMRT-502	Radiotherapy Planning, Procedure and Equipment-I		3	1	-	4	40	60	100
3	DSC-18	BMRT-503	Advanced Modalities		3	1	-	4	40	60	100
4	DSC-19	BMRT-504	Interventional Radiological Procedures and Techniques-I		3	1	-	4	40	60	100
5	DSEC-1	BMRT-505	DISCIPLINE SPECIFIC ELECTIVE COURSE	Basics of Medical Emergency	3	1	-	4	40	60	100
		BMRT-506		Clinical Support in the Healthcare Industry							
6	DSC-20	BMRT-507	Patient Care and Radiation Protection in Diagnostic Radiology-I		3	1	-	4	40	60	100
7	SEC-22	BMRT-501P	General Pathology in Diagnostic Radiology-I		-	-	4	2	40	60	100
8	SEC-23	BMRT-502P	Radiotherapy Planning, Procedure and Equipment-I		-	-	4	2	40	60	100
9	SEC-24	BMRT-503P	Advanced Modalities		-	-	4	2	40	60	100
10	SEC-25	BMRT-504P	Interventional Radiological Procedures and Techniques-I		-	-	4	2	40	60	100
			TOTAL		18	6	16	32	400	600	1000

VITH SEMESTER

S.NO	Category	Course Code	Course title		Periods			Credit	Evaluation Scheme		
					L	T	P		IA	ESE	Total
1	CC-9	BMRT-601	General Pathology in Diagnostic Radiology-II		3	1	-	4	40	60	100
2	DSC-21	BMRT-602	Radiotherapy Planning, Procedure and Equipment-II		3	1	-	4	40	60	100
3	DSC-22	BMRT-603	Advanced Radiological Procedures		3	1	-	4	40	60	100
4	DSC-23	BMRT-604	Interventional Radiological Procedures and Techniques-II		3	1	-	4	40	60	100
5	DSC-24	BMRT-605	Patient Care and Radiation Protection in Diagnostic Radiology-II		3	1	-	4	40	60	100
6	DSEC-2	BMRT-606	DISCIPLINE SPECIFIC ELECTIVE COURSE	Hospital Procedures	3	1	-	4	40	60	100
		BMRT-607		Hospital Administration							
7	SEC-26	BMRT-601P	General Pathology in Diagnostic Radiology-II		-	-	4	2	40	60	100
8	SEC-27	BMRT-602P	Radiotherapy Planning, Procedure and Equipment-II		-	-	4	2	40	60	100
9	SEC-28	BMRT-603P	Advanced Radiological Procedures		-	-	4	2	40	60	100
10	SEC-29	BMRT-604P	Interventional Radiological Procedures and Techniques-II		-	-	4	2	40	60	100
			TOTAL		18	6	16	32	400	600	1000
11	VAC	VACMRT-103	Professional Values of a Radiographer								

Note:

1. The minimum pass marks will be 40% in individual subjects in theory and Practical and 50% in aggregate.

2. The Theory and Practical papers will be of equal weightage with 40% in Sessional and 60% in final University Examination.

3. The division will be determined on the basis of the aggregate of the marks of all the courses/Subjects prescribed for the degree as under:
   a) Passed with honours will be rewarded on 75% and above only in first attempt.
   b) First Division will be marked on 60% and above.
   c) Second Division will be marked on 50% and above but less than 60%.

Examination Scheme:

Components	**Internal Examination (Average of Ist Internal exam & IInd Internal Exam)**	**External Examination Yearly**
Weightage (%)	Out of 40 Marks	60 Marks

Bachelors in Medical Radio Imaging and Technology Ist Semester

Course code	**:**	BMRT-101
Course Name	**:**	Human Anatomy-I
Semester /Year	**:**	Ist Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Introduction- Scope of Anatomy-Terminology-Body parts and areas- Anatomical position of the body, Axis and planes of body-Different Positions of body-Body Cavities: Ventral cavity, Dorsal Cavity, Planes & Sections. Organization of cells-Organization of Tissues- Organs and systems-The integumentary System: Structure and function of skin.

UNIT-II

Bones-Classification, development, parts of long bones and blood supply of bones.
Muscles- Classification of various muscles, types of muscles, their role.
Joints- Definition, classification, movements of different joint.

UNIT –III

Upper Extremity
Osteology- Clavicle, scapula, Humerus, Radius, ulna, carpals, metacarpals and Phalanges.
Soft tissue- Breast, pectoral region, axilla, front & back of arm, front of forearm, back of forearm, Palm, dorsum aspect of Hand. (Only Outline)

UNIT-IV

Lower Extremity
Osteology-Hipbone, Femur, Tibia, Fibula, Patella, Tarsals, Metatarsals and Phalanges.
Soft tissue parts: Gluteal region, front and back of the thigh (femoral triangle, femoral canal and inguinal canal) medial side of the thigh (adductor canal). Lateral side of the thigh, popliteal fossa, Anterior and posterior compartment of leg, sole of the foot. (Only outline)

UNIT-V

Joints- Shoulder girdle, Shoulder joint, elbow joint, radio-ulnar joint, wrist joint and joints of hand, Hip joint, knee joint, ankle joint, joints of the foot.

UNIT-VI

Surface measuring and Radiological Anatomy of upper limb.

Text Books:

1. B.D. Chourasia's Human Anatomy Fifth Edition
2. Vishram Singh's Textbook of Anatomy

Reference Books:

1. Atlas of Anatomy
2. Osteology

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Identify different body parts, body surfaces and skeletal composition of human body.
CO2	Categorize bones, muscles, body parts as per their shape and size.
CO3	Determine various joints of body, body cavities, muscular attachments of different body parts.
CO4	Explain bony structure of upper and lower extremities.
CO5	Assess important regions present in different compartments of the body.
CO6	Write anatomical composition of body.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	1	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO6	3	-	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Bachelors in Medical Radio Imaging and Technology Ist Semester

Course code	**:**	BMRT-102
Course Name	**:**	Human Physiology-I
Semester /Year	**:**	Ist Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Cell Physiology: Structure of cell, Transportation system of cell, Active and passive Organization of body, Body Composition, Body fluid volumes

Terminology: Diffusion, viscosity, Osmosis, Tonicity, homeostasis

UNIT-II

Physiology Of Blood: Composition of Blood, Function of RBC WBC, Blood groups, Blood Circulation-General Principles, Blood Groups, anaemia, Haemoglobin, Coagulation

UNIT-III

Lymphatic System: Composition of lymphatic system, Role of lymphatic system, Lymphatic tissues, Thymus

UNIT-IV

Cardiovascular System: Structure and function of Heart, arteries, veins and capillaries Cardiac cycle and output, pulse rate, Blood Pressure: Systolic and diastolic, heart sounds, E.C.G, Hypertension and Hypotension and their types, shock.

UNIT-V

Respiratory System: Organs included in the respiratory system, Mechanism of respiration- internal and external, Pulmonary function and pulmonary circulation, Capacity and lung volumes, Gas exchange at lungs, Gas transport between lungs and tissues.

Definition of Hypoxia, Dyspnoea, cyanosis, asphyxia, COPD, obstructive airway diseases.

UNIT-VI

Digestive System: Introduction to digestive system, Function of organs of GIT, The Salivary glands, The stomach and its secretion, Intestine & its secretion, Function of liver, spleen, gall bladder and pancreas, digestion, absorption and assimilation, GI hormones, Physiology of digestion of carbohydrates, lipids and proteins

Definition of Jaundice, cirrhosis, pancreatitis, hepatomegaly

Text Books:

1. Human Physiology for BDS by Dr. A.K Jain (Fifth Edition)

2. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Reference Books:

1. Anatomy and Physiology in Health and Illness by Ross and Wilson

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define basic physiological phenomenon of body.
CO2	Identify role of physiology, mechanism of physiology.
CO3	Determine cell physiology and role of lymphatic system.
CO4	Illustrate physiological function of cardiovascular system.
CO5	Review mechanism of respiration.
CO6	Write about various secretions and functions of digestive system.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	-	3	-	-	1	-	-	-
CO2	3	-	3	2	-	2	-	-	-	-	-	-
CO3	3	-	2	1	-	2	-	-	-	-	-	-
CO4	3	-	3	1	-	3	-	-	1	-	-	-
CO5	3	-	2	1	-	3	-	-	-	-	-	-
CO6	3	-	3	2	3	2	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology Ist semester

Course code	**:**	BMRT-103
Course Name	**:**	Basic & Radiation Physics-I
Semester /Year	**:**	Ist Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I
Basic concepts: Physical Quantity, Basic Units and measurements – Fundamental and derived units, Power, Work, Force, Energy, Temperature, Heat, electric field, magnetic field, luminous intensity, sound, Radioactivity and various quantities used in diagnostic and therapeutic radiology- SI units of above parameters.
UNIT-II
Atomic structure- Atomic Structure-Atom-Nucleus - Atomic Number, Mass Number- electron orbit and energy levels-Periodic table -Isotopes-Isobars-Isomers- Ionization-excitation-Binding energy.
UNIT-III
Electrical energy and power – electric charge-electric potential-unit of charge, current and potential-resistance, coulombs law, Ohm 's law, circuit laws, Joules Law, Kirchhoff's law, - capacitance and capacitors-oscillators-Alternating current-direct current- Heating effect of current- transformers theory and losses.
UNIT-IV
Magnetism-Para magnetism, diamagnetism, ferromagnetism- Magnetic field lines-Magnetic flux- Magnetic effect of an electric current - applications of magnetic field. Electro-magnetic induction, Faradays laws, mutual induction and self-induction.
UNIT-V
Heat: Definition- temperature-heat capacity- Specific Heat capacity- Conduction- Convection-Radiation-Thermal Conductivity- equation of thermal conductivity (k)-thermal expansion-Newton's law of cooling-Stefan Law-Process of Heat dissipation in X-ray tubes.
UNIT-VI
Sound: Nature and propagation of sound-speed of sound-intensity of sound-interference of sound-Diffraction- Ultrasonic Wave- Production of Ultrasonic Wave-Piezo-electric effect.

Text Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

2. Basic Radiological Physics by K. Thayalan Second Edition

Reference Books:

1. Christensen's Physics of Diagnostic Radiology by Thomas S. Curry

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define basic concept of electric field and magnetic field.
CO2	Interpret practical aspects behind electromagnetic induction.
CO3	Examine the nature and propagation of sound.
CO4	Explain the process of thermal conductivity.
CO5	Evaluate various physical units and their measurements.
CO6	Write about atomic structure, atomic activity and various elements.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	-	-	1	1	-	-	-	-	-	1
CO2	-	2	-	-	2	2	-	-	-	-	1	1
CO3	-	1	-	-	1	1	-	-	-	-	-	-
CO4	-	2	1	1	3	3	1	-	-	-	-	2
CO5	-	1	-	-	-	-	3	-	-	-	-	1
CO6	-	1	-	-	3	-	1	-	-	-	-	1

Bachelors in Medical Radio Imaging and Technology I[st] Semester

Course code	**:**	BMRT-104
Course Name	**:**	Orientation of Diagnostic Radiology and Para clinical Imaging-I
Semester /Year	**:**	I[st] Semester

	L	T	P	C
	03	**-**	**-**	**03**

UNIT-I

The X-Ray machine: Historical aspects of X-ray Tube-Gas filled X-ray tube- Construction of X-Ray Tube, Tube housing, Anode & Cathode, Types of anodes, --speed of anode rotation- target angle-

UNIT-II

Construction, working principle and limitations of stationary anode X-Ray tube- Construction, working principle and limitations of rotating anode X-Ray tube Focal spot size, Line focus Principle-

UNIT-III

Quality, Quantity and Intensity of X-rays, HVL Measurements, Heel effect, soft and Hard X-rays, added and inherent Filtration, tube failure causes- Factors affecting X-ray Emission spectra-off focus radiation

UNIT-IV

Exposure timing. - the Heat produced by X-ray tubes- tube rating-Heat units- Requirement of X-ray production. Control of Scattered Radiation- Beam limiting devices (cones, diaphragms, beam centering devices, light beam collimators)

UNIT-V

Circuit of X-ray generator, types of generators- 3 Phase, 6 Phase and 12 Phase circuits, Filament circuit, high voltage circuit- Rectifiers, half wave and full wave rectification

UNIT-VI

Exposure switches and timers- tube current- tube voltage- space charge-Filament current- Filament Voltage-Automatic Exposure control assembly-Switch fuses

Text Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition
2. Basic Radiological Physics by K. Thayalan Second Edition

Reference Books:

1. Christensen's Physics of Diagnostic Radiology by Thomas S. Curry

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Describe the working principle of various X-ray equipment.
CO2	Classify various parts of X-ray equipment.
CO3	Examine causes of X-ray tube failure.
CO4	Assess the role of beam limiting devices.
CO5	Evaluate various circuits of X-ray machine assembly.
CO6	Write about various parameters and switches in control unit.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	1	1	3	2	-	-	-	-	1	2
CO2	-	3	2	-	3	2	-	-	-	-	1	1
CO3	-	3	1	3	3	3	-	-	2	-	-	2
CO4	-	3	2	-	2	2	-	-	-	-	-	2
CO5	-	3	-	-	3	3	-	-	2	-	-	1
CO6	-	2	-	-	3	3	-	-	1	-	-	3

Bachelors in Medical Radio Imaging and Technology Ist Semester

Course code	**:**	BMRT-105
Course Name	**:**	Medical Laws and Radiation Protection in Diagnostic Radiology-I
Semester /Year	**:**	Ist Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I
Introduction of Radiation Protection, Difference between Primary radiation and Secondary Radiation, Advantages of Radiation Protection
UNIT-II
Regulatory authorities of Radiation Facility: IAEA, AERB, e LORA, PCPNDT.
UNIT-III
Radiation protection principle: Principles of radiation protection, concept of 'ALARA', guidelines given by ALARA, time - distance and shielding, shielding. Importance of 'ALARA'.
UNIT-IV
Radiation protection of self and patient-Guidelines for radiation protection by ICRP, NRPB, WHO-NABH guidelines, AERB guidelines, PNDT Act and guidelines, AERB Specifications for site planning.
UNIT-V
Radiation Monitoring-Radiation survey meters, **Radiation detector** –area monitoring and personnel monitoring devices-Application of area monitoring devices- Application of personal monitoring devices.
UNIT-VI
Radiation Shielding: Various methods of radiation shielding, Different shielding equipment, personnel and public shielding methods.

Text Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition
2. Basic Radiological Physics by K. Thayalan Second Edition

Reference Books:

1. Christensen's Physics of Diagnostic Radiology by Thomas S. Curry

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define the need of radiation protection.
CO2	Interpret various radiation safety measures.
CO3	Apply various radiation measurement techniques through area and personal monitoring devices.
CO4	Explain the various guidelines of radiation protection.
CO5	Debate on various harmful effects of radiation.
CO6	Write about various radiation protection and radiation measurement devices.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	1	-	-	1	3	1	-	2	-	2
CO2	-	2	-	-	-	-	2	3	-	3	1	3
CO3	-	2	1	-	1	1	3	1	-	3	2	3
CO4	-	-	-	-	-	-	3	2	-	3	1	3
CO5	-	-	-	-	-	-	3	1	-	3	1	1
CO6	-	2	-	-	1	1	3	1	-	3	1	1

Bachelors in Medical Radio Imaging and Technology I[st] Semester

Course code	**:** BMRT-106
Course Name	**:** English Communication I
Semester /Year	**:** I[st] Semester

	L	**T**	**P**	**C**
	01	**-**	**02**	**02**

UNIT-I

First Session:

- Self-Introduction & Evaluation
- Foundations of Communication Techniques
- Common Expressions

UNIT-II

Functional Grammar:

- Parts of Speech
- Verbs
- Tense
- Modals
- Conjunctions
- Subject Verb Agreement
- Articles Spotting Errors

UNIT-III

Writing Skills:

- Application & Formal Letter Writing
- Email Writing
- Note Taking & Note Making
- Essay Writing.

UNIT-IV

Speaking Skills:

- Intonation & Voice Dynamics
- Art of Public Speaking
- Common Conversation
- Extempore

UNIT-V

Reading Skills:

- Reading & Understanding
- Reading Comprehensions

Text Books:

1. English Grammar Composition and Usage by J.C. Nesfield, Macmillian Publishers.
2. Communication Skills by Sanjay Kumar & PushpLata, Oxford University Press
3. Business Writing for Dummies (3rd Edition) by Natalie Canavor, For Dummies

Reference Books:

1. Reading and Listening Comprehension Skills by Michelle Osment, Curriculum Concepts Unveiling the Secrets of Verbal Ability by Abhishek Verma and Shweta Bajaj, Research India.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Understanding the basic concepts of functional grammar
CO2	Interpret the fundamentals of communicating in English
CO3	Preparing basic official written communication
CO4	Demonstrating effective speaking skills
CO5	Demonstrating comprehension in reading text
CO6	Focus on integrating all language skills (speaking, listening, reading, writing) to ensure holistic proficiency.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	2	-	-	-	1	-	-	-	-
CO2	-	-	-	3	-	-	-	1	-	-	-	-
CO3	-	-	-	2	-	-	-	1	-	-	-	-
CO4	-	-	-	2	-	-	-	2	-	-	-	-
CO5	-	-	-	1	-	-	-	1	-	-	-	-
CO6	-	-	-	3	-	-	-	1	-	-	-	-

Bachelors in Medical Radio Imaging and Technology Ist Semester

Course code	**:** BMRT-107
Course Name	**:** Remedial Biology
Semester /Year	**:** Ist Semester

	L	T	P	C
	01	**-**	**02**	**02**

UNIT-I

Introduction to Biology

Definition and Scope of Biology

- What is Biology?
- Branches of Biology (e.g., Botany, Zoology, Microbiology, Ecology)
- Importance of Biology in Science and Society

UNIT-II

Cell Biology

Cell Structure and Function

- Cell Theory
- Prokaryotic vs. Eukaryotic Cells
- Organelles and their Functions (e.g., Nucleus, Mitochondria, Ribosomes, Endoplasmic Reticulum, Golgi Apparatus)

Cell Membrane and Transport

- Structure of the Plasma Membrane
- Passive Transport (Diffusion, Osmosis)
- Active Transport (Pump Mechanisms, Endocytosis, Exocytosis)

Cell Cycle and Division

- Mitosis and its Phases
- Meiosis and its Phases
- Regulation of the Cell Cycle

UNIT-III

Genetics

Mendelian Genetics

- Principles of Inheritance (Dominant and Recessive Traits)
- Punnett Squares

- Genetic Crosses (Monohybrid, Dihybrid)

Molecular Genetics

- DNA Structure and Function
- RNA and Protein Synthesis (Transcription, Translation)

Genetic Variation and Heredity

- Mutations and Their Effects
- Genetic Linkage and Recombination

UNIT-IV

Evolutionary Biology

Theory of Evolution

- Charles Darwin and Natural Selection
- Evidence for Evolution (Fossil Record, Comparative Anatomy, Embryology, Molecular Biology)

UNIT-V

Anatomy and Physiology

Human Anatomy and Physiology

- Basic Human Body Systems (Integumentary, Skeletal, Muscular, Nervous, Endocrine, Cardiovascular, Respiratory, Digestive, Urinary, Reproductive)

Functional Relationships

- How Systems Interact (Homeostasis, Feedback Mechanisms)

Bachelors in Medical Radio Imaging and Technology Ist Semester

Course code	**:**	BMRT-101P
Course Name	**:**	Human Anatomy-I
Semester /Year	**:**	Ist Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

PRACTICALS

1. Demonstration of anatomical position, various imaginary planes, body surfaces.
2. Demonstration of different body parts, body cavities.
3. Demonstration of different body positions.
4. Demonstration of different types of bones present in the human body.
5. Demonstration of different types of muscles.
6. Demonstration of various types of joints present in body.
7. Demonstration of bones present in upper limb of body.
8. Demonstration of bones present in lower limb of the body.

Bachelors in Medical Radio Imaging and Technology Ist Semester

Course code	**:**	BMRT-102P
Course Name	**:**	Human Physiology-I
Semester /Year	**:**	Ist Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practical

1. Demonstration to measure vital capacity.
2. Demonstration to measure pulse rate.
3. Demonstration to measure capacity and lung volume.
4. Identification of heart sounds.
5. Determination of different blood groups.
6. Demonstration of electrocardiogram

Bachelors in Medical Radio Imaging and Technology Ist Semester

Course code	**:**	BMRT-103P
Course Name	**:**	Basic and Radiation Physics-I
Semester /Year	**:**	Ist Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of electric circuits.
2. Demonstration of different types of capacitors and their applications.
3. Demonstration of magnetic properties of different materials.
4. Demonstration of conduction, convection and radiation of heat.
5. Demonstration of transducers for better understanding of piezo electric effect.

Bachelors in Medical Radio Imaging and Technology Ist Semester

Course code	**:**	BMRT-104P
Course Name	**:**	Orientation of Diagnostic Radiology and Para clinical Imaging-I
Semester /Year	**:**	Ist Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of tube housing, cathode (filament, focusing cup), anode (target, anode angle, rotor, stator,), tube window.
2. Observation of outer shielding of the X- Ray tube.
3. Demonstration of Heel effect.
4. Demonstration of Beam limiting devices (cones, diaphragms, beam centering devices, light beam collimators)
5. Demonstration of switches and fuses in the control assembly.

Bachelors in Medical Radio Imaging and Technology Ist Semester

Course code	**:**	BMRT-105P
Course Name	**:**	Medical Laws & Radiation Protection-I
Semester /Year	**:**	Ist Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of various radiation protection devices.
2. Demonstration to show proper handling of radiation shielding devices like lead aprons, thyroid shields, pelvic shield, Lead goggles etc.
3. Demonstration of various radiation measurement devices.
4. Demonstration to show proper handling of radiation dosimeters.
5. Demonstration of various radiation detectors.
6. Demonstration to show site planning as per the guidelines.

Bachelors in Medical Radio Imaging and Technology II[nd] Semester

Course code	**:**	BMRT-201
Course Name	**:**	Human Anatomy -II
Semester /Year	**:**	II[nd] Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT –I

Trunk

Osteology-Vertebra and ribs, sternum.

Soft tissue- Vertebral muscles & intercostals muscles

Joints- Costochondral, Costovertebral, Intervertebral Joints.

UNIT –II

Head And Neck

Osteology-Mandible and bones of skull.

Joints- Temporomandibular Joints.

Surface and Radiological Anatomy of the Head & Neck.

UNIT- III

Thorax

Pleura, Lungs, Mediastinum, Pericardium, Heart, Trachea, Oesophagus

Surface measuring and Radiological Anatomy of Thorax.

UNIT –IV

Abdomen

Soft Tissue-Abdominal cavity & Peritoneum, Stomach, Intestine, Spleen, Pancreas, Liver & Gall Bladder, Kidney & Ureter, Urinary Bladder & Urethra, Diaphragm, Male & Female reproductive organs, Rectum & Anal Canal. (Only Outline)

UNIT- V

Neuro Anatomy- Meninges & C.S.F., Sulcus & Gyrus and various areas of Cerebral Hemispheres, Thalamus, Hypothalamus and basal Ganglia, Cerebellum, Pons Medulla, Spinal Cord, III[rd], IV[th] & Lateral Ventricles, Blood Supply of Spinal Cord & Brain.

Surface and Radiological Anatomy of Brain.

UNIT-VI

Surface measuring and Radiological Anatomy of Trunk, Head and neck, Thorax and abdomen.

Text Books:

1. B.D. Chourasia's Human Anatomy Fifth Edition

2. Vishram Singh's Textbook of Anatomy

Reference Books:

1. Atlas of Anatomy

2. Osteology

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Identify skeletal composition of different body parts.
CO2	To categorize bones, muscles, body parts as per their shape and size.
CO3	Determine various joints of body, body cavities, muscular attachments of different body parts.
CO4	Able to explain major and minor arterial and venous supply of different body parts.
CO5	Able to assess important regions present in different compartments of the body.
CO6	To write anatomical composition of body.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	1	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO6	3	-	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Bachelors in Medical Radio Imaging and Technology II[nd] Semester

Course code	**:**	BMRT-202
Course Name	**:**	Human Physiology-II
Semester /Year	**:**	II[nd] Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I
Endocrinal System: General Principle of endocrinology, Thyroid, Parathyroid, adrenal, pituitary.
UNIT-II
Urogenital System Physiology of Kidney and Urine formation, Constituent of normal urine etc., Kidney function tests, Physiology of Male and Female reproductive system.
UNIT-III
Nervous System: Reflex arc, Physiology of the central nervous system, Physiology of Spinal cord, Neuron, nerve impulse, Physiology of the sympathetic and Parasympathetic nervous system, Function of Cerebrum, Cerebellum, basal ganglia, thalamus, Hypothalamus, CSF and Blood brain barrier.
UNIT-IV
Skin: Structure & function of Skin. **Special Senses:** General organization and physiology.
UNIT-V
Electrolytes: Their balance and Imbalances. Definition of acidosis and alkalosis.
UNIT-VI
Nerve physiology of muscles: Structural and functional properties of different muscles.

Text Books:

1. Human Physiology for BDS by Dr. A.K Jain (Fifth Edition)

2. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Reference Books:

1. Anatomy and Physiology in Health and Illness by Ross and Wilson

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define about basic physiological phenomenon of body.
CO2	Identify role of physiology, mechanism of physiology.
CO3	Determine general principle of endocrinology, structure and function of skin
CO4	Illustrate physiology of kidney and reproductive system, KFT and constituents of urine.
CO5	Review reflex arc, physiology of CNS, physiology of sympathetic and parasympathetic nervous system and to assess function of different parts of brain.
CO6	Facilitate experimental handling by doing TLC, DLC, RBC, Hb, ESR, BP etc. during lab sessions

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	-	3	-	-	1	-	-	-
CO2	3	-	3	2	-	2	-	-	-	-	-	-
CO3	3	-	2	1	-	2	-	-	-	-	-	-
CO4	3	-	3	1	-	3	-	-	1	-	-	-
CO5	3	-	2	1	-	3	-	-	-	-	-	-
CO6	3	-	3	2	3	2	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology IInd Semester

Course code	**:**	BMRT-203
Course Name	**:**	Basic & Radiation Physics-II
Semester /Year	**:**	IInd Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Electromagnetic Waves- Introduction-electromagnetic spectrum-energy density-frequency and wavelength-radiation in atmosphere-Inverse square law

UNIT-II

Radiation: Quantum nature of radiation-mass energy equivalence- Luminescence- Fluorescence-Phosphorescence-X-Rays introduction, frequency, wavelength- Properties of alpha particles, beta particles and gamma rays.

UNIT-III

Radioactivity: Natural and artificial radioactivity-alpha decay-beta decay and Gamma decay. Half-life- Physical Half Life- Biological Half Life- Nuclear Fission-Nuclear reactor.

UNIT-IV

Radiation sources-Natural and artificial-production of radio isotopes-reactor produced isotopes Fission products-Gamma ray source for medical uses.

UNIT-V

X-ray: Discovery of X-rays- Production of X-rays (bremsstrahlung and Characteristic radiations)-X-Ray emission spectrum-Properties of X-Rays- X-Ray Quality and Quantity- Half Value Layer- Application of X-rays

UNIT-VI

Interaction of Ionizing radiation with matter: Attenuation of X-ray or Gamma Rays-Absorption and scattering- linear attenuation coefficient- coherent scattering-Photoelectric effect-Compton scattering-pair production and photoelectric Disintegration-**Differential Absorption.** Exponential attenuation- Half- value thickness- Tenth value Thickness- Linear energy Transfer-

Text Books:

3. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition
4. Basic Radiological Physics by K. Thayalan Second Edition

Reference Books:

2. Christensen's Physics of Diagnostic Radiology by Thomas S. Curry

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define basic characteristics of electromagnetic radiations.
CO2	Interpret practical aspects behind emission of various ionizing and non-ionizing radiations.
CO3	Examine the phenomenon of Radioactive decay, production of radioisotopes and fission products.
CO4	Explain the process of radiation production and interpret properties of X- rays.
CO5	Debate on the interaction of radiation with matter.
CO6	Write about basic technical terms of diagnostic field.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	-	-	-	-	1	-	-	-	-	-
CO2	-	3	1	-	1	1	-	-	-	-	-	-
CO3	-	2	-	-	2	-	-	-	-	-	1	-
CO4	-	2	-	-	3	2	-	-	-	2	2	-
CO5	-	-	-	-	-	-	2	-	-	-	-	-
CO6	-	2	-	-	2	1	2	-	-	1	-	-

Bachelors in Medical Radio Imaging and Technology IInd Semester

Course code	**:**	BMRT-204
Course Name	**:**	Orientation of Diagnostic Radiology and Para clinical Imaging-II
Semester /Year	**:**	IInd Semester

	L	T	P	C
	03	**-**	**-**	**03**

UNIT-I
Cassette: Structure, Types of cassettes, Film Handling-Storage of Film-Loading & Unloading, safe light.
UNIT-II
Radiographic Film: Structure- Types of radiographic-Single and double coated radiographic films-Screen and non-screen films-Latent Image-Film Handling-Film artifacts
UNIT-III
Intensifying Screens: Types of intensifying screen, Construction and working principle of IR-Luminescence-screen characteristics.
UNIT-IV
Grid: Principle, Structure, Types of Grids, Stationary grid, moving grid Parallel grid, Focused grid, crossed grid, moving grid potter bucky diaphragms-types of grid movements- Grid control system-Interlocking and X-ray tube overload protection- Grid Ratio- Grid cut off-
UNIT-V
Layout: Lay out of X-ray room and dark room Radiographic Exposure, Film Developing & Processing, Dark room,
UNIT-VI
Radiographic Image: Magnification penumbra un sharpness inverse square law patient exposure-Image contrast, density, sharpness, magnification, distortion of image, noise and blur, radiographic illuminators, mottle

Text Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition
2. Basic Radiological Physics by K. Thayalan Second Edition

Reference Books:

1. Christensen's Physics of Diagnostic Radiology by Thomas S. Curry

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Describe various types of image receptors, films and grid.
CO2	To classify the maintenance of equipment procedure of X-ray machine and cooling method.
CO3	To Demonstrate work flow digital/equipment handling.
CO4	To assess the importance of radiographic exposure.
CO5	To evaluate the layout of the darkroom.
CO6	To design the parameter for identification of radiographic image quality

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	1	-	2	-	-	-	-	-	-	1
CO2	-	2	2	-	2	1	1	1	-	1	-	3
CO3	-	2	-	-	2	1	-	-	-	-	-	1
CO4	-	1	2	-	-	-	-	-	-	-	1	-
CO5	-	-	-	-	1	3	-	-	-	-	-	-
CO6	-	-	-	-	1	3	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology IInd Semester

Course code	**:**	BMRT-205
Course Name	**:**	Medical Laws and Radiation Protection in Diagnostic Radiology-II
Semester /Year	**:**	IInd Year

	L	T	P	C
	03	**-**	**-**	**03**

UNIT-I
Radiation: Quantum nature of radiation-mass energy equivalence- Luminescence- Fluorescence-Phosphorescence-X-Rays introduction, frequency, wavelength- Properties of alpha particles, beta particles and gamma rays.
UNIT-II
Area Monitoring devices- Geiger Muller counter (GM counter)- Construction and Working principle, Scintillation detector Construction and Working principle, Ionization chamber-Construction and Working principal.
UNIT-III
Personal Monitoring Devices- TLD badge-Construction and Working principle, Pocket Dosimeter- Construction and Working principle, Film Badge- Construction and Working principle. Criteria for proper handling of Radiation Protection Devices.
UNIT-III
Radiobiology- Harmful effects of Radiation- Direct and Indirect effects of Radiation, Stochastic Effects, deterministic effects, Somatic Effects, Genetic effects, Threshold Dose, Antenatal Exposure of radiation, 10-day rule, 14-day rule, 28-day rule

Text Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition
2. Basic Radiological Physics by K. Thayalan Second Edition

Reference Books:

1. Christensen's Physics of Diagnostic Radiology by Thomas S. Curry

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To define the need of radiation protection.
CO2	To interpret various radiation safety measures.
CO3	To apply various radiation measurement techniques through area and personal monitoring devices.
CO4	To explain the various guidelines of radiation protection.
CO5	To debate on various harmful effects of radiation.
CO6	To write about various radiation protection and radiation measurement devices.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	1	-	-	1	3	3	1	3	1	1
CO2	-	1	1	-	-	-	2	2	-	2	1	1
CO3	-	1	1	-	-	-	2	3	-	2	2	1
CO4	-	-	-	-	-	-	2	3	1	3	1	1
CO5	-	-	-	-	-	-	3	1	-	3	1	1
CO6	-	-	1	-	-	-	1	2	-	2	1	1

Bachelors in Medical Radio Imaging and Technology II[nd] Semester

Course code	**:**	BMRT-206
Course Name	**:**	Preventive Medicine and Health Care
Semester /Year	**:**	II[nd] Semester

	L	T	P	C
	03	**-**	**-**	**03**

UNIT-I

Introduction: Definition of Health care, Common health problems of developed and developing countries, Role of nutritional diet, Various nutritional disorders, Role of physical exercises and yoga in prevention of various diseases.

Water, air, and noise Pollution: Removal of water hardness, purification of water and standards of water quality. Air and Pollution and their prevention. Housing and air conditioning.

UNIT-II

Hygiene and sanitation: Sanitation barriers, excreta disposal and disposal of hospital waste. Incineration and disinfection.

Infections and control: Microbial Pathogenicity, source and spread of infection in community, pathogenesis, toxigenicity, invasiveness, variations and virulence, host factors controlling infections to men, mode of spread and their control by physical & chemical agents.

UNIT-III

Epidemiology: Definition of Epidemiology, aetiology, surveillance and control of community infections of various communicable diseases like malaria, TB, dengue, rabies, poliomyelitis, measles, cholera, leprosy, diarrhoea. Emergence of drugs resistance. Methods of prevention and control-Isolation of patients, quarantine and incubation periods of various infectious diseases.

UNIT- IV

Prophylactic immunization: Rationale of immunization, immune response and duration of immunity, controlled studies of prophylactic Vaccines and hazards immunization. Various national immunization programs and vaccine schedule. Reproductive, Family Planning & Child Health Care Programs.

UNIT- V

Various Health related organizations: WHO, UNICEF, UNFPA, FAO, Indian Red Cross Society, ILO, Family Welfare and Planning.

UNIT- VI

Health care by balance diet and yoga: Normal constituents of diet, various diet programs, balanced diet and factors responsible for aetiology of various nutritional disorders. Carcinogens in food, Role of regular exercise and yoga in prevention and management of various diseases.

Health Planning and Management: Health planning, Planning cycle, malaria eradication and various other national health policy and programs. Various national immunization programs, National cancer control or prevention programs, AIDS control program, Population control program.

Text Books:

1. Park's Textbook of Preventive and social medicine 25th Edition

Reference Books:

1. Community Medicine (PSM) Vivek Jain Third Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To outline about water, air and noise pollution
CO2	To associate with hygiene and sanitation.
CO3	To examine infection and control like microbial pathogenicity and source and spread of infection
CO4	To illustrate about epidemiology, surveillance, methods of prevention and control of infection.
CO5	To debate on prophylactic immunization.
CO6	To write about role of balanced diet and yoga for health care and health planning and management.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	1	-	-	2	-	1	-	-	-	-
CO3	1	-	-	-	-	3	1	-	-	-	-	1
CO4	1	-	1	-	-	3	1	1	1	-	-	-
CO5	-	-	-	-	-	2	1	-	-	-	-	-
CO6	-	-	2	-	-	1	2	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology II[nd] Semester

Course code	**:**	BMRT-207
Course Name	**:**	English Communication II
Semester /Year	**:**	II[nd] Semester

	L	T	P	C
	01	**-**	**02**	**02**

UNIT-I

Writing Skills:

- Proposal & Report Writing
- Preparing Notice
- Verbal Analogies

UNIT-II

Listening Skills:

- Active Listening
- Talk Shows
- Commentaries
- Listening Comprehensions

UNIT-III

Functional Grammar & Vocabulary:

- Root Words
- Idioms & Phrases
- Technical Jargons
- Direct & Indirect Speech
- Active & Passive Voice
- Sentence Re-arrangement

UNIT- IV

Communication Skills:

- Power Point Presentations
- Know Your Body Language
- Role Plays
- Picture Perception
- Public Speaking 'Debate, Stage Handling, Oral Presentation

UNIT- V

Verbal Ability:

- One Word Substitutions
- Jumbled Words
- Sentence Improvement

Textbooks:

1. English Grammar Composition and Usage by J.C. Nesfield, Macmillian Publishers.
2. Communication Skills by Sanjay Kumar & PushpLata, Oxford University Press

Reference Books:

1. Business Writing for Dummies (3rd Edition) by Natalie Canavor, For Dummies
2. Reading and Listening Comprehension Skills by Michelle Osment, Curriculum Concepts

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To outline and Demonstrating comprehension in listening
CO2	To Understand and improve vocabulary
CO3	To Demonstrate public speaking skill
CO4	To illustrate about Draft official written communication formats
CO5	To Apply concept and rules of grammar.
CO6	To Demonstrating effective speaking skills

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	2	-	-	-	-	-	-	-	-
CO2	-	-	-	1	-	-	-	1	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	1	-	-	-	-
CO5	-	-	-	1	-	-	-	-	-	-	-	-
CO6	-	-	-	2	-	-	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology IInd Semester

Course code	**:**	BMRT-201P
Course Name	**:**	Human Anatomy-II
Semester /Year	**:**	IInd Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

PRACTICALS

1. Demonstration of anatomical position, various imaginary planes, body surfaces.
2. Demonstration of different body parts, body cavities.
3. Demonstration of different body positions.
4. Demonstration of different types of bones present in the human body.
5. Demonstration of different types of muscles.
6. Demonstration of various types of joints present in body.
7. Demonstration of bones present in trunk, thorax and abdomen of body.
8. Demonstration of bones present in head and neck of the body.

Bachelors in Medical Radio Imaging and Technology IInd Semester

Course code	**:**	BMRT-202P
Course Name	**:**	Human Physiology-II
Semester /Year	**:**	IInd Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practical

1. Demonstration to measure vital capacity.
2. Demonstration to measure pulse rate.
3. Demonstration to measure capacity and lung volume.
4. Identification of heart sounds.
5. Determination of different blood groups.
6. Demonstration of electrocardiogram

Bachelors in Medical Radio Imaging and Technology IInd Semester

Course code	**:**	BMRT-203P
Course Name	**:**	Basic & Radiation Physics-II
Semester /Year	**:**	IInd Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration to show luminescence, fluorescence and phosphorescence.
2. Demonstration of X-ray tube and its components.
3. Demonstration of control room and various knobs.
4. Demonstration to show production of X-rays.

Bachelors in Medical Radio Imaging and Technology IInd Semester

Course code	**:**	BMRT-204P
Course Name	**:**	Orientation of Diagnostic Radiology and Para clinical Imaging-II
Semester /Year	**:**	IInd Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of cassettes, loading and unloading of cassette.
2. Demonstration to show safe light.
3. Demonstration of Intensifying screens, radiographic films and grid.
4. Demostration to show proper layout of darkroom as per the guidelines.

Bachelors in Medical Radio Imaging and Technology IInd Semester

Course code	**:**	BMRT-205P
Course Name	**:**	Medical Laws & Radiation Protection-II
Semester /Year	**:**	IIst Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of various radiation protection devices.
2. Demonstration to show proper handling of radiation shielding devices like lead aprons, thyroid shields, pelvic shield, Lead goggles etc.
3. Demonstration of various radiation measurement devices.
4. Demonstration to show proper handling of radiation dosimeters.
5. Demonstration of various radiation detectors.
6. Demonstration to show site planning as per the guidelines.

Department of Radiology & Imaging Technology

Value Added Course

Clinical Education

VACMRT-101

Duration: 30

Course Objective:

- **Demonstrate Advanced Clinical Skills:** Exhibit proficiency in advanced clinical techniques and procedures.
- **Apply Evidence-Based Practice:** Integrate current research and evidence into clinical decision-making.
- **Develop Professional Communication:** Enhance skills in patient interaction, interprofessional collaboration, and conflict resolution.
- **Engage in Reflective Practice:** Reflect on clinical experiences to identify strengths, weaknesses, and areas for improvement.
- **Explore Healthcare Systems:** Understand and navigate the complexities of healthcare systems, including patient safety and quality improvement.

Course Contents

Module I: Introduction to Advanced Clinical Skills**.**

- Overview of course objectives, expectations, and advanced skills.

Module II: Clinical Assessment Techniques**.**

- Advanced physical examination, diagnostic reasoning.

Module III: Patient-Centered Communication

- Techniques for effective patient interaction and building rapport

Module IV: Quality Improvement and Patient Safety**.**

- Strategies for enhancing patient safety and quality of care.

References:

- Clinical Skills for Healthcare Professionals by J. Smith & A. Johnson
- Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava

Bachelors in Medical Radio Imaging and Technology III[rd] Semester

Course code	**:**	BMRT-301
Course Name	**:**	Orientation in Para clinical Imaging
Semester /Year	**:**	III[rd] semester

	L	T	P	C
	03	**-**	**-**	**03**

UNIT-I

MICROBIOLOGY

Morphology & physiology of Bacteria, Staphylococcus, Streptococcus, Mycobacterium Tuberculosis, Spirochetes, Corynebacterium Diphtheria

UNIT-II

VIRUS

General Properties, Herpes Virus, Poliovirus, Hepatitis Virus, Oncogenic Virus, HIV

UNIT-III

MEDICINE

- Pericarditis
- Valvular diseases
- Rhematic Heart Disease
- Heart failure
- Hypertension.

UNIT-IV

ORTHPAEDICS

Fracture

- Type Mechanism, Healing, Delayed Union, Non- complication
- Injuries of the shoulder gridle, Dislocation of shoulder
- Fracture of Humerus, Elbow Forearm
- Of Distal Radius & Ulna
- Injuries of the Capos
- Dislocation of Hip
- Fracture Femur, Tibia, Ankle, Calcaneum
- Acute & chronic osteoarthritis
- Rheumatoid arthritis
- Paget's Disease
- Ankylosing spondylitis
- Club foot
- Bone Tumour- Benign, Malignant

Text Books:

1. Harsh Mohan. Textbook of Pathology. Eight Edition.
2. Baweja, 2018. Textbook of Microbiology. Sixth Edition.
3. Essential Orthopaedics by Maheshwari.

Reference Books:

1. **Handbook of fracture by Kenneth Egol, MD.**

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To outline the morphology and physiology of various microbial agents and viruses.
CO2	To done contrasting between various microbial and viral agents.
CO3	To examine treatment option required to treat various clinical conditions.
CO4	To explain clinical features, treatment options, required diagnostic investigations of various clinical conditions.
CO5	To Understand the basic anatomy and physiology of the musculoskeletal system, including bones, joints, muscles, and connective tissues.
CO6	To Identify and describe common orthopaedic disorders and injuries, such as fractures, dislocations, arthritis, and spinal deformities.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	2	1	-	1	-	-	-	-	1	-
CO4	-	-	2	2	-	2	-	-	-	-	1	-
CO5	-	-	-	1	-	-	1	-	2	-	-	1
CO6	-	-	-	1	-	-	-	-	2	-	-	1

Bachelors in Medical Radio Imaging and Technology IIIrd Semester

Course code	**:**	BMRT-302
Course Name	**:**	Special Radiological Equipment-I
Semester /Year	**:**	IIIrd semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Conventional Radiography: Process of film developing-Composition of developer and Fixer- Fixer replenishment-silver recovery-Film Storage-Film Handling-Loading and unloading of cassette-Film screen contact-Film contrast- Manual processing assembly and technique

UNIT-II

Automatic processing assembly and technique-Formation of Latent image-silver recovery

UNIT-III

Computed Radiography- Construction, working principle, equipment & imaging System, Advancements & Applications, Differenced between conventional radiography and computed radiography.

UNIT-IV

Digital Radiography- Construction, working principle, equipment & imaging System, Advancements & Applications, Differenced between conventional radiography and computed radiography.

UNIT-V

Fluoroscopy: Fluorescence and Phosphorescence-Types of fluorescent and Phosphorescent materials used in fluoroscopy-Fluoroscopic Screen-Tilting Table-Construction and working principle of Image intensifier &TV Monitor-construction and working principle of picture tube, vidicon camera and CCD- image formation and quality-Automatic brightness control-Serial radiography- Manual Cassette changer assembly and automatic cassette changer assembly- Principal of Cine Fluoroscopy

UNIT-VI

Digital Fluoroscopy- Construction, working principle, equipment & imaging System, Advancements & Applications, Differenced between conventional fluoroscopy and digital fluoroscopy, patient radiation dose and its safety measures. Advantages of image intensifier over fluoroscopic screen.

Text Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

2. Basic Radiological Physics by K. Thayalan Second Edition

Reference Books:

1. Christensen's Physics of Diagnostic Radiology by Thomas S. Curry

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To define basic principle of different imaging modalities.
CO2	To done contrasting between conventional, computed and digital radiography.
CO3	To determine the role of dynamic imaging to identify various pathologies.
CO4	To outline developments, Principle and various generations of computed tomography.
CO5	To outline the working principle of Magnetic Resonance Imaging
CO6	To manage and operate different imaging modalities.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	1	-	2	1	-	-	1	-	-	2
CO2	-	3	1	-	2	1	-	-	1	-	-	2
CO3	-	3	1	-	2	1	-	-	1	-	-	2
CO4	-	2	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	2	-	3	1	-	3	-	-
CO6	-	-	-	-	-	-	-	-	-	1	-	2

Bachelors in Medical Radio Imaging and Technology IIIrd Semester

Course code	**:** BMRT-303
Course Name	**:** Radiographic Techniques-I
Semester /Year	**:** IIIrd semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Common terminology, Patient handling & Preparation-Clinical, Ethical & Legal Responsibility, (including medico legal /Accident cases)

UNIT-II

Patient Preparation: Introduction, Need of Patient Preparation, General Abdominal Preparation, Purgatives- Type of Purgatives, Their Use, Their Side effects, Prevention of Intestinal gas, Clothing of Patient, High KV technique, soft tissue radiography, Xeroradiography

UNIT-III

Upper Extremities Related Radiological Anatomy Basic and Special projections

- Finger PA, LAT, OBLIQUE
- Hand PA, LAT, NOGAARD'S View
- Wrist PA, LAT, Carpal Tunnel, Carpal Canal
- Thumb AP, LAT, Oblique, Folio Method
- Forearm AP, LAT.

UNIT-IV

Upper Extremities Related Radiological Anatomy Basic and Special projections

- Femur AP,LAT
- Knee joint AP, LAT
- Patella SKYLINE View
- Tibia & Fibula AP, LAT
- Ankle joint AP, LAT, MORTISE View, AP STRESS View
- Foot AP, LAT
- Calcaneus AXIAL and LATERAL.

UNIT-V

Chest Radiography

- Basic views
- Inspiratory & expiratory films-
- Special chest views & their significance

UNIT-VI

Abdomen Radiography

- Preparation of patient
- Positioning for fluid and air Levels in abdomen.
- Basic and special projection for Abdomen and acute abdomen investigation.

Text Books:

1. Bontrager's Textbook of Radiographic Positioning and Related Anatomy by John P. Lameignano and Leslie E. Kendrick. Tenth Edition
2. Clark's Positioning in Radiography by A. Stewart Whipley, Gail Jefferson, Ken Holmes, Charles Sloand, Craig Anderson and Graham Hoadley. Thirteenth Edition

Reference Books:

1. Radiology of Positioning and applied anatomy by G. S. Garkal. Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To Describe the professional laws and ethics.
CO2	To discuss the legal aspect and medical ethics in health setup
CO3	To Demonstrate patient handling and preparation.
CO4	To assess the techniques of Chest, abdomen, pelvis and extremities Radiography.
CO5	To evaluate the radiographic image quality.
CO6	To design the parameter for identification of radiographic image quality.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	2	3	-	3	1	-
CO2	-	-	-	-	-	-	2	3	-	3	1	-
CO3	-	-	-	-	-	1	-	-	-	-	3	-
CO4	-	-	-	1	-	-	-	-	-	-	3	-
CO5	-	-	-	-	-	3	-	-	-	-	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology III[rd] semester

Course code	**:**	BMRT-304
Course Name	**:**	Special Radiological Procedures-I
Semester /Year	**:**	III[rd] semester

	L	T	P	C
	03	-	-	03

UNIT-I

Contrast Media: properties, Types, Reaction and treatment of contrast media-Emergency drug used in Radiology Department- Emergency equipment in the radiology department-Aseptic Technique-Patient handling & Preparation.

UNIT-II

Patient Preparation: Introduction, Need of Patient Preparation, General Abdominal Preparation, Purgatives- Type of Purgatives, Their Use, Their Side effects, Prevention of Intestinal gas, Clothing of Patient.

UNIT-III

Procedures of G.I. Tract:

- Barium swallow
- Barium meal
- Barium meal follow through (BMFT)
- Barium enema
- Small Bowel Enema

UNIT-IV

Procedures Of Excretory System:

- IVP
- RGU
- Micturating Cystourethrography
- Ascending Urethrography
- Voiding Cystography (VCUG)

UNIT-V

Procedures of Reproductive system

- HSG (Hysterosalpingography)

UNIT-VI
Procedures of Hepatobiliary system • T-tube cholangiography • ERCP • Percutaneous Trans hepatic Cholecystography

Text Books:

1. Chapman & Leinakienly's guide to Radiological Procedures. Third Edition
2. Clark's Positioning in Radiography by A. Stewart Whipley, Gail Jefferson, Ken Holmes, Charles Sloand, Craig Anderson and Graham Hoadley. Thirteenth Edition

Reference Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To Describe the properties of contrast media.
CO2	To discuss the Use appropriate exposure settings, positioning, and imaging protocols to obtain high-quality images.
CO3	To Provide clear instructions to patients for positioning and breathing to achieve optimal imaging results.
CO4	To assess the importance of Radiological Procedure done in Radiology Department
CO5	To Ensure patients understand the procedure, including potential risks and benefits, before proceeding.
CO6	To design the parameter for familiar with when different radiological procedures are appropriate based on clinical indications.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	2	3	-	3	1	-
CO3	-	-	-	-	-	1	-	-	-	3	-	-
CO4	-	-	-	1	-	-	-	-	-	-	3	-
CO5	-	-	-	-	-	3	-	-	-	-	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology IIIrd semester

Course code	**:**	BMRT-305
Course Name	**:**	Computed Tomography-I
Semester /Year	**:**	IIIrd semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I
Basic Principle, Historical developments, various generations, clinical applications-Imaging principles in computed tomography
UNIT-II
Equipment/Hardware: Instrumentation of CT scan-CT Gantry-Advances in Detector technology- Slip ring technology- Helical CT-Single slice and Multi slice CT Scan system (recent advancement in CT scanner)-
UNIT-III
Pressure Injector-Data Acquisition System-Image Display System-Storage-CT Control Console.
UNIT-IV
Hounsfield Unit, CT Number, Pitch, Post processing Technique; Contrast in CT, Phase Enhancement in CT, Windowing, Resolution,
UNIT-V
Image Reconstruction: Basic Principle, Image reconstruction in CT, MPR, MIP, Min IP, 3D rendering
UNIT-VI
Advantages of CT over X-Ray Limitations and Advancements of computed tomography

Text Books:

1. Christensen's Physics of Diagnostic Radiology by Thomas S. Curry
2. MRI at a Glance. Catherine Wrest brook.

Reference Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To outline developments, Principle and various generations of computed tomography.
CO2	To interpret technical aspects behind instrumentation of CT scan, advancements in detector technology, helical CT, and HRCT.
CO3	To implement standard protocols of various CT examinations.
CO4	To illustrate the difference between artefact and normal regions on radiograph.
CO5	To assess basic reconstruction mechanism of Computed Tomography.
CO6	To write about the advantages of CT in diagnosing various pathological conditions.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	-	-	3	-	-	-	-	-	1	-
CO2	-	3	-	-	3	-	-	-	-	-	1	2
CO3	-	2	2	-	2	-	-	-	-	-	3	-
CO4	-	3	-	-	3	1	-	-	-	-	2	-
CO5	-	2	-	-	3	1	-	-	-	-	2	-
CO6	-	2	3	3	3	3	1	1	-	3	3	-

Bachelors in Medical Radio Imaging and Technology IIIrd Semester

Course code	**:**	BMRT-306
Course Name	**:**	Magnetic Resonance Imaging-I
Semester /Year	**:**	IIIrd semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I
Introduction- Magnetism-Magnetic Susceptibility-Fringe Field- Motion within the atom- MR active nuclei-Hydrogen nucleus-
UNIT-II
Principle: Principles of magnetic resonance imaging- NMV-Spin-Alignment-Classical Theory-Quantum Theory- Precession-Spin Wobble-Larmor Equation-Gyromagnetic Ratio-Resonance-MR Signal- Free Induction Decay-
UNIT-III
Relaxation-T1 Recovery- T2 Decay- T2* decay -Time Pulse cycle T1 weighted image T2 weighted image Proton density image.
UNIT-IV
MR Parameters: Extrinsic Parameters- Intrinsic Parameters-Signal to Noise Ratio- Contrast to Noise Ratio-Spatial resolution- Volume Imaging
UNIT-V
Hardware: MR Instrumentation, Types of magnets- Permanent Magnet, Resistive Magnet, Superconducting Magnet, RF transmitter & receiver coils-Gradient coils-Shim coils-RF shielding-Computers- Patient Transportation System- Console Panel.
UNIT-VI
Advantage of MRI over computed tomography or ultrasonography. Its limitations and use and cross-sectional anatomy.

Text Books:

1. Christensen's Physics of Diagnostic Radiology by Thomas S. Curry
2. MRI at a Glance. Catherine Wrest brook.

Reference Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To outline the working principle of Magnetic Resonance Imaging
CO2	To understand the role of various components of MR machine.
CO3	To implement technical methods required to operate MRI modality.
CO4	To min map the conditions, which needs to be fulfilled before starting a MR scan.
CO5	To predict difference between artefact and normal regions on a radiograph.
CO6	To write about benefits of MRI over other modalities.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	3	-	-	-	-	-	1	-
CO2	-	2	-	-	3	-	-	-	-	-	1	-
CO3	-	2	-	-	2	-	-	-	-	-	3	-
CO4	-	-	-	-	3	1	-	-	-	-	2	-
CO5	-	2	1	-	3	1	-	-	-	-	2	-
CO6	-	2	-	-	3	3	1	1	-	3	3	-

Bachelors in Medical Radio Imaging and Technology IIIrd Semester

Course code	**:**	BMRT-307
Course Name	**:**	Environmental Sciences
Semester /Year	**:**	IIIrd semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Introduction to Environmental Science

- Definition of Environmental Science
- History and Evolution of Environmental Studies
- Scope and Importance of Environmental Science

UNIT-II

Environmental Resources and Human Impact

- Natural Resources: Types and Uses
- Resource Depletion and Conservation
- Human Impact on Ecosystems

UNIT-III

- **Environmental Pollution**
- Types of Pollution: Air, Water, Soil
- Sources and Effects of Pollution
- Pollution Management Strategies

UNIT-IV

Environmental Communication and Education

- Strategies for Environmental Education
- Effective Communication Techniques
- Public Awareness Campaigns

UNIT-V

Environmental Ethics and Activism

- Environmental Ethics: Theories and Perspectives
- Role of Activism in Environmental Protection
- Case Studies of Environmental Movements

Text Books:

1. Cunningham, W. P., & Cunningham, M. A. (2023). *Environmental Science: A Global Concern*.
2. Molles, M. C. (2022). *Ecology: Concepts and Applications*.

3. Pratson, L. (2022). *Environmental Science: Systems and Solutions*.

Reference Books:

1. Romm, J. (2021). Climate Change: What Everyone Needs to Know.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Understand fundamental ecological principles and systems.
CO2	Analyse the impact of human activities on the environment.
CO3	Explore strategies for environmental conservation and sustainability.
CO4	Develop skills for environmental research and data analysis.
CO5	Engage in critical discussions on contemporary environmental issues.
CO6	To Understanding Critical Analysis of Environmental Issues.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	3	-	-	-	-
CO2	-	-	-	2	-	-	-	3	-	-	-	-
CO3	-	-	-	2	-	-	-	2	-	-	-	-
CO4	-	-	-	-	-	-	-	3	-	-	-	-
CO5	-	-	-	2	-	-	-	3	-	-	-	-
CO6	-	-	-	2	-	-	-	3	-	-	-	-

Bachelors in Medical Radio Imaging and Technology IIIrd Semester

Course code	**:**	BMRT-301P
Course Name	**:**	Orientation in Paraclinical Sciences-I
Semester /Year	**:**	IIIrd Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration to show morphology of different microbial agents.
2. Identification of numerous viruses and bacteria.
3. Demonstration for better identification of different pathologies.

Bachelors in Medical Radio Imaging and Technology III[rd] Semester

Course code	**:**	BMRT-302P
Course Name	**:**	Special Radiological Equipment-I
Semester /Year	**:**	III[rd] Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of film development-Composition of developer and Fixer- Fixer replenishment-silver recovery.
2. Demonstration of Film Storage and Film Handling in conventional radiography.
3. Demonstration of Loading and unloading of cassette
4. Demonstration of Film Handling-Loading & Unloading.
5. Demonstration of Conventional Radiography equipment.
6. Demonstration of Digital Radiography assembly, detectors.
7. Demonstration of Construction and working principle of Image intensifier &TV Monitor

Bachelors in Medical Radio Imaging and Technology IIIrd Semester

Course code	**:**	BMRT-303P
Course Name	**:**	Radiographic Techniques-I
Semester /Year	**:**	IIIrd Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of body planes and basic patient preparation techniques.
2. Demonstration of basic views of chest radiography.
3. Observation of basic views of spine radiography.
4. Demonstration of basic techniques to examine abdominal region and pelvic region.
5. Demonstration of basic radiographic views of upper and lower extremities.

Bachelors in Medical Radio Imaging and Technology IIIrd Semester

Course code	**:**	BMRT-304P
Course Name	**:**	Special Radiological Procedures-I
Semester /Year	**:**	IIIrd Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of body planes and basic patient preparation techniques for contrast procedures.
2. Demonstration of basic contrast procedures of GI Tract.
3. Demonstration of various anatomical landmarks of extremities.
4. Demonstration of patient positioning during different contrast procedures of extremities.
5. Demonstration of patient positioning during different contrast procedures of extremities.

Bachelors in Medical Radio Imaging and Technology IIIrd Semester

Course code	**:** BMRT-305P
Course Name	**:** Computed Tomography-I
Semester /Year	**:** IIIrd Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of basic components of CT machine.
2. Demonstrations to show routine CT procedures technique.
3. Demonstration to prepare pressure injector.
4. Demonstration of patient positioning and part positioning for various CT procedures.

Bachelors in Medical Radio Imaging and Technology IIIrd Semester

Course code	**:** BMRT-306P
Course Name	**:** Magnetic resonance Imaging-I
Semester /Year	**:** IIIrd Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of basic components of MRI machine.
2. Demonstrations to show routine MR procedures technique.
3. Demonstration to prepare pressure injector.
4. Demonstration of patient positioning during various MRI examinations.
5. Demonstration to show proper administration of RF coils.

Bachelors in Medical Radio Imaging and Technology IVth Semester

Course code	**:**	BMRT-401
Course Name	**:**	**Pharmacology**
Semester /Year	**:**	IVth Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I
General Pharmacology: Definition of Pharmacology**,** Pharmacokinetic and pharmacodynamics**,** Routes of drug administration**,** Side effect of drugs, adverse effect of drug potency and efficacy of drug, bioavailability of drug.
UNIT-II
Autonomic Nervous System Drugs: Cholinergic Drugs and Anticholinergic Drugs, Adrenergic Drugs and Antiadrenergic Drugs
UNIT-III
Central Nervous System Drugs: Sedatives, Hypnotics, and Anxiolytics, Analgesics and Narcotics, Antiepileptic Drugs. Importance of Pharmacology in Radiological Procedures, Introduction to Radiographic Contrast Media
UNIT-IV
Radiographic Contrast Media: Types of Contrast Media (Iodinated Contrast Agents, Barium sulphate, etc.), Pharmacological Management of Contrast Media Reactions, Adverse Reactions and Complications of Contrast Media, Treatment and Management of Non-allergic Reactions e.g., Vasovagal reaction.
UNIT-V
Pharmacological Agents used in Interventional: Radiology (e.g., Sedatives, Analgesics, Anaesthetics), Periprocedural Medications and Management, Contrast Agents in Interventional Procedure, Adverse Effects and Complications Management in Interventional Radiology

Text Books:

1. Fundamental of Orthopaedics. Mahindra. Jain. Second Edition
2. Textbook of Operative Surgery by Vipul Yagnik.
3. Five Teachers Textbook of Gynaecology by Rashid Lalit Khan and Yousuf Lalit Khan. Seventh Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To identify routes of drug administration & Side effect of drugs.
CO2	To interpret adverse effect of drug potency and efficacy of drug, bioavailability of drug.
CO3	To determine the cholinergic Drugs and Anticholinergic Drugs.
CO4	To correlate importance of Pharmacology in Radiological Procedures.
CO5	To assess types & management of Contrast Media.
CO6	To design the parameters of Pharmacological Agents used in Interventional Radiology.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	3	1	-	1	-	-	-	-	-	-
CO2	-	-	3	-	-	1	-	-	-	-	-	-
CO3	-	-	1	-	-	1	-	-	-	-	-	-
CO4	1	-	1	-	-	1	-	-	-	-	-	-
CO5	1	-	1	-	-	1	-	-	-	-	-	-
CO6	2	-	2	1	-	1	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology IVth Semester

Course code	**:**	BMRT-402
Course Name	**:**	Special Radiological Equipment-II
Semester /Year	**:**	IVth Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Positron Emission Tomography (PET)

- Principles of PET Imaging
- PET Scanners: Design and Operation
- PET/CT and PET/MRI Hybrid Systems
- Clinical Applications and Recent Developments

UNIT-II

Single Photon Emission Computed Tomography (SPECT)

- Principles of SPECT Imaging
- SPECT Scanners: Design and Function
- SPECT/CT Hybrid Systems
- Clinical Applications and Advancements

UNIT-III

Emerging Technologies and Future Trends

Artificial Intelligence in Radiology

- AI Algorithms and Applications in Radiology
- AI in Image Interpretation and Diagnostic Support

UNIT-IV

Telemedicine and Remote Radiology

- Tele-radiology Technologies
- Remote Imaging Solutions and Challenges

UNIT-V

Innovations in Radiological Equipment

- Emerging Technologies and Future Directions
- Research and Development in Radiology

Text Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition
2. Basic Radiological Physics by K. Thayalan Second Edition

Reference Books:

1. Christensen's Physics of Diagnostic Radiology by Thomas S. Curry

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To define basic principle of different imaging modalities.
CO2	To Identify and describe the various types of special radiological equipment used in medical imaging and radiation therapy.
CO3	To determine the role of dynamic imaging to identify various pathologies.
CO4	To Demonstrate operational proficiency in the setup, calibration, and maintenance of special radiological equipment
CO5	To Apply knowledge of special radiological equipment to ensure patient safety and optimize imaging outcomes
CO6	To Understand and adhere to the regulatory and ethical standards governing the use of special radiological equipment.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	1	-	2	1	-	-	1	-	-	2
CO2	-	3	1	-	2	1	-	-	1	-	-	2
CO3	-	3	1	-	2	1	-	-	1	-	-	2
CO4	-	2	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	2	-	3	1	-	3	-	-
CO6	-	-	-	-	-	-	-	-	-	1	-	2

Bachelors in Medical Radio Imaging and Technology IVth Semester

Course code	**:**	BMRT-403
Course Name	**:**	Radiographic Techniques-II
Semester /Year	**:**	IVth Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Paediatric Radiography

- Positioning,
- Immobilization devices
- Child Abuse
- Handling and Caring
- Radiation protection while handling babies
- Imaging parts for paediatric patients.

UNIT-II

Shoulder girdle and thorax Radiography

- Technique for shoulder joint, scapular, clavicle, acromioclavicular joints, sternum, ribs, sternoclavicular joint. Supplementary projections and techniques.
- Recurrent dislocation of shoulder.
- Traumatic dislocation of shoulder.

UNIT-III

Pelvic girdle and hip region Radiography

- Technique for whole pelvis. Ilium, ischium, pubic bones, Sacro iliac joint, symphysis pubis, hip joint, acetabulum neck of femur, greater and lesser trochanter.

UNIT-IV

Spine Radiography -Vertebral column – Atlanta occipital articulation- cervical spine- dorsal spine - lumbar spine – sacrum -vertebral canal- vertebral foramen.

- Technique for atlanto-occipital joint
- Technique for cervical spine
- Technique for Cervico thoracic spine
- Technique for thoracic spine
- Technique for thoracic lumber spine
- Technique for lumber sacral spine, sacrum and coccyx.
- Technique to demonstrate: Scoliosis, Kyphosis, Spondylolisthesis.

UNIT-V

Skull Radiography: Special projection and Anatomic Relationship

Technique for

- Skull Series
- Facial Bones
- Nasal Bones
- Zygomatic Arches
- Optic foramina and orbit
- Mandible
- TM Joint
- Sinuses

UNIT-VI

Abdominal Radiography

- Technique for plain film examination.
- Projection for acute abdomen patients.
- Technique to demonstrate: Foreign bodies, Imperforate anus.

Text Books:

1. Bontrager's Textbook of Radiographic Positioning and Related Anatomy by John P. Lameignano and Leslie E. Kendrick. Tenth Edition
2. Clark's Positioning in Radiography by A. Stewart Whipley, Gail Jefferson, Ken Holmes, Charles Sloand, Craig Anderson and Graham Hoadley. Thirteenth Edition

Reference Books:

1. Radiology of Positioning and applied anatomy by G. S. Garkal. Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To Describe radiographic techniques for upper and lower limb skeletal imaging, utilizing supplementary methods for detailed views.
CO2	To discuss the radiographic techniques for shoulder girdle, thorax, vertebral column, and pelvic girdle imaging
CO3	To Apply comprehensive radiographic techniques for skeletal surveys, skull imaging, and specialized views, demonstrating proficiency in diagnostic imaging.
CO4	To assess the importance abdomen Radiography.
CO5	To evaluate the radiographic image quality.
CO6	To design the parameter for identification of radiographic image quality.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	2	3	-	3	1	-
CO2	-	-	-	-	-	-	2	3	-	3	1	-
CO3	-	-	-	-	-	1	-	-	-	-	3	-
CO4	-	-	-	1	-	-	-	-	-	-	3	-
CO5	-	-	-	-	-	3	-	-	-	-	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology IInd year

Course code	**:**	BMRT-404
Course Name	**:**	Special Radiological Procedures-II
Semester /Year	**:**	IVth Semester

	L	T	P	C
	03	**-**	**-**	**03**

UNIT-I

Female Reproductive System:

- Hysterosalpingography (HSG)

FNAC

UNIT-II

Spinal cord

- Myelography

Respiratory System:

- Bronchography- Awareness

UNIT-III

Salivary glands

- Sialography

Lacrimal Gland

- Dacro cystography

UNIT-IV

Other Procedure

- Loopogram
- Sinogram
- Fistulogram Related anatomy, associated pathology and radiographic appearance Indications, contraindications and technique

Text Books:

1. Chapman & Leinakienly's guide to Radiological Procedures. Third Edition
2. Clark's Positioning in Radiography by A. Stewart Whipley, Gail Jefferson, Ken Holmes, Charles Sloand, Craig Anderson and Graham Hoadley. Thirteenth Edition

Reference Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To Understand the principles and techniques of various special radiological procedures.
CO2	To Analyse the indications, contraindications, and risks associated with special radiological procedures.
CO3	To Demonstrate patient handling and preparation
CO4	To assess the importance of Radiological Procedure done in Radiology Department
CO5	To Develop and implement patient care strategies for different radiological procedures.
CO6	To design the parameter for identification of radiographic image quality

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	-	-	-	-	-	-	-	-	3	-
CO2	-	1	-	-	-	-	2	3	-	3	1	-
CO3	-	1	-	-	-	1	-	-	-	3	2	-
CO4	-	-	-	1	-	-	-	-	-	-	3	-
CO5	-	1	-	-	-	3	-	-	-	-	3	-
CO6	-	2	-	-	-	3	-	-	-	-	2	-

Bachelors in Medical Radio Imaging and Technology IVth Semester

Course code	**:**	BMRT-405
Course Name	**:**	Computed Tomography-II
Semester /Year	**:**	IVth Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

CT Scanner Technology

- **Types of CT Scanners**
  - Single-slice vs. multi-slice CT scanners
  - Spiral (helical) CT
  - Cone-beam CT

UNIT-II

Image Acquisition Techniques

- **CT Imaging Protocols**
  - Protocols for various body regions (head, chest, abdomen, pelvis)
  - Contrast media usage and administration
  - Patient positioning and preparation
- **Artifact Management**
  - Common artifacts (beam hardening, motion artifacts, ring artifacts)
  - Techniques for minimizing artifacts

UNIT-III

Advanced CT Techniques

- **CT Angiography**
  - Principles of CT angiography
  - Indications and interpretation
- **CT for Interventional Procedures**
  - CT-guided biopsies and drainage procedures
  - Patient preparation and procedural techniques
- **Dual-Energy CT**
  - Principles and applications of dual-energy CT
  - Image interpretation and diagnostic benefits

UNIT-IV

- **Quality Control and Maintenance**
  - Routine maintenance procedures
  - Quality assurance checks and protocols
- **Safety Protocols**
  - Patient safety measures
  - Reducing radiation exposure (ALARA principle)

UNIT-V

Future Trends in Computed Tomography

- **Emerging Technologies**
  - Advances in CT technology (high-resolution imaging, AI in CT)
- **Research and Development**
  - Current research trends and future directions in CT imaging

Text Books:

1. Christensen's Physics of Diagnostic Radiology by Thomas S. Curry
2. Computed Tomography for Technologists: Exam Review" by Lois E. Romans

Reference Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition
2. "Essentials of Radiologic Science" by James Johnston and Philip K. S. Grubbs

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To outline developments, Principle and various generations of computed tomography.
CO2	To interpret technical aspects behind instrumentation of CT scan, advancements in detector technology, helical CT, and HRCT.
CO3	To implement standard protocols of various CT examinations.
CO4	To illustrate the difference between artefact and normal regions on radiograph.
CO5	To assess basic reconstruction mechanism of Computed Tomography.
CO6	To demonstrate effective patient care practices and communication skills in a clinical CT setting.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	-	-	3	-	-	-	-	-	1	-
CO2	-	3	-	-	3	-	-	-	-	-	1	2
CO3	-	2	2	-	2	-	-	-	-	-	3	-
CO4	-	3	-	-	3	1	-	-	-	-	2	-
CO5	-	2	-	-	3	1	-	-	-	-	2	-
CO6	-	2	3	3	3	3	1	1	-	3	3	-

Bachelors in Medical Radio Imaging and Technology IVth Semester

Course code	**:**	BMRT-406
Course Name	**:**	Magnetic Resonance Imaging-II
Semester /Year	**:**	IVth Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

MRI Image Interpretation

- Image contrast and resolution
- Interpretation of normal and abnormal MRI findings
- Common artifacts in MRI

UNIT-II

Clinical Applications of MRI

- MRI in neurology, orthopaedics, and oncology
- Case studies and diagnostic strategies

UNIT-III

Advanced MRI Techniques

- Functional MRI (fMRI)
- Diffusion Tensor Imaging (DTI)
- MRI Spectroscopy

UNIT-IV

Emerging Trends in MRI

- Latest advancements in MRI technology
- Future directions in MRI research

Text Books:

1. Christensen's Physics of Diagnostic Radiology by Thomas S. Curry
2. MRI at a Glance. Catherine Wrest brook.

Reference Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To Explain the fundamental concepts behind MRI imaging techniques.
CO2	To understand the role of various components of MR machine.
CO3	To implement technical methods required to operate MRI modality.
CO4	To Understand advanced MRI technologies and emerging trends.
CO5	To predict difference between artefact and normal regions on a radiograph.
CO6	To apply theoretical knowledge to real-world MRI scenarios.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	3	-	-	-	-	-	1	-
CO2	-	2	-	-	3	-	-	-	-	-	1	-
CO3	-	2	-	-	2	-	-	-	-	-	3	-
CO4	-	-	-	-	3	1	-	-	-	-	2	-
CO5	-	2	1	-	3	1	-	-	-	-	2	-
CO6	-	2	-	-	3	3	1	1	-	3	3	-

Bachelors in Medical Radio Imaging and Technology IVth Semester

Course code	**:**	BMRT-402P
Course Name	**:**	Special Radiological Equipment-II
Semester /Year	**:**	IVth Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of basic principle of PET/SPECT
2. Demonstration of emerging technology and future trend (AI in Radiology)
3. Demonstration of Telemedicine and remote radiology
4. Demonstration and collection of data for research and development radiology.

Bachelors in Medical Radio Imaging and Technology IVth Semester

Course code	**:**	BMRT-403P
Course Name	**:**	Radiographic Techniques-II
Semester /Year	**:**	IVth Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of basic views of Pediatric radiography.
2. Observation of basic views of spine radiography.
3. Demonstration of basic techniques to examine abdominal region and pelvic region.
4. Demonstration of basic views of skull radiography.
5. Demonstration of various techniques to diagnose facial bones.

Bachelors in Medical Radio Imaging and Technology IVth Semester

Course code	**:**	BMRT-404P
Course Name	**:**	Special Radiological Procedures-II
Semester /Year	**:**	IVth Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Observation of basic procedures.
2. Demonstration of salivary gland procedure
3. Demonstration of biliary system.
4. Demonstration of abdominal organs.
5. Demonstration of myelography, FNAC etc.

Bachelors in Medical Radio Imaging and Technology IVth Semester

Course code	**:** BMRT-405P
Course Name	**: Computed Tomography**-II
Semester /Year	**:** IVth Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of Quality control and maintenance
2. Demonstration of Artifacts management
3. Demonstration of CT Angiography
4. Demonstration of Interventional procedures done in CT

Bachelors in Medical Radio Imaging and Technology IVth Semester

Course code	**:**	BMRT-406P
Course Name	**:**	Magnetic resonance Imaging-II
Semester /Year	**:**	IVth Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of Image Acquisition and Processing
2. Demonstration of Clinical Applications of MRI
3. Demonstration of Advanced MRI Techniques
4. Demonstration of Latest advancements in MRI technology
5. Demonstration of MRI Hardware and Technology

Department of Radiology & Imaging Technology

Value Added Course

Hospital Practice and Patient care

VACMRT-102

Duration: 30

Course Objective:

- Demonstrate effective patient assessment and management skills.
- Apply evidence-based practices in patient care.
- Understand and navigate the hospital environment and interdisciplinary team dynamics.
- Communicate effectively with patients, families, and healthcare team members.
- Develop strategies for continuous improvement in patient care practices.

Course Contents

Module I: Introduction to Hospital Practice**.**

- Hospital organization and hierarchy
- Roles and responsibilities of different healthcare professionals
- Overview of hospital departments and services

Module II: Clinical Skills and Patient Assessment

- Techniques for effective history taking
- Performing a thorough physical examination

Module III: Patient Management and Care Planning

- Setting SMART goals for patient care
- Creating individualized care plans

Module IV: Ethical and Legal Aspects of Patient Care**.**

- Ethical principles in healthcare
- Legal issues related to patient care.

References:

- *Clinical Skills for Healthcare Professionals* by J. Smith & A. Johnson
- Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava
- *Current Diagnosis & Treatment: Hospital Medicine* by *J. R. D'Angelo, MD*

Bachelors in Medical Radio Imaging and Technology Vth Semester

Course code	**:**	BMRT-501
Course Name	**:**	General Pathology in Diagnostic Radiology-I
Semester /Year	**:**	**Vth Semester**

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

- Pericarditis
- Valvular diseases
- Rhematic Heart Disease
- Heart failure, Hypertension
- Coronary Artery disease
- Arrhythmia
- Congenital Heart Disease

UNIT-II

- Chronic Bronchitis
- Emphysema, Bronchiectasis
- Pneumonia, Tuberculosis
- Pleura effusion
- Empyema
- Spontaneous Pneumothorax
- Asthma
- Pulmonary Oedema
- Pulmonary Fibrosis
- Sarcoidosis.

UNIT-III

- Achalasia Cardia Peptic ulcer
- Intestinal obstruction, Crohn's disease
- Ulcerative Colitis, Pancreatitis
- Portal Hypertension
- Ascites, Cirrhosis
- Cholecystitis
- Appendicitis, diverticulitis.

UNIT-IV

- Hematuria
- UTI
- Hydro nephrosis
- Horseshoe Kidney
- Hydrocele
- Urinary calculi
- Polycystic Kidney disease
- Renal failure

Text Books:

4. Fundamental of Orthopaedics. Mahindra. Jain. Second Edition
5. Textbook of Operative Surgery by Vipul Yagnik.
6. Five Teachers Textbook of Gynaecology by Rashid Lalit Khan and Yousuf Lalit Khan. Seventh Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To identify various clinical pathologies.
CO2	To interpret clinical symptoms of patient related to various pathologies
CO3	To determine the examinations required to identify various pathologies.
CO4	To correlate various clinical pathologies on radiograph.
CO5	To assess treatment option required to treat various clinical conditions.
CO6	To write about clinical features, treatment options, required diagnostic investigations of various clinical conditions.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	3	1	-	1	-	-	-	-	-	-
CO2	-	-	3	-	-	1	-	-	-	-	-	-
CO3	-	-	1	-	-	1	-	-	-	-	-	-
CO4	1	-	1	-	-	1	-	-	-	-	-	-
CO5	1	-	1	-	-	1	-	-	-	-	-	-
CO6	2	-	2	1	-	1	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology Vth Semester

Course code	**:**	BMRT-502
Course Name	**:**	Radiotherapy Planning, Procedure and Equipment-I
Semester /Year	**:**	**Vth semester**

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Introduction

- Types of Radiotherapy-Teletherapy and Brachytherapy
- Types of Teletherapy, Clinical Applications
- Types of brachytherapy, Clinical Applications.

UNIT-II

- Introduction Radiography equipment used in Radiotherapy-Orthovoltage and Kilovoltage equipment
- Cobalt 60 Units its construction and source housing and handling mechanism

UNIT-III

Linear Accelerator

- Principle
- Working
- Tube design
- Wave guide system
- Target design beam bending system.

UNIT-IV

- Introduction to Radio-surgery equipment-Gamma knife- Gamma ray sources used in radiotherapy.
- Basic principle of Manual and remote after-loading system

Text Books:

1. Faiz M. Khan. (Khan's The Physics of Radiation Therapy). Faiz M. Khan and John P. Gyvbons. Fifth Edition
2. Basic Radiological Physics by K. Thayalan Second Edition

Reference Books:

1. Step by Step Radiation Therapy (Treatment and Planning) by Arun Kumar Rathi

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To define role of radiotherapy, its planning and procedures.
CO2	To understand the role of simulation technique in radiotherapy.
CO3	To efficiently present terminology of radiotherapy
CO4	To organize treatment setup efficiently with use of proper immobilization devices.
CO5	To measure percentage of radiation dose at particular depth
CO6	To write about various types of radiotherapy machines.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	1	1	-	1	1	-	2	-	1	-
CO2	-	1	-	2	2	1	1	-	1	-	1	-
CO3	-	1	-	-	1	-	1	-	-	-	-	-
CO4	-	3	2	1	3	2	1	-	-	-	1	-
CO5	-	-	-	-	-	-	3	1	-	2	-	1
CO6	-	3	-	-	2	-	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology Vth Semester

Course code	**:** BMRT-503
Course Name	**:** Advanced Imaging Modalities-I
Semester /Year	**: Vthsemester**

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I
Radiovisigraphy (RVG)- Principal, Basic Components-X-ray Machine, Intra Oral Sensor, Display Processing Unit, Advantages of RVG. **Cath Lab & DSA Machine-** Principal, Components of Machine, Technique, Common Procedures.
UNIT-II
DEXA- Principal of working, Components of machine, Types of DEXA Scanners, Benefits and application of DEXA.
UNIT-III
PET Scan- Principal of working, Components of PET Scanners- Gantry, Table, detector System, Scintillator, PMT, Types of PET Scanners, Radiopharmaceuticals in PET Scan, Advantages and applications of PET.
UNIT-IV
SPECT- Basic principle of SPECT, Components of SPECT Scanner- Gantry, Table, Scintillation Camera, PMT, Radiopharmaceuticals in SPECT Scan, Advantages and applications of PET.
UNIT-V
Hybrid Imaging: PET-CT, SPECT-CT, MRI-PET, MRI-SPECT- Advantages of Hybrid Imaging, Application of Hybrid Imaging.

Text Books:

1. Faiz M. Khan. (Khan's The Physics of Radiation Therapy). Faiz M. Khan and John P. Gyvbons. Fifth Edition
2. Basic Radiological Physics by K. Thayalan Second Edition

Reference Books:

1. Step by Step Radiation Therapy (Treatment and Planning) by Arun Kumar Rathi

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To identify different imaging modalities used for diagnostic purpose.
CO2	To understand the working principle of different advanced modalities.
CO3	To Demonstrate the role of hybrid scanning.
CO4	To assess the importance and mechanism of Radiopharmaceuticals
CO5	To evaluate the application and importance of advanced imaging modalities.
CO6	To write about the components, working principle and application of various advanced modalities.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	2	-	2	-	-	-	-	-	-	-
CO2	-	2	1	-	3	-	-	-	-	-	-	-
CO3	-	2	-	1	1	-	-	-	-	-	-	1
CO4	-	-	1	-	-	-	-	-	-	-	1	-
CO5	-	3	2	2	3	-	-	-	-	-	1	-
CO6	-	3	-	-	3	-	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology Vth Semester

Course code	**:**	BMRT-504
Course Name	**:**	Interventional Radiological Procedures and Techniques-I
Semester /Year	**:**	Vth Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Introduction to Interventional Radiology

- History and evolution of IR
- Basic principles of image-guided interventions
- Role of interventional radiology in modern medicine

UNIT-II

Pre procedure tasks:

- Consent, Patient evaluation and management, Safety consideration, Medications, Tools, Contrast agents

Intra procedure tasks

- Sedation, Antibiotic prophylaxis, Blood pressure control, Anticoagulation, Fluid management, Vascular access, Imaging, Treatment of adverse events and reaction

Post procedure patient care

- Sheath removal, Patient shifting, Patient monitoring, Images storage and transfers, Orders, Discharge criteria

UNIT-III

Interventional radiology suite

- Machine handling, imaging detector, patient positioning, pulsed fluoroscopy, fluoroscopy mode
- DSA
- Name of different interventional radiology procedure and the modality (CT, C-arm, USG, and DSA/ Cath Lab Guidance
- Differentiation between lines, tubes and drain in imaging correct or not

UNIT-IV

- Equipment used in various interventional radiology procedures.
- Cath Lab / DSA equipment and machine part
- C-arm equipment: instrumentation and working procedure

UNIT-V

Tools of the trade:

- Type of needles
- Type of vascular sheath
- Type of guide wires, Type of catheters
- Type of balloon
- Type of stent
- Sterilization of interventional radiology equipment
- Type of biopsy guns
- Type of drains.

Text Books:

1. RadCases. Interventional Radiology. Hector Ferral, Jonathan Lorenz. International Edition
2. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Reference Books:

1. Handbook of Interventional Radiological Procedures. Krishna Kandarpa, Lindsay Machan, Janette D. Durham. Fifth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To define role of interventional radiology, IR machine handling, DSA, different IR procedures and modalities.
CO2	To exemplify equipment used in IR procedures like Cath Lab/ DSA, C-arm equipment etc
CO3	To efficiently present principles of Pre, intra and Post IR procedures
CO4	To organize treatment setup efficiently by understanding vascular and non-vascular anatomy and pathology, clinical applications and sterile techniques in angiography procedures.
CO5	To distinguish anaesthesia and emergency drugs in IR
CO6	To write about emboli zing agents, radiation safety aspects in IR department, OT instruments and sterility.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	1	2	2	-	-	-	-	-	2	-
CO2	-	2	1	1	2	-	-	-	-	-	2	1
CO3	-	3	3	3	-	-	-	-	-	-	3	-
CO4	-	2	3	1	2	1	-	-	2	-	2	-
CO5	-	-	2	-	-	-	-	-	3	-	-	-
CO6	-	-	-	2	2	-	-	-	-	3	2	-

Bachelors in Medical Radio Imaging and Technology Vth Semester

Course code	**:**	BMRT-505
Course Name	**:**	Basics of Medical Emergencies
Semester /Year	**:**	**Vth Semester**

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Introduction to Medical Emergencies in Radiology

Overview of Radiology Department Functions

- Roles of Radiologic Technologists and Radiologists
- Common Procedures and Their Risks

Importance of Emergency Preparedness

- Why Emergency Preparedness Matters
- Legal and Ethical Considerations

Types of Medical Emergencies

- Cardiac Arrest and Acute Myocardial Infarction
- Respiratory Distress
- Allergic Reactions and Anaphylaxis
- Contrast Media Reactions
- Patient Falls and Injuries
- Infection Control Emergencies
- Radiation Safety Incidents

UNIT-II

Emergency Protocols and Procedures

Developing and Understanding Emergency Protocols

- Basic Steps in Emergency Response
- Evacuation Procedures and Safety Plans
- Emergency Equipment and Supplies
- First Aid Kits
- Automated External Defibrillators (AEDs)
- Emergency Medical Equipment
- Communication with Healthcare Providers and Emergency Services

UNIT-III
Basic First Aid and Life Support • CPR (Cardiopulmonary Resuscitation) • Choking Relief (Heimlich Maneuver) • Wound Care and Bleeding Control
UNIT-IV
Patient Care During Emergencies **Assessment and Stabilization of the Patient** • Initial Assessment Techniques • Stabilization Procedures **Patient Communication** • Calming and Reassuring Patients • Effective Communication with Patient Families

Text Books:

1. Concise Textbook on Hospital Management and Patient care in Diagnostic Radiology by N. K. Kardam and Lalit Aggarwal.
2. *Emergency Care and Transportation of the Sick and Injured* by American Academy of Orthopaedic Surgeons (AAOS)

Reference Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Identify various medical emergencies that could occur in a radiology department.
CO2	Understand the standard operating procedures and emergency protocols.
CO3	Demonstrate basic first aid and life support skills.
CO4	Develop effective communication strategies for emergency situations.
CO5	Implement emergency response plans and coordinate with medical and emergency services.
CO6	To design the parameter for identification of patient care responsibility & health care facility of a radiographer.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	2	-	-	2	3	2	3	1	2
CO2	-	1	-	-	-	-	3	3	2	2	1	1
CO3	-	-	1	1	-	1	-	-	2	-	1	-
CO4	-	2	-	2	1	-	3	2	-	2	-	1
CO5	-	1	-	3	-	-	2	2	-	3	2	3
C06	-	-	-	1	-	-	2	1	1	1	1	-

Bachelors in Medical Radio Imaging and Technology Vth Semester

Course code	**:**	BMRT-506
Course Name	**:**	Clinical Support in the Healthcare Industry
Semester /Year	**:**	**Vth Semester**

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Introduction to Clinical Support in Healthcare

- Overview of Clinical Support Roles
- Importance of Clinical Support in Healthcare
- Introduction to the Radiology Profession
- Ethical and Legal Considerations in Radiology

UNIT-II

Patient Care Fundamentals

- Basic Principles of Patient Care
- Patient Rights and Confidentiality
- Effective Communication Skills

UNIT-III

Infection Control in Radiology

- Infection Control Procedures
- Standard Precautions and Hygiene Practices
- Handling Contaminated Equipment

UNIT-IV

Patient Interaction and Management

- Techniques for Managing Anxious Patients
- Effective Patient Interviews and Assessments
- Dealing with Difficult Situations

UNIT-V

Legal and Ethical Issues in Radiology

- Legal Responsibilities of Radiologic Technologists
- Ethical Decision-Making in Radiology
- Reporting and Documentation Practices

Text Books:

1. Concise Textbook on Hospital Management and Patient care in Diagnostic Radiology by N. K. Kardam and Lalit Aggarwal.
2. **"Patient Care in Radiography"** by Ruth Ann Ehrlich and Dawn M. P. Goss

Reference Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To describe the Importance of the Professional Laws &Ethics.
CO2	Understand the principles of clinical support and their application in radiology.
CO3	Develop skills for effective patient communication and support.
CO4	Gain knowledge of clinical procedures and safety protocols in radiology.
CO5	Learn to work collaboratively within a multidisciplinary healthcare team.
CO6	Apply theoretical knowledge to practical scenarios in healthcare settings.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	2	-	-	-	3	2	3	1	2
CO2	-	1	-	3	-	-	1	3	2	2	1	1
CO3	-	-	1	-	-	1	-	-	2	-	1	-
CO4	-	2	-	3	1	-	2	2	-	2	-	1
CO5	-	1	-	2	-	-	1	2	-	3	2	3
C06	-	-	-	2	-	-	-	1	1	1	1	-

Bachelors in Medical Radio Imaging and Technology Vth Semester

Course code	**:**	BMRT-507
Course Name	**:**	Patient care and & Management in diagnostic radiology-I
Semester /Year	**:**	Vth Semester

	L	T	P	C
	03	**-**	**-**	**03**

UNIT-I

Safety and Infection Control

Radiation Safety

- Principles of radiation protection (ALARA principle)
- Personal protective equipment (PPE)
- Patient shielding techniques

Infection Control Practices

- Standard precautions and hygiene practices
- Cleaning and disinfecting radiology equipment
- Handling and disposal of biohazard materials

Emergency Procedures

- Identifying and managing medical emergencies
- Basic life support (BLS) and advanced cardiac life support (ACLS)
- Emergency preparedness and response plans

UNIT-II

Clinical Procedures and Workflow

Patient Preparation and Positioning

- Preparing patients for different imaging modalities
- Correct positioning for various diagnostic exams
- Use of immobilization devices and techniques

Managing the Imaging Process

- Scheduling and managing patient appointments
- Coordination with other healthcare providers

- Workflow optimization and time management

Documentation and Record Keeping

- Accurate documentation of patient information
- Maintaining and managing radiology records
- Legal and ethical considerations in documentation

UNIT-III

Principles of Patient Care in Radiology

- Patient-centered care
- Importance of communication skills
- Building rapport with patients
- Patient rights and ethical considerations

UNIT-IV

Patient Communication and Education

- Explaining procedures and processes
- Discussing risks, benefits, and alternatives
- Ensuring patient understanding and consent

Handling Special Patient Populations

- Pediatric patients
- Geriatric patients
- Patients with disabilities
- Non-English-speaking patients

Text Books:

1. Concise Textbook on Hospital Management and Patient care in Diagnostic Radiology by N. K. Kardam and Lalit Aggarwal.

Reference Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To describe the Importance of the Professional Laws &Ethics.
CO2	To discuss the legal aspect and medical ethics in health setup
CO3	To demonstrate body mechanics & transferring of patient.
CO4	To assess the Knowledge of departmental safety and infection control.
CO5	To evaluate the roll of Radiological exposure & protection principle.
CO6	To design the parameter for identification of patient care responsibility & health care facility of a radiographer.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	2	-	-	2	3	2	3	1	2
CO2	-	1	-	1	-	-	3	3	2	2	1	1
CO3	-	-	1	-	-	1	-	-	2	-	1	-
CO4	-	2	-	1	1	-	3	2	-	2	-	1
CO5	-	1	-	3	-	-	2	2	-	3	2	3
C06	-	-	-	-	-	-	2	1	1	1	1	-

Bachelors in Medical Radio Imaging and Technology Vth Semester

Course code	**:**	BMRT-501P
Course Name	**:**	General Pathology in Diagnostic Radiology-I
Semester /Year	:	Vth Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of all pathology
2. Demonstration of treatment planning procedure of all pathologies.
3. Demonstration of various devices.
4. Demonstration of control and handling of patients.
5. Demonstration of Radiography equipment.

Bachelors in Medical Radio Imaging and Technology Vth Semester

Course code	**:**	BMRT-502P
Course Name	**:**	Radiotherapy Planning, Procedure and Equipment-I
Semester /Year	**:**	Vth Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of orthovoltage and kilovoltage equipment.
2. Demonstration of treatment planning procedure.
3. Demonstration of various beam modification devices.
4. Demonstration of various immobilization devices.
5. Demonstration of Conventional Radiography equipment.

Bachelors in Medical Radio Imaging and Technology Vth Semester

Course code	**:**	BMRT-503P
Course Name	**:**	Advanced Modalities
Semester /Year	**:**	**Vth Semester**

	L	T	P	C
	-	**-**	**02**	**01**

Practicals

1. Demonstration of Radioviigraphy.
2. Observation of basic procedures.
3. Demonstration of DEXA.
4. Demonstration of PET/SPECT.
5. Demonstration of hybrid Imaging.

Bachelors in Medical Radio Imaging and Technology Vth Semester

Course code	**:**	BMRT-504P
Course Name	**:**	Interventional Radiological Procedures and Techniques-I
Semester /Year	**:**	**Vth Semester**

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of machines used in intervention radiology.
2. Demonstration of machine handling.
3. Demonstration of various equipment required in intervention radiology.
4. Demonstration of various intervention procedures.

Bachelors in Medical Radio Imaging and Technology VIth Semester

Course code	**:**	BMRT-601
Course Name	**:**	General Pathology in Diagnostic Radiology-II
Semester /Year	**:**	**VIth Semester**

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

- Meningoencephalitis
- Cerebral Vascular Disorders
- Sinusitis
- Polyps
- DNS
- Otitis Media
- Tonsillitis
- CSF Rhinorrhea

UNIT-II

- Aneurysms
- Arachnoids cysts
- Alzheimer's
- Parkinson's
- Shock
- Hypertension

UNIT-III

- Hangman's fracture
- Diskitis
- Spondylitis
- Scoliosis
- Pott's TB Spine
- Kyphosis
- Epilepsy

UNIT-IV

- Cerebral Vascular Disorders
- Meningitis, Encephalitis
- Stroke
- Haemorrhage
- Epilepsy
- Infarct
- Brain infection
- Multiple Sclerosis
- Vertigo
- Cerebral Palsy
- Congenital Brain Disorders
- Dementia, Parkinson's Disease
- Alzheimer's disease
- Neurocysticercosis
- Myelopathy
- Motor neuron Disease

Text Books:

1. Fundamental of Orthopaedics. Mahindra. Jain. Second Edition
2. Textbook of Operative Surgery by Vipul Yagnik.
3. Five Teachers Textbook of Gynaecology by Rashid Lalit Khan and Yousuf Lalit Khan. Seventh Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To identify various clinical pathologies.
CO2	To interpret clinical symptoms of patient related to various pathologies
CO3	To determine the examinations required to identify various pathologies.
CO4	To correlate various clinical pathologies on radiograph.
CO5	To assess treatment option required to treat various clinical conditions.
CO6	To write about clinical features, treatment options, required diagnostic investigations of various clinical conditions.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	3	1	-	1	-	-	-	-	-	-
CO2	-	-	3	-	-	1	-	-	-	-	-	-
CO3	-	-	1	-	-	1	-	-	-	-	-	-
CO4	1	-	1	-	-	1	-	-	-	-	-	-
CO5	1	-	1	-	-	1	-	-	-	-	-	-
CO6	2	-	2	1	-	1	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology VIth Semester

Course code	**:**	BMRT-602
Course Name	**:**	Radiotherapy Planning, Procedure and Equipment-II
Semester /Year	**:**	**VIth Semester**

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

- Definition of treatment planning
- Planning procedure in general and special Technique
- Terminology
- tumours localization and target volume
- Isodose Chart
- Parameters of Isodose chart

UNIT-II

- Treatment Planning Setup- Treatment Simulation
- CT Simulator
- Simulation Procedure
- tissue air-ratio
- tissue maximum ratio
- wedge angle
- hinge angle

UNIT-III

- Percentage depth dose
- Immobilization devices- Beam modification devices-Beams flattering filters
- scattering foils
- Physical properties of phantoms, phantom materials, bolus and bolus substitutes.

Text Books:

1. Faiz M. Khan. (Khan's The Physics of Radiation Therapy). Faiz M. Khan and John P. Gyvbons. Fifth Edition
2. Basic Radiological Physics by K. Thayalan Second Edition

Reference Books:

1. Step by Step Radiation Therapy (Treatment and Planning) by Arun Kumar Rathi

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To define role of radiotherapy, its planning and procedures.
CO2	To understand the role of simulation technique in radiotherapy.
CO3	To efficiently present terminology of radiotherapy
CO4	To organize treatment setup efficiently with use of proper immobilization devices.
CO5	To measure percentage of radiation dose at particular depth
CO6	To write about various types of radiotherapy machines.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	1	1	-	1	1	-	2	-	1	-
CO2	-	1	-	2	2	1	1	-	1	-	1	-
CO3	-	1	-	-	1	-	1	-	-	-	-	-
CO4	-	3	2	1	3	2	1	-	-	-	1	-
CO5	-	-	-	-	-	-	3	1	-	2	-	1
CO6	-	3	-	-	2	-	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology VIth Semester

Course code	**:**	BMRT-603
Course Name	**:**	Advanced Radiological Procedures
Semester /Year	**:**	**VIth Semester**

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I
Cerebral Studies- Ventriculography-Arthrography (shoulder, hip, knee, elbow)-Carotid Angiography-Thoracic and arch aortography-Selective studies: Renal, SMA, Coeliac Axis-Vertebral Angiography-Femoral Arteriography-Angiocardiography-Peripheral venography-cerebral venography- inferior and superior venocavography-visceral phlebography-PTCA-BMV-CAG-Electrophysiology
UNIT-II
USG Doppler studies: Technique of sonography-Patient Preparation, Patient positioning, part positioning and technique for TVS, TAS and TRUS-USG Guided FNAC and biopsy
UNIT-III
CT guided FNAC and Biopsy, CT coronary angiography-Peripheral angiography- Brain angiography- Triple Phase
UNIT-IV
Advanced Procedures: MR contrast media MR angiography – TOF & PCA MR Spectroscopy-Functional MRI MRCP-Diffusion/Perfusion scans-MRS blood flow imaging-MR Spectroscopy-Functional MRI-
UNIT-V
Common interventional radiology procedures Types of interventional radiology procedure: vascular and non-vascular

Text Books:

1. Chapman & Leinakienly's guide to Radiological Procedures. Third Edition
2. Clark's Positioning in Radiography by A. Stewart Whipley, Gail Jefferson, Ken Holmes, Charles Sloand, Craig Anderson and Graham Hoadley. Thirteenth Edition

Reference Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To define research and the steps of research.
CO2	To understand the role of research study.
CO3	To Demonstrate about the different types of research
CO4	To assess the societal importance of research
CO5	To predict research problem and its solutions.
CO6	To write synopsis by following standard protocols.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	1	1	-	1	1	-
CO3	-	-	-	-	-	1	-	-	-	1	-	-
CO4	-	-	-	1	-	-	-	-	-	-	1	-
CO5	-	-	-	-	-	1	-	-	-	-	-	-
CO6	-	-	-	-	-	1	-	-	-	-	-	-

Bachelors in Medical Radio Imaging and Technology VIth Semester

Course code	**:**	BMRT-604
Course Name	**:**	Interventional Radiological Procedures and Techniques-II
Semester /Year	**:**	**VIth Semester**

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

- Vascular and non-vascular anatomy and pathology with gross anatomy appearance on DSA and other image modality
- Clinical application: disease diagnosis, severity interpretation
- Case follow up
- Sterile techniques in angiography procedures

UNIT-II

- Common interventional radiology procedures
- Types of interventional radiology procedure: vascular and non-vascular
- Definition, indication contraindication
- Patient preparation and technique
- Needle puncture: direct and guided Catheter angiography (cerebral, peripheral, visceral)

UNIT-III

Anaesthesia and emergency drugs used in interventional radiology

- Anaesthesia equipment handling
- Facilities regarding general anaesthesia in the interventional radiology department
- Anaesthetic problems associated with specific technique: Vascular studies, non-vascular studies, Carotid angiography, Venography

UNIT-IV

- Embolization agents
- Radiation safety in interventional radiology department
- Basic knowledge of OT instruments and sterility

Text Books:

1. RadCases. Interventional Radiology. Hector Ferral, Jonathan Lorenz. International Edition
2. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Reference Books:

1. Handbook of Interventional Radiological Procedures. Krishna Kandarpa, Lindsay Machan, Janette D. Durham. Fifth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To define role of interventional radiology, IR machine handling, DSA, different IR procedures and modalities.
CO2	To exemplify equipment used in IR procedures like Cath Lab/ DSA, C-arm equipment etc
CO3	To efficiently present principles of Pre, intra and Post IR procedures
CO4	To organize treatment setup efficiently by understanding vascular and non-vascular anatomy and pathology, clinical applications and sterile techniques in angiography procedures.
CO5	To distinguish anaesthesia and emergency drugs in IR
CO6	To write about emboli zing agents, radiation safety aspects in IR department, OT instruments and sterility.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	1	2	2	-	-	-	-	-	2	-
CO2	-	2	1	1	2	-	-	-	-	-	2	1
CO3	-	3	3	3	-	-	-	-	-	-	3	-
CO4	-	2	3	1	2	1	-	-	2	-	2	-
CO5	-	-	2	-	-	-	-	-	3	-	-	-
CO6	-	-	-	2	2	-	-	-	-	3	2	-

Bachelors in Medical Radio Imaging and Technology VIth Semester

Course code	**:**	BMRT-605
Course Name	**:**	Patient care and & Management in diagnostic radiology
Semester /Year	**:**	VIth Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Legal Responsibilities

- Understanding medical malpractice and negligence
- Legal issues related to patient consent and confidentiality

Ethical Considerations

- Ethical principles in patient care and professional conduct
- Case studies of ethical dilemmas in radiology

Regulatory Compliance

- Knowledge of relevant laws and regulations Aim & Principle of Radiation Protection Concept of ALARA, ICRP regulation, Radiation Protection
- Compliance with accreditation and certification standards

UNIT-II

- Handling the emergencies in Radio diagnosis Reaction to contrast media Oxygen administration and suction
- Respiratory emergencies
- Cardiac emergencies
- Trauma,Shock

Patient care during Investigation

- G.I.Tract
- Biliary tract
- Respiratory tract
- Gynaecology
- Cardiovascular,
- Lymphatics

UNIT-III

Professional Development and Continuing Education

Career Development

- Opportunities for specialization and advancement in radiology
- Professional organizations and resources for radiologists

Continuing Education

- Importance of lifelong learning and professional growth
- Options for continuing education and certification

UNIT-IV

Research and Evidence-Based Practice

- Understanding the role of research in radiology
- Incorporating evidence-based practices into clinical routines

Text Books:

1. Concise Textbook on Hospital Management and Patient care in Diagnostic Radiology by N. K. Kardam and Lalit Aggarwal.

Reference Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To describe the Importance of the Professional Laws &Ethics.
CO2	To discuss the legal aspect and medical ethics in health setup
CO3	To demonstrate body mechanics & transferring of patient.
CO4	To assess the Knowledge of departmental safety and infection control.
CO5	To evaluate the roll of Radiological exposure & protection principle.
CO6	To design the parameter for identification of patient care responsibility & health care facility of a radiographer.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	2	3	2	3	1	2
CO2	-	1	-	-	-	-	3	3	2	2	1	1
CO3	-	-	1	-	-	1	-	-	2	-	1	-
CO4	-	2	-	-	1	-	3	2	-	2	-	1
CO5	-	1	-	-	-	-	2	2	-	3	2	3
C06	-	-	-	-	-	-	2	1	1	1	1	-

Bachelors in Medical Radio Imaging and Technology VIth Semester

Course code	**:**	BMRT-606
Course Name	**:**	Hospital Procedure
Semester /Year	**:**	VIth Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Introduction to Radiology

Overview of Radiology

- History and Evolution of Radiology
- Role of Radiology in Modern Medicine
- Overview of Radiology Subspecialties

UNIT-II

Ethics and Professionalism

- Patient Safety and Confidentiality
- Informed Consent and Patient Communication
- Professional Conduct and Responsibilities

UNIT-III

Radiology Workflow Management

- **Scheduling and Coordination**
  - Patient Scheduling Systems
  - Interdepartmental Communication
- **Documentation and Reporting**
  - Radiology Reporting Systems
  - Documentation Standards and Legal Requirements

UNIT-IV

Quality Assurance and Improvement

- **Quality Control Measures**
  - Equipment Maintenance and Calibration
  - Quality Assurance Protocols
- **Continuing Education**
  - Professional Development Opportunities

- Staying Current with Radiology Advances

Text Books:

1. Concise Textbook on Hospital Management and Patient care in Diagnostic Radiology by N. K. Kardam and Lalit Aggarwal.

Reference Books:

1. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To describe the Importance of the Professional Laws &Ethics.
CO2	To discuss the legal aspect and medical ethics in health setup
CO3	To demonstrate body mechanics & transferring of patient.
CO4	To assess the Knowledge of departmental safety and infection control.
CO5	To evaluate the roll of Quality Assurance and Improvement
CO6	To design the parameter for identification of patient care responsibility & health care facility of a radiographer.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	2	3	2	3	1	2
CO2	-	1	-	-	-	-	3	3	2	2	1	1
CO3	-	-	1	-	-	1	-	-	2	-	1	-
CO4	-	2	-	-	1	-	3	2	-	2	-	1
CO5	-	1	-	-	-	-	2	2	-	3	2	3
C06	-	-	-	-	-	-	2	1	1	1	1	-

Bachelors in Medical Radio Imaging and Technology VIth Semester

Course code	**:**	BMRT-607
Course Name	**:**	Hospital Administration
Semester /Year	**:**	VIth Semester

	L	**T**	**P**	**C**
	03	**-**	**-**	**03**

UNIT-I

Introduction to Hospital Administration

- **Definition and Scope of Hospital Administration**
  - Understanding the role of hospital administration in healthcare.
  - Evolution and historical development of hospital management.
  - Functions and responsibilities of hospital administrators.
- **Types of Healthcare Facilities**
  - Differences between hospitals, clinics, and long-term care facilities.
  - Classification of hospitals (public vs. private, general vs. specialized)

UNIT-II

Legal and Ethical Issues in Hospital Administration

- **Legal Aspects of Healthcare Administration**
  - Understanding healthcare laws and legal issues.
  - Patient rights and legal responsibilities of healthcare providers.
- **Ethical Considerations in Healthcare**
  - Ethical dilemmas in hospital management.
  - Policies for ethical decision-making and practices.

UNIT-III

Patient Care and Communication

- **Patient Relations and Communication**
  - Strategies for effective patient communication.
  - Handling complaints and conflicts.
- **Patient Rights and Responsibilities**
  - Educating patients about their rights and responsibilities.

UNIT-IV

Telemedicine and Innovative Technologies

- Introduction to telemedicine services.
- Emerging technologies in healthcare.

Text Books:

2. Concise Textbook on Hospital Management and Patient care in Diagnostic Radiology by N. K. Kardam and Lalit Aggarwal.

Reference Books:

2. Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava Fourth Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To describe the Importance of the Professional Laws &Ethics.
CO2	To discuss the legal aspect and medical ethics in health setup
CO3	To demonstrate body mechanics & transferring of patient.
CO4	To assess the Knowledge of departmental safety and infection control.
CO5	To evaluate the roll of Quality Assurance and Improvement
CO6	To design the parameter for identification of patient care responsibility & health care facility of a radiographer.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	2	3	2	3	1	2
CO2	-	1	-	-	-	-	3	3	2	2	1	1
CO3	-	-	1	-	-	1	-	-	2	-	1	-
CO4	-	2	-	-	1	-	3	2	-	2	-	1
CO5	-	1	-	-	-	-	2	2	-	3	2	3
C06	-	-	-	-	-	-	2	1	1	1	1	-

Bachelors in Medical Radio Imaging and Technology VIth Semester

Course code	**:**	BMRT-601P
Course Name	**:**	General Pathology in Diagnostic Radiology-II
Semester /Year	**:**	**VIth Semester**

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of Basic Pathological Concepts for Radiologists.
2. Demonstration of Common Diseases and Their Imaging Findings
3. Demonstration of various Imaging Modalities and Their Role.
4. Demonstration of various Practical Tips for Radiologists.
5. Demonstration of Case Examples.

Bachelors in Medical Radio Imaging and Technology VIth Semester

Course code	**:**	BMRT-602P
Course Name	**:**	Radiotherapy Planning, Procedure and Equipment-II
Semester /Year	**:**	**VIth Semester**

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of orthovoltage and kilovoltage equipment.
2. Demonstration of treatment planning procedure.
3. Demonstration of various beam modification devices.
4. Demonstration of various immobilization devices.
5. Demonstration of Conventional Radiography equipment.

Bachelors in Medical Radio Imaging and Technology VIth Semester

Course code	**:**	BMRT-603P
Course Name	**:**	Advanced Radiological Procedures
Semester /Year	**:**	VIth Semester

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals

1. Demonstration of basic contrast procedures of GI Tract.
2. Observation of basic procedures of excretory system.
3. Demonstration of Extremities
4. Demonstration of biliary system.
5. Demonstration of abdominal organs.

Bachelors in Medical Radio Imaging and Technology VIth Semester

Course code	**:**	BMRT-604P
Course Name	**:**	Interventional Radiological Procedures and Techniques
Semester /Year	**:**	**VIth Semester**

	L	**T**	**P**	**C**
	-	**-**	**02**	**01**

Practicals:

1. Demonstration of machines used in intervention radiology.
2. Demonstration of machine handling.
3. Demonstration of various equipment required in intervention radiology.
4. Demonstration of various intervention procedures.

Department of Radiology & Imaging Technology

Value Added Course

Professional Values of a Radiographer

VACMRT-103

Duration: 30

Course Objective:

- Articulate and apply the core professional values and ethics in radiography.
- Demonstrate advanced communication skills tailored to various stakeholders.
- Analyze and address contemporary challenges in the radiography profession.
- Develop leadership and advocacy skills for improving practice standards.
- Integrate evidence-based practice into clinical decision-making..

Course Contents

Module I: Introduction to Professional Values in Radiography.

Overview of core values: integrity, compassion, respect, accountability

Module II: Ethical Principles and Decision Making

Ethical theories, principles, and frameworks in clinical practice.

Module III: Communication Skills for Radiographers

Effective communication with patients, families, and healthcare teams.

Module IV: Patient-Centered Care

Principles of patient-centered care, empathy, and respect for patient

References:

- *Clinical Skills for Healthcare Professionals* by J. Smith & A. Johnson
- Textbook of Radiology for Residents and Technicians by S.K Bhargava. Sumeet Bhargava
- *Current Diagnosis & Treatment: Hospital Medicine* by *J. R. D'Angelo, MD*