

# Study & Evaluation Scheme of Bachelor of Science in Medical Radiology and Imaging Technology

[Applicable for 2020-23]

Version 2020

[As per CBCS guidelines given by UGC]



Approved in BOS	Approved in BOF	Approved in Academic Council
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BMRIT V 2020

## Quantum University, Roorkee *Study & Evaluation Scheme* *Study Summary*

Name of the Faculty	Faculty of Health Sciences
Name of the School	Quantum School of Health Sciences
Name of the Department	Department of Paramedical Sciences

Program Name	Bachelor of Science in Medical Radiology and Imaging Technology
Duration	3 Years + 6 months internship
Medium	English

***Evaluation Scheme***

<b>Type of Papers</b>	<b>Internal Evaluation (%)</b>	<b>End Semester Evaluation (%)</b>	<b>Total (%)</b>
Theory	40	60	100
Practical/ Dissertations/Project Report/ Viva-Voce	40	60	100
<i>Internal Evaluation Components (Theory Papers)</i>			
Mid Semester Examination	60 Marks		
Assignment –I	30 Marks		
Assignment-II	30 Marks		
Attendance	50 <sup>30</sup> Marks		
<i>Internal Evaluation Components (Practical Papers)</i>			
Quiz One	30 Marks		
Quiz Two	30 Marks		
Quiz Three	30 Marks		
Lab Records/ Mini Project	30 Marks		
Attendance	5030 Marks		
<i>End Semester Evaluation(Practical Papers)</i>			
ESE Quiz	40 Marks		
ESE Practical Examination	40 Marks		

### Structure of Question Paper (ESE Theory Paper)

The question paper will consist of 5 questions, one from each unit. Student has to Attempt all questions. All questions carry 20 marks each. Parts a) and b) of question Q1 to Q5 will be compulsory and each part carries 2 marks. Parts c), d) and e) of Q1 to Q5 Carry 8 marks each and the student may attempt any 2 parts.

#### **Important Note:**

*1. The purpose of examination should be to assess the Course Outcomes (CO) that will ultimately lead to attainment of Program Outcomes (PO). A question paper must assess the following aspects of learning planned for Specific Course i.e., Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy). The standard of question paper will be based on mapped BL level complexity of the unit of the syllabus, which is the basis of CO attainment model adopted in the university.*

*2. Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.*

*3. There shall be continuous evaluation of the student and there will be a provision of real time reporting on QUMS. All the assignments will be evaluated through module available on ERP for time and access management of the class.*

## **Introduction**

### **Radiography**

This field took birth in 1895 when X-rays were discovered, the process evolved through the years to be used for diagnostic purposes. To provide the right treatment for a disease or ailment, it is necessary to make the correct diagnosis. But it is not always possible to diagnose a disease based on symptoms alone. Here radiography comes to the rescue.

Radiography is used to diagnose the problem by focusing on the internal parts of the anatomy using X-rays, sometimes referred to as „X-ray photography“. This field has had a huge impact on the medical field as well as in industrial applications.

### **Technologist/Technician**

This field is a highly technical one and the processes vary, depending on which part of the anatomy or tissue is being imaged. Radiographers are trained to use the equipment and adapt to new technology and procedures. Some important procedures include fluoroscopy, ultrasound or sonography, MRI (Magnetic Resonance Imaging), PET (Positron Emission Tomography) and CT scan

### **Diagnostic and therapeutic branches**

A diagnostic radiographer is required to explain procedures to the patients, help prepare them for the tests, operate and maintain equipment and records. Their assistance is required by physicians in performing procedures such as myelograms (examinations to detect injuries, cysts, or tumors in the spinal cord) and by surgeons in the operating room, usually with portable X-ray or fluoroscopic machines.

Therapeutic radiography, also referred to as radiotherapy is used in the treatment and diagnosis of diseases such as cancer, tumors and ulcers. Here radiation is used in controlled conditions as an exact amount of radiation would help shrink the tumor size. Their work is closely associated with doctors, nurses, physicists and others from oncology teams in treating patients with cancer. The role of a radiographer in radiotherapy caring for a cancer patient has a broad range, from the initial referral stage, giving pre-treatment information, planning process, treatment and follow-up post-treatment.

### **VISION:**

To provide an educational environment that challenges and motivates students to prepare themselves personally to be one of the premier academic radiology programs at Quantum University.

To achieve excellence in diagnostic imaging



### **MISSION:**

To provide outstanding clinical care through expertise in medical imaging and interpretation, with innovation and advances in imaging research and excellence in teaching and mentoring imaging trainees.

To deliver quality clinical services to the patient served by radiology students using medical imaging technology and image-guided therapy services through hospital postings. Advancing the frontiers, the working understanding of imaging systems perform radiation safety principles, demonstrate comprehensive radiographic procedures, and perform routine exams.

**Internship: Full Time Six Months**

The internship for the qualifying Bachelor of Science in Medical Radiology and Imaging Technology Program will be of six months after completing all prescribed courses. Minimum of 720 hours of an internship is required to be completed by the candidate for the award of degree besides the course work. Students must undertake the rotational postings during which students have to work under the supervision of experienced staff in the following areas:

Sl. No	Postings	Duration
1.	Conventional Radiography	1.5 Months
2.	Radiographic Special Procedures Including Diagnostic and Therapeutic Interventional Procedures	1.5 Months
3.	CR, DR and PACS	1 Month
4.	Computed Tomography	1 Month
5.	Magnetic Resonance Imaging	1 Month

**Other Details**

- The entire internship shall be done in a Hospital or Medical College.
- Every candidate after successfully completing the final examination of Bachelor of Science in Medical Radiology and Imaging Technology will be required to undergo a compulsory internship up to satisfaction of the University for a period of six months to be eligible for the award of the degree of Bachelor of Science in Medical Radiology and Imaging Technology.
- The University shall issue a provisional degree of Bachelor of Science in Medical Radiology and Imaging Technology on passing the final examination and completion of the internship, if the candidate demands it.
- The internee shall be entrusted with clinical responsibilities under the direct supervision of a Senior Medical Officer/Technologist. They shall not be working independently.
- Internee will not authorize to sign any official certificate/reports during her/his internship. ● A duly signed completed Internship logbook is compulsory to submit to the department/college to obtain an internship completion letter.

**Assessment of Internship**

- The internship will be evaluated as per the norms of academic regulation of the University. The Internee shall maintain the record of work, which is to be verified and certified by the Technologist followed by HOD Radiology under whom he/she worked.
- The internee will submit an internship completion certificate issued by the concerned hospital/ medical college authority.
- Only after satisfactory completion of an internship, the university shall award the degree of Bachelor of Science in Medical Radiology and Imaging Technology.



## BREAKUP OF COURSES

Sr. No	CATEGORY	CREDITS
1	Foundation Core (FC)	13
2	Program Core (PC)	105
3	Open Elective	09
4	Value Added Programs (VAP)	06
5	Hospital Posting	18
6	Seminar	02
7	General Proficiency (GP)	05
8	Disaster Management*	02*
	<b>TOTAL NO. OF CREDITS</b>	<b>158</b>

\*Non-CGPA Audit Course

## BREAKUP OF CATEGORY

	Foundation	Core		
Sciences	13	105	118	73.8
Seminar			02	1.93
Hospital Posting			18	11.61
Open Elective			09	5.80
VAPs			06	3.18
GP			05	3.22
Disaster Management*			02*	00.00
<b>Grand Total</b>	13	105	<b>158</b>	<b>100</b>

\*Non-CGPA Audit Course



**SEMESTER-WISE BREAKUP OF CREDITS**

SEM	3
1 Foundation Core	9 4 13
2 Program Core	12 14 21 22 20 16 105
3 Open Elective	- 3 3 3 - - 09
4 Hospital Posting	- - 06 - 06 06 18
5 VAPs	1 2 1 1 1 06
6 Seminar	- - - 2 02
7 GP	1 1 1 1 1 5
9 Disaster Management*	2* 2*
<b>TOTAL</b>	<b>23 24 32 27 28 24 158</b>

\*Non-CGPA Audit Course

**Minimum Credit Requirements:**

**Bachelor of Science in Medical Radiology and Imaging Technology: 158 credits**



## SEMESTER 1

Course Code								Course Prerequisite
RD3101	PC	Human Anatomy – I	3	0	0	3	1.0	Nil
RD3106	PC	Basics Of Human Physiology – I	3	0	0	3	1.0	Nil
ND3105	FC	Biochemistry	3	0	0	3	1.0	Nil
RD3104	PC	Radiation Physics	3	2	0	4	1.0	Nil
CY3205	FC	Environmental Studies	2	0	0	2	1.0	Nil
EG3102	FC	Professional Communication	2	0	0	2	1.0	Nil
EG3140	FC	Professional Communication Lab	0	0	2	1	1.0	Nil
RD3140	PC	Human Anatomy - I Lab	0	0	2	1	1.0	Nil
RD3143	PC	Basics of Human Physiology I Lab	0	0	2	1	1.0	Nil
ND3144	FC	Bio-Chemistry Lab	0	0	2	1	1.0	Nil
VP3101	VAP	Communication & Professional Skills – I	0	0	2	1	1.0	Nil
GP3101	GP	General Proficiency	0	0	0	1	1.0	Nil
TOTAL			16	2	10	23		

Contact Hrs. = 28





## SEMESTER 2

Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
RD3201	PC	Human Anatomy- II	3	0	0	3	1.0	RD3101
RD3206	PC	Basics of Human Physiology- II	3	0	0	3	1.0	RD3102
RD3203	PC	Radiographic Positioning- I	4	0	0	4	1.0	Nil
CS3102	FC	Fundamentals of Computer Applications	3	0	0	3	1.0	Nil
RD3240	PC	Human Anatomy- II Lab	0	0	2	1	1.0	RD3140
RD3243	PC	Basics of Human Physiology- II Lab	0	0	2	1	1.0	RD3141
RD3242	PC	Radiographic Positioning - I Lab	0	0	4	2	1.0	Nil
CS3141	FC	Fundamentals of Computer Applications Lab	0	0	2	1	1.0	Nil
VP3201	VAP	Communication & Professional Skills – II	2	0	0	2	1.0	Nil
GP3201	GP	General Proficiency	0	0	0	1	1.0	Nil
---	OE	Open Elective I	3	0	0	3	1.0	Nil
CE3201	FC	Disaster Management*	2	0	0	2*	1.0	Nil
TOTAL			<b>20</b>	<b>0</b>	<b>08</b>	<b>24</b>		
* Internship to be done in hospital for two weeks after 2 <sup>nd</sup> Semester and will be evaluated in 3 <sup>rd</sup> semester.								

\*Non-CGPA Audit Course

Contact Hrs. = 28

**OPEN ELECTIVE I**

S.No.	Code	Name	Department (Offering)
1.	CE3011	Carbon Emission & Control	Civil Engineering
2.	CS3011	HTML5	Computer Science and Engineering
3.	CS3021	Mining and Analysis of Big data	Management + CSE
4.	AG3011	Ornamental Horticulture	Agriculture
5.	BB3011	Entrepreneurial Environment in India	Business & Management
6.	JM3011	Media Concept and Process (Print and Electronic)	Journalism
7.	HM3011	Indian Cuisine	Hospitality & Tourism
8.	MB3011	SAP 1	Management
9.	EG3011	French Beginner A1	English
10.	CS3031	Microsoft Office Specialist (MSO-Word)	Computer Science and Engineering
11.	CS3004	Digital Marketing	Computer Science and Engineering
12.	CS3002	Introduction of IOT	Computer Science and Engineering
13.	MT3011	Elementary Robotics	Mechanical Engineering

**SEMESTER 3**

Code								Prerequisite
RD3301	PC	Radiographic Positioning II	4	0	0	4	1.0	RD3203

RD3302	PC	Conventional Radiographic Technique-I	4	0	0	4	1.0	Nil
RD3303	PC	Basics of USG and Mammography	4	0	0	4	1.0	Nil
RD3304	PC	Special Radiographic Procedure	3	0	0	3	1.0	Nil
RD3306	PC	Orientation in Para Clinical Sciences	4	0	0	4	1.0	Nil
RD3341	PC	Special Radiographic Procedure Lab	0	0	2	1	1.0	Nil
RD3342	PC	Radiographic Positioning – II Lab	0	0	2	1	1.0	RD3242
RD3343	HP	Hospital Posting	0	0	12	6	1.0	Nil
VP3301	VAP	Employability Skills – I (Numerical Abilities)	0	0	2	1	1.0	Nil
	OE	Open Elective II	3	0	0	3	1.0	Nil
GP3301	GP	General Proficiency	0	0	0	1	1.0	Nil
TOTAL			22	00	16	32		

**Contact Hrs. = 38**

**OPEN ELECTIVE II**

S.No.	Code	Name	Department (Offering)
1.	CE3013	Environment Pollution and Waste Management	Civil Engineering
2.	CS3013	Java Script	Computer Science and Engineering
3.	CS3023	Big Data Analytics: HDOOP Framework	Management + CSE
4.	AG3013	Organic farming	Agriculture
5.	BB3013	Establishing a New Business	Business & Management
6.	JM3013	Photo Journalism	Journalism
7.	HM3013	Chinese Cuisine	Hospitality & Tourism
8.	MB3013	SAP 3	Management
9.	EG3013	French Intermediate B1	English
10.	CS3033	MS -Excel (Advanced) MSO Certification	Computer Science and Engineering
11.	EG3002	Report Writing	Humanities and Social Sciences
12.	MT3013	Introduction to Automation	Mechanical Engineering

**SEMESTER 4**

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
RD3401	PC	Conventional Radiographic Technique II	4	0	0	4	1.0	RD3302
RD3402	PC	Computed Tomography	4	0	0	4	1.0	Nil

RD3403	PC	Equipment of Radiotherapy	4	0	0	4	1.0	Nil
RD3404	PC	Magnetic Resonance Imaging	4	0	0	4	1.0	Nil
RD3406	PC	Orientation in Clinical Sciences	4	0	0	4	1.0	Nil
RD3441	PC	Computed Tomography Lab	0	0	2	1	1.0	Nil
RD3442	PC	Magnetic Resonance Imaging Lab	0	0	2	1	1.0	Nil
VP3401	VAP	Employability Skills – II (Aptitude & Reasoning)	0	0	2	1	1.0	Nil
	OE	Open Elective III	3	0	0	3	1.0	Nil
GP3401	GP	General Proficiency	0	0	0	1	1.0	Nil
TOTAL			23	00	06	27		

**Contact Hrs. = 29**



**OPEN ELECTIVE III**

S.No.	Code	Name	Department (Offering)
1.	CE3015	Hydrology	Civil Engineering
2.	CS3025	Java Script	Computer Science and Engineering
3.	AG3015	Big Data Analytics: HDOOP Framework	Management + CSE
4.	BB3015	Organic farming	Agriculture
5.	JM3015	Establishing a New Business	Business & Management
6.	HM3015	Photo Journalism	Journalism
7.	MB3015	Chinese Cuisine	Hospitality & Tourism
8.	EG3015	SAP 3	Management

9.	CS3035	French Intermediate B1	English
10.	CS3015	MS -Excel (Advanced) MSO Certification	Computer Science and Engineering
11.	MT3015	Robotic Industry 4.0	Mechanical Engineering

**SEMESTER 5**

Course Code	Category	COURSE TITLE	L	T	P	C	Version	Course Prerequisite
RD3501	PC	Nuclear Medicine Technology	4	0	0	4	1.0	Nil
RD3502	PC	Patient Care and Management	4	0	0	4	1.0	Nil
RD3503	PC	Radiation Protection and Quality Assurance	4	0	0	4	1.0	Nil
RD3504	PC	Interventional procedure and Technique	4	0	0	4	1.0	Nil
RD3505	PC	Preventive Medicine & Community Health Care	3	0	0	3	1.0	Nil
RD3541	PC	Nuclear Medicine Technology Lab	0	0	2	1	1.0	Nil
RD3542	HP	Hospital Posting	0	0	12	6	1.0	Nil
VP3501	VAP	Employability Skills- III (GDPI)	0	0	2	1	1.0	Nil
GP3501	GP	General Proficiency	0	0	0	1	1.0	Nil
TOTAL			19	00	16	28		

**Contact hours: 35**

**SEMESTER 6**

Course Code	Category	COURSE TITLE	L	T	P	C	n	Course Prerequisite
RD3601	PC	Biostatistics and Research Methodology	4	0	0	4	1.0	Nil
RD3602	PC	Clinical aspects in Radio Imaging	4	0	0	4	1.0	Nil
RD3603	PC	Advance CT, MRI, USG	4	0	0	4	1.0	Nil
RD3605	PC	Medical Law and Ethics	3	0	0	3	1.0	Nil
RD3604	S	Seminars	2	0	0	2	1.0	Nil
RD3641	PC	Clinical aspects in Radio Imaging Lab	0	0	2	1	1.0	Nil
RD3642	HP	Hospital Posting	0	0	1 2	6	1.0	Nil
<b>TOTAL</b>			<b>17</b>	<b>00</b>	<b>14</b>	<b>24</b>		

**Contact hours: 31**



## B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our university.

The following is the course module designed for the Bachelor of Science in Medical Radiology and Imaging Technology program:

**Core competency:** Students will acquire core competency in Paramedical Studies and in allied subject areas.

**Skilled communicator:** The course curriculum incorporates basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral presentation.

**Critical thinker and problem solver:** The course curriculum also includes components that can be helpful to graduate students to develop critical thinking ability by way of solving problems/numerical using basic & Advance knowledge and concepts of Paramedical Studies.

**Sense of inquiry:** It is expected that the course curriculum will develop an inquisitive characteristic among the students through appropriate questions, planning and reporting experimental investigation.

**Skilled healthcare worker:** The course curriculum has been designed in such a manner as to enabling a graduate student to become a skilled healthcare worker by acquiring knowledge about patient handling and management, writing, planning, study of ethical standards and rules and regulations pertaining to patient care.

**Ethical awareness/reasoning:** A graduate student requires understanding and developing ethical awareness/reasoning which the course curriculums adequately provide.

**Lifelong learner:** The course curriculum is designed to inculcate a habit of learning continuously through use of advanced ICT technique and other available techniques/books/journals for personal academic growth as well as for increasing employability opportunity.

**Value Added Course (VAC)/ Training/ Certification:** A value added course is a skill enhancement training beyond the syllabus specially non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability, technical new norms of the industry - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world. There shall be no credit; however, it will be compulsory for every student to pass these courses with minimum 45% marks to be eligible for the certificate. These marks will not be included in the calculation of CGPI. Students have to specifically be registered in the specific course of the respective semesters time to time. The department & course coordinator will notify as when starting the course after adequate approval from higher authority.

**Skill Enhancement Course:** This course may be chosen from a pool of courses designed to provide value-based and/or skill based knowledge.

**Generic/Open Elective (OE):** Open Elective is an interdisciplinary additional subject that is compulsory in a program. The score of Open Elective is counted in the overall aggregate marks under Choice Based Credit System (CBCS). Each Open Elective paper will be of 3 Credits in II, III and IV semesters. Each student has to take Open/Generic Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Open Electives.



**Non CGPA Audit Course (NCAC):** This is a compulsory course but not included in CGPA calculation and will be of 2 credits. Each student of Bachelor of Science in Medical Radiology and Imaging Technology Program has to compulsorily pass the Disaster Management.

### C. Program Outcomes of Bachelor of Science in Medical Radiology and Imaging Technology

<b>PO-01</b>	Radiology Knowledge:	Possess knowledge and comprehension of the core and basic knowledge associated with the profession of radiology, including medical ethics, machines quality assurance; radiation physics, special procedure technique, conventional radiographic technique, and radiographic positioning and about magnetic resonance imaging, computed tomography and nuclear medicine.
<b>PO-02</b>	Planning Abilities:	Demonstrate effective planning abilities including time management, resource management, delegation skills and managerial skills. Develop and implement plans and organize work to meet deadlines.
<b>PO-03</b>	Problem analysis:	Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyse, evaluate and apply information systematically and shall make defensible decisions.
<b>PO-04</b>	Allied Healthcare provider:	As a healthcare provider applies the acquired knowledge and skills in prevention, investigations and managing patients under the direction of a medical professional.
<b>PO-05</b>	Leadership skills:	Understand and believe the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well- being.
<b>PO-06</b>	Professional Identity:	Understand, analyse and communicate the value of their professional roles in society (e.g., Health care professionals, radio-technician, educators, radiation safety officer and can also work in the field of application specialists).
<b>PO-07</b>	Medical Law Ethics:	Honour personal values and apply ethical principles in professional and social contexts. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
<b>PO-08</b>	Communication:	Communicate effectively with the rad community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
<b>PO-09</b>	The radiologist and society:	Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the subsequent responsibilities relevant to the professional radiology practice.
<b>PO-10</b>	Radiation hazards & sustainability:	Understand the impact of the radiation hazards on environmental contexts and demonstrate the knowledge of disposing of radiopharmaceuticals and need for sustainable development.

PO-11	Life-long learning	Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self- access and use feedback effectively from others to identify learning needs and to satisfy these needs on an on-going basis.
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#### D. Program Specific Outcomes:

**PSO1:** Detail understanding of theoretical and practical knowledge of all core and allied subjects of Radiologic sciences, which includes concept related to radiation physics, radiographic positioning, special radiographic techniques with their manufacturing and QA/QC regulation etc. As an independent professional and a lifelong learner demonstrates high standards of professional ethics, integrity & continuous learning.

**PSO2:** As a healthcare provider applies the acquired knowledge and skills in prevention, investigations and managing patients under the direction of a medical professional. For the benefit of academicians, hospital/community of radio-technician, application specialists and emphasizing the consequences of the radiation hazards and most importantly Adheres to the Code of Ethics prescribed by the professional body/Faculty/Department and maintains appropriate relationships and boundaries with patients and care givers.

**PSO3:** Rigorous core course work in allied healthcare to deal with radiographic imaging equipment"s with the ability to apply standard principles, practices, new technologies and strategies in the field of medical sciences with its new modalities.

#### E. Program Educational Objectives (PEO's)

**PEO1.**To be familiar with the concept of Medical Radiology and Imaging Technology for leading a successful career in hospital or as entrepreneur or pursue higher education.

**PEO2.**To develop their knowledge for their professional skills for providing effective solutions to problems using the domain of Medical Radiology and Imaging Technology.

**PEO3.**To instill lifelong learning approach towards constantly technologies with innovative and ethical

#### mindset. F. Pedagogy & Unique practices adopted:

"Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept".

In addition to conventional time-tested lecture method, the institute will emphasize on experiential learning:

*Role Play & Simulation:* Role- play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore, role-play& simulation exercises such as virtual share trading, marketing simulation etc. are being promoted for the practical-based experiential learning of our students.

*Video Based Learning (VBL) & Learning through Movies (LTM):* These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give examples from movies during their discourses. Making students learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL & LTM, wherever possible.

*Field/Live Projects:* The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.

*Hospital Visits:* Hospital visits are essential to give students hand-on exposure and experience of how things and processes work in Hospital. Our institute organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

*MOOCs:* Students may earn credits by passing MOOCs as decided by the college. Graduate level programs may award Honors degree provided students earn pre-requisite credits through MOOCs. University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval. Keeping this in mind, University proposed and allowed a maximum of two credits to be allocated for each MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through only NPTEL could be given 2 credits for each MOOC course.

For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

- a) It will be necessary for every student to take at least one MOOC Course throughout the programme.
- b) There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.
- c) The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalize a list of courses to be offered with 2 credits defined for each course and the mode of credit consideration of the student. The complete process shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course, the approval will be valid only for the semester on offer.
- d) Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Coordinator MOOC through the Principal of the College.
- e) After completion of MOOC course, Student will submit the photo copy of Completion certificate of MOOC Course to the Examination cell as proof.
- f) Marks will be considered which is mentioned on Completion certificate of MOOC Course.
- g) College will consider the credits only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

*Special Guest Lectures (SGL) & Extra Mural Lectures (EML):* Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia and industry from time to time to deliver their vital inputs and insights.

*Student Development Programs (SDP):* Harnessing and developing the right talent for the right industry an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced excel training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

*Hospital Postings:* Establishing collaborations with various Hospitals to deliver the programme on sharing basis. The specific courses are to be delivered by Radiography experts to provide practice-based insight to the students.

*Special assistance program for slow learners & fast learners:* The program has provision to identify slow and fast learners. Syllabus adheres the University Policy for slow and fast learners. Fast learners are given research problems and higher order learning assignments whereas slow learners are given additional resources and peer group learning across the subjects.

*Induction program:* Every year 3 weeks induction program is organized for 1st year students and senior students to make them familiarize with the entire academic environment of university including Curriculum, Classrooms, Labs, Faculty/ Staff members, Academic calendar and various activities.

*Mentoring scheme:* There is Mentor-Mentee system. One mentor lecture is provided per week in a class. Students can discuss their problems with mentor who is necessarily a teaching faculty. In this way, student's problems or issues can be identified and resolved.

*Competitive exam preparation:* Students are provided with one class in every week for Competitive exams preparation.

*Extra-curricular Activities:* organizing & participation in extracurricular activities will be mandatory to help students develop confidence & face audience boldly. It brings out their leadership qualities along with planning & organizing skills. Students undertake various cultural, sports and other competitive activities within and outside then campus. This helps them build their wholesome personality.

*Career & Personal Counseling:* - Identifies the problem of student as early as possible and gives time to discuss their problems individually as well as with the parents. Counseling enables the students to focus on behavior and feelings with a goal to facilitate positive change. Its major role lies in giving: Advice, Help, Support, Tips, Assistance, and Guidance.

*Participation in Flip Classes, Project based Learning (A2 Assignment), Workshops, Seminars & writing & Presenting Papers:* Departments plan to organize the Flip Classes, Project based Learning (A2 Assignment), workshops, Seminars & Guest lecturers time to time on their respective topics as per academic calendar. Students must have to attend these programs. This participation would be count in the marks of general Discipline & General Proficiency which is the part of course scheme as non-credit course.

*Formation of Student Clubs, Membership & Organizing & Participating events:* Every department has the departmental clubs with the specific club's name. The entire student's activity would be performed by the club. One faculty would be the coordinator of the student clubs & students would be the members with different responsibility.

*Capability Enhancement & Development Schemes:* The Institute has these schemes to enhance the capability and holistic development of the students. Following measures/ initiatives are taken up from time to time for the same: Career Counseling, Soft skill development, Remedial Coaching, Bridge Course, Language Lab, Yoga and Meditation, Personal Counseling

*Library Visit & Utilization of QLRC:* Students may visit the library from morning 10 AM to evening 8 PM. Library created its resources Database and provided Online Public Access Catalogue (OPAC) through which users can be accessed from any of the computer connected in the LAN can know the status of the book. Now we are in process to move from OPAC to KOHA.

**Detailed Syllabus (Semester wise /course wise)****SEMESTER 1 Year -1**

<b>RD3101</b>	<b>Title: Human Anatomy- I</b>	<b>L T P C 3 0 0 3</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	Anatomy is a key component of all education programs for BMRIT. To develop the basic concept of gross, functional, and applied anatomy and should have a strong focus on organ position, orientation and relationships.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Terminology and General Plan of the Body</b>	8
Terminology and General Plan of the Body, Body Parts and Areas, Terms of Location and Position, Body Cavities and Their Membranes, Dorsal cavity, Ventral cavity, Planes and Sections.		
<b>Unit II</b>	<b>Cells</b>	7
Cells: Structure, function and location, Prokaryotic and eukaryotic cells, Cell organelles, Cell division Tissue, Types, Structure, Location and Function of Epithelial Tissue, Connective Tissue, Muscle Tissue, Nerve Tissue, Membranes, Glandular tissue, The Integumentary System: structure and function of The Skin, Subcutaneous Tissue		
<b>Unit III</b>	<b>Musculoskeletal System</b>	7
Musculoskeletal System: Basic anatomy of important muscles and bones		
<b>Unit IV</b>	<b>Respiratory system</b>	7
Respiratory system: Basic anatomy of nose, larynx, trachea, bronchi and lungs		
<b>Unit V</b>	<b>Digestive system</b>	7
Digestive system: basic anatomy of esophagus, stomach, small intestine, large intestine, liver, Gall bladder, pancreas.		
<b>Text Books</b>	1. Waugh A, Grant A. Ross & Wilson Anatomy and Physiology in Health and Illness E-Book. Elsevier Health Sciences Chaurasia BD, Garg K. BD	
<b>Reference Books</b>	1. Chourasia's Human Anatomy: Lower limb, abdomen & pelvis. CBS Publishers& Distributors. 2. Principles of Anatomy and Physiology, Gerard J. Tortora and Bryan H. Derrickson	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	

<b>Date of approval by the Academic Council</b>	13-09-2020
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**BMRIT V 2020 Course Outcome for RD3101**

<b>Unit-wise Course Outcome</b>	<b>Descriptions</b>	<b>BL L ev el</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn about Terminology, General Planes, Body Cavities and their Membranes.	1	S
<b>CO2</b>	Students will be able to study about cells, tissue, and the integumentary system of human body.	1	S
<b>CO3</b>	Students will be able to know about Introduction of Musculoskeletal System: Basic anatomy of muscles and bones.	2	S
<b>CO4</b>	Students will be able to study the basic anatomy of respiratory system and its clinical disorders.	2	S
<b>CO5</b>	Students will be able to learn basic anatomy of esophagus, stomach, small & large intestine, liver, Gall bladder,pancreas.	3	S

**CO-PO Mapping for RD3101**

Course Outco mes	Program Outcomes (Course Articulation Matrix (Highly Mapped-3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO 10	PO11	PS O 1	PSO 2	PS O 3
CO 1	2	3	1	3	2	2	2	3	2	2	3	3	3	3
CO 2	2	2	1	3	2	1	2	1	1	1	3	3	3	3
CO 3	3	3	2	3	2	3	2	2	2	1	3	3	3	3
CO 4	2	2	2	3	2	2	2	2	2	1	3	3	3	3
CO 5	2	2	2	3	2	2	2	2	1	2	3	3	3	3

Avg	2.2	2.4	1.6	3	2	2	2	2	1.6	1.4	3	3	3	3
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<b>RD3106</b>	<b>Title: Basics of Human Physiology- I</b>	<b>L T P C</b> <b>3 0 0 3</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	To enable the studentsto understand the normal functioning of Various organ systems of the body, and their interactions.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Cell physiology</b>	7
Cell physiology: Structure, membrane, transport across cell membrane, Active, Passive, Organization of the Body, Body Composition, Body Fluid Volumes and its measurement, Diffusion, Osmosis, Tonicity, Homeostasis		
<b>Unit II</b>	<b>Blood</b>	7
Blood-composition, function, cellular component & their function, hemoglobin & anemia, blood groups and coagulation Lymphatic system-Composition & function of lymph, lymphatic tissue, Immunity with the role of thymus		
<b>Unit III</b>	<b>Cardiovascular system</b>	7
Cardiovascular system-general arrange, heart, arteries, veins and capillaries, heart structure and function, cardiac cycle, heart sounds, heart rate, blood pressure, mechanism of circulation, definition of hypertension & shock		
<b>Unit IV</b>	<b>Respiratory system</b>	7
Respiratory system: parts of respiratory system, mechanism of respiration, pulmonary function, pulmonary circulation, lungs volume, Gas transport between lungs and tissues, Definition of hypoxia, dyspnea, cyanosis, asphyxia, and obstructive airways diseases		
<b>Unit V</b>	<b>Gastrointestinal physiology</b>	8
Gastrointestinal physiology: Organs of GIT and their structure & function, secretion, digestion, absorption and assimilation, gastrointestinal hormones, physiology of digestion of carbohydrates, proteins & lipids, Structure & function of liver, spleen, gall bladder &pancreas, Jaundice, Cirrhosis & Pancreatitis.		
<b>Textbooks</b>	1. Sembulingam K, Sembulingam P. Essentials of medical physiology. JP Medical Ltd.	





CO 1	2	2	2	3	2	1	2	1	1	2	3	3	3	2
CO 2	3	2	2	3	3	2	2	2	2	2	3	3	3	3
CO 3	3	2	3	3	3	3	2	3	3	2	3	3	3	3
CO 4	3	2	2	3	3	3	2	2	2	2	3	3	3	3
CO 5	3	2	3	3	3	3	2	2	2	2	3	3	3	3
Avg	<b>2.8</b>	<b>2</b>	<b>2.4</b>	<b>3</b>	<b>2.8</b>	<b>2.4</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2.8</b>

<b>ND3105</b>	<b>Title: Biochemistry</b>	<b>L T P C</b> <b>3 0 0 3</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	To enable the students to understand about the equipments used in labs and their applications. To develop the basic concepts of Lab diagnosis for Radiology.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Introduction to Fundamental and Clinical Biochemistry</b>	7
Introduction to Fundamental and Clinical Biochemistry, First aid in laboratory accidents. Principle, working, care & maintenance of Weighing balance, hotplate, centrifuges, incubator, hot air oven, colorimeter, spectrophotometer, pH meter.		
<b>Unit II</b>	<b>Buffers</b>	8
Preparation of solution and reagents, normal solution, molar solutions, percent solution, buffer solution, dilutions, w/v, v/v, concepts of acid and base, units of measurement: SI unit, reference range, conversion factor, units for measurement of enzymes, protein, osmolarity, drugs, hormones, vitamins.		
<b>Unit III</b>	<b>Carbohydrates, Lipids and Enzyme</b>	7
Carbohydrates: Structure, Classification and their function in biological system. Proteins: Classification, Primary, secondary and tertiary structure and functions of protein. Amino acids: classification, Structure, properties and biological functions. Lipids: Classification of lipids, Classification of fatty acids, their biological functions. Enzymes: Definition, classification of enzyme, units for measuring enzyme activity.		

<b>Unit IV</b>	<b>Nucleic acids</b>	7
Nucleic acids: Structure, function and types of DNA and RNA. Nucleotides, Nucleosides, Nitrogen bases, and role of Nucleic acid.		
<b>Unit V</b>	<b>Vitamins</b>	7
Vitamins: classification, function and disease associated with vitamins. Role of Minerals and ions: Calcium, Iron, Iodine, Zinc, Phosphorus, Copper, Potassium, Zinc.		
<b>Textbooks</b>	1. Vasudevan DM, Sreekumari S, Vaidyanathan K. Textbook of biochemistry for medical students. JP Medical Ltd.	
<b>Reference Books</b>	1. Hames BD, Hooper NM, Hames BD. Instant notes in biochemistry. Biochemical education. 2. Devlin TM, editor. Textbook of biochemistry: with clinical correlations.	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

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**BMRIT V 2020 Course Outcome for ND3105**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be Introduced to Fundamental and Clinical Biochemistry.	1	Emp
<b>CO2</b>	Students will be able to study about buffers.	1	Emp
<b>CO3</b>	Students will be able to study about classification of carbohydrates, lipids, and enzymes.	2	Emp
<b>CO4</b>	Students will be able to learn about Nucleic acids: Structure, function and types of DNA and RNA.	3	Emp
<b>CO5</b>	Students will be able to learn about vitamins and minerals.	2	Emp

**CO-PO Mapping for ND3105**

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO3
CO 1	0	1	0	1	0	1	1	2	2	1	1	2	2	1
CO 2	0	0	0	0	0	1	1	2	1	2	1	2	2	1
CO 3	3	2	2	2	2	2	2	3	2	2	2	2	3	1
CO 4	2	1	2	2	2	2	2	2	3	3	2	3	3	1
CO 5	3	2	2	1	2	2	1	2	2	2	2	3	3	1
Avg	1.6	1.2	1.2	1.2	1.2	1.6	1.4	2.2	2	2	1.6	2.4	2.6	1

<b>RD3104</b>	<b>Title: Radiation Physics</b>	<b>L T P C 3 2 0 4</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	To enable the students to gain knowledge on the field of radiation along with the basic atomic and electric physics to the designing of x-ray circuits and its system.	
<b>Unit No</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>The Atom</b>	10
Definition, Thomson Atom, Bohr Atom, Atomic Structure, Electron Binding Energy, Radioactivity, laws of radioactivity and decay schemes of different alpha, Beta, gamma ray.		
<b>Unit II</b>	<b>Electromagnetic Radiation</b>	9
Photon, Velocity and amplitude, Frequency and wavelength, Electromagnetic Spectrum, Inverse square law, Units and quantities of radiation, dose measurement for various diagnostic procedures.		
<b>Unit III</b>	<b>Electricity And Magnetism, Electromagnetism</b>	10

Electrostatics, Laws of electrostatics, Coulomb's law, Electrodynamics, Ohm's laws, Alternative & Direct Current, Magnet, Classification of magnets, Magnetic laws. Electromagnetic Effect, Faraday's & Lenz's law of Electromagnetic Induction, Generator, Transformers, Laws of Transformers, Types of Transformers		
<b>Unit IV</b>	<b>X-Ray Imaging System, Image Quality</b>	10
Operating console, Autotransformers, Control of kVp, mAs, Exposure Timers, Voltage Rectification, Exposure, attenuation, absorption, contrast, resolution, sharpness, noise, various factors determining image quality.		
<b>Unit V</b>	<b>X-Ray Circuits Components</b>	9
Filament Circuit, High voltage circuit, Switched, Fuses, Circuit Breakers Beam limiting Devices-Cones, Cylinders, collimator, Grids, Filters.		
<b>Text Books</b>	1. Curry TS, Dowdey JE, Murry RC. Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins.	
<b>Reference Books</b>	1. Holmberg O, Malone J, Rehani M, McLean D, Czarwinski R. Current issues and actions in radiation protection of patients. 2. Dendy PP, Heaton B. Physics for diagnostic radiology. CRCpress.	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

**BMRIT V 2020 Course Outcome for RD3104**

<b>Unit-wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to study the basic structure of Atom and Radioactivity, laws of radioactivity.	2	Emp
<b>CO2</b>	Students will be able to Learn about electromagnetic radiation.	2	Emp
<b>CO3</b>	Students will be able to study about electricity, magnetism, and electromagnetism.	3	Emp
<b>CO4</b>	Students will be able to Learn about x-ray imaging system and its image quality factors.	3	Emp

<b>CO5</b>	Students will be able to study about x-rays circuits and its components.	3	Emp
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### CO-PO Mapping for RD3104

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO3
CO 1	3	3	2	2	3	2	2	1	3	3	3	3	3	2
CO 2	3	3	3	2	3	3	2	2	2	3	3	3	3	2
CO 3	3	3	3	2	3	3	1	2	2	2	3	3	2	2
CO 4	3	3	3	3	3	3	0	2	2	2	3	3	3	3
CO 5	3	3	3	3	3	2	0	1	1	2	3	3	3	3
Avg	<b>3</b>	<b>3</b>	<b>2.8</b>	<b>2.4</b>	<b>3</b>	<b>2.6</b>	<b>1</b>	<b>1.6</b>	<b>2</b>	<b>2.4</b>	<b>3</b>	<b>3</b>	<b>2.8</b>	<b>2.4</b>

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BMRIT V 2020

<b>CY3205</b>	<b>Title: Environmental Studies</b>	<b>L T P C 2 0 0 2</b>
<b>Version No.</b>	<b>3.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objective</b>	The objective of the course is to understand about issues related to the environment and their impact on human life.	
<b>Unit No.</b>	<b>Unit Title</b>	<b>No. of hours (per Unit)</b>
<b>Unit I</b>	<b>Introduction to Environmental studies &amp; Ecosystems</b>	5

Multidisciplinary nature of environmental studies, Scope and importance, Need for public awareness. Concept, Structure and function of an ecosystem, Energy flow in an ecosystem: food chains, food webs and ecological pyramids. Examples of various ecosystems such as: Forest, Grassland, Desert, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)		
<b>Unit II</b>	<b>Natural Resources: Renewable &amp; Non-renewable resources</b>	5
Land as a resource, land degradation, landslides (natural & man-induced), soil erosion and desertification. Forests & forest resources: Use and over-exploitation, deforestation. Impacts of deforestation, mining, dam building on environment and forests. Resettlement and rehabilitation of project affected persons; problems and concerns with examples. Water resources: Use and over-exploitation of surface and ground water, floods, drought, conflicts over water (international & inter state). Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems with examples. Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs.		
<b>Unit III</b>	<b>Biodiversity &amp; Conservation</b>	5
Levels of biological diversity: genetic, species and ecosystem diversity. Bio-geographic zones of India. Ecosystem and biodiversity services. Biodiversity patterns and global biodiversity hot spots, India as a mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.		
<b>Unit IV</b>	<b>Environmental Pollution</b>	4
Environmental pollution and its types. Causes, effects and control measures of :a) Air pollution b) Water pollution – freshwater and marine c) Soil pollution d) Noise pollution e) Thermal pollution, Nuclear hazards and human health risks, Solid waste management: Control measures of urban and industrial waste.		
<b>Unit V</b>	<b>Environmental Policies &amp; Practices</b>	5
Concept of sustainability and sustainable development. Water conservation & watershed management. Climate change, global warming, acid rain, ozone layer depletion. Disaster management: floods, earthquake, cyclones and landslides. Wasteland reclamation. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation. Environment: rights and duties. Population growth. <b>Field work</b> Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of simple ecosystems-pond, river, hill slopes, etc.		

BMRIT V 2020 **Text Books** 1. Bharucha. E, Textbook of Environmental Studies for Undergraduate Courses.

<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Kaushik Anubha, Kaushik C P, Perspectives in Environmental Studies New Age Publication.</li> <li>2. Rajagopalan, Environmental Studies from Crisisto Cure, Oxford University Press.</li> </ol>
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<b>Mode of Evaluation</b>	Internal and External Examinations
<b>Recommendation by Board of Studies on</b>	27-07-2020
<b>Date of approval by the Academic Council</b>	13-09-2020

#### Course Outcome for CY3205

<b>Unit-wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to understand about issues related to the environment and their impact on human life.	3	S
<b>CO2</b>	Students will be able to understand about the solutions related to the environmental problems.	2	S
<b>CO3</b>	Students will be able to understand about different components of the environment and their function and sustainable development.	3	S
<b>CO4</b>	Students will be able to Comprehend the importance of ecosystem and biodiversity	3	S
<b>CO5</b>	Students will be able to correlate the human population growth and its trend to the environmental degradation	3	S

#### BMRIT V 2020 CO-PO Mapping for CY3205

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
			PO3		PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1		
CO 1	2	1	2	2	2	1	2	3	1	1	2	2	1	2
CO 2	1	1	1	1	1	2	1	2	2	2	1	1	2	1
CO 3	1	2	1	1	1	2	2	1	2	3	3	2	2	2

CO 4	1	2	2	2	1	2	2	2	1	3	3	2	1	3
CO 5	1	3	1	2	1	2	1	1	2	2	1	1	3	4
Avg	1.8	1.8	2.6	2	1.4	2.6	1.6	2.4	1.8	2	2	1.6	1.8	2.4

<b>EG3102</b>	<b>Title: Professional Communication</b>	<b>L T P C 2 0 0 2</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	To introduce students to the theory, fundamentals, and tools of communication and to develop in them vital communication skills	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit I</b>	<b>Fundamentals of Communication</b>	5
Introduction–Communication Process, Distinction between General and Technical Communication. Language as a Tool of Communication; Interpersonal, Organizational, Mass Communication. Formal Communication: Downward, Upward, Lateral/ Horizontal, Diagonal; Informal Communication (Grapevine). Barriers to Communication		
<b>Unit II</b>	<b>Components of Technical Written Communication</b>	5
Vocabulary building: Synonyms and Antonyms, Homophones, Conversions. Common Grammatical Errors, Paragraph Development, Précis writing. Technical Papers: Project, Dissertation and Thesis.		
<b>Unit III</b>	<b>Forms of Business Communication</b>	5
Business Correspondence- Types: Memorandum; Official letters. Job Application, Resume/CV/Bio-data; Notice, Agenda, Minutes of Meetings. Technical Proposal: Types, Significance, Format and Style of Writing Proposals. Technical Report: Types, Significance, Format and Style of Writing Reports.		
<b>Unit IV</b>	<b>Presentation Techniques and Soft Skills</b>	5
Presentation- Defining Purpose, Audience and Location; Organizing Contents; Preparing Outline; Audio-Visual Aids in Presentations. On-Verbal Aspects of Presentation: Kinesics, Proxemics, Chronemics, Paralanguage. Listening Skills: Importance, Active and Passive listening. Speaking Skills: Common Errors in Pronunciation; Vowels, Consonants and Syllables; Accent, Rhythm and Intonation.		
<b>Unit V</b>	<b>Value-based Text Readings</b>	4



Thematic and value-based critical reading of the following essays with emphasis on the mechanics of writing and speaking: 1. The Language of Literature and Science by Aldous Huxley 2. Of Discourse by Francis Bacon	
<b>Suggested Reference Books</b>	<ol style="list-style-type: none"> <li>1. Barun K. Mitra, <i>Effective Technical Communication</i>, Oxford Univ. Press</li> <li>2. Meenakshi Raman and Sangeeta Sharma, <i>Technical Communication Principles and Practices</i>, Oxford Univ. Press</li> <li>3. Prof. R.C. Sharma &amp; Krishna Mohan, <i>Business Correspondence and Report Writing</i>, Tata McGraw Hill &amp; Co. Ltd. New Delhi</li> <li>4. V.N. Arora and Laxmi Chandra <i>Improve Your Writing</i>, Oxford Univ. Press, New Delhi</li> <li>5. Ruby Gupta, <i>Basic Technical Communication</i></li> </ol>
<b>Mode of Evaluation</b>	Internal and External Examinations
<b>Recommendation by Board of Studies on</b>	27-07-2020
<b>Date of approval by the Academic Council</b>	13-09-2020

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**BMRIT V 2020 Course Outcome for EG3102**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn about Fundamentals of Communication	2	S
<b>CO2</b>	Students will be able to learn about Components of Technical Written Communication	1	S
<b>CO3</b>	Students will be able to learn about Forms of Business Communication	3	S
<b>CO4</b>	Students will be able to learn about Presentation Techniques and Soft Skills	3	S
<b>CO5</b>	Students will be able to learn about Value-based Text Readings	2	S

**CO-PO Mapping for EG3102**

<b>Course Outcomes</b>	<b>Program Outcomes (Course Articulation Matrix (Highly Mapped 3, Moderate- 2, Low-1, Not related-0))</b>	<b>Program Specific Outcomes</b>
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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PSO3
CO 1	2	2	1	2	3	2	3	3	2	3	3	3	3	2
CO 2	2	2	2	2	2	2	3	3	2	3	3	3	3	3
CO 3	2	3	2	2	3	3	2	3	1	2	2	3	2	3
CO 4	3	2	2	3	2	3	2	3	3	3	3	3	3	2
CO 5	3	1	1	1	2	2	2	3	2	2	3	3	2	2
Avg	<b>2.4</b>	<b>2</b>	<b>1.6</b>	<b>2</b>	<b>2.4</b>	<b>2.4</b>	<b>2.4</b>	<b>3</b>	<b>2</b>	<b>2.6</b>	<b>2.8</b>	<b>3</b>	<b>2.6</b>	<b>2.4</b>

<b>EG3140</b>	<b>Title: Professional Communication Lab</b>	<b>L T P C</b> <b>0 0 2 1</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	To provide practice to students in an interactive manner to apply the fundamentals and tools of English communication to life situations	
Experiment No.	List of Experiments	

<ol style="list-style-type: none"> <li>1. Common conversation skills</li> <li>2. Introductions</li> <li>3. Making requests</li> <li>4. Asking for permission</li> <li>5. Asking questions</li> <li>6. Describing events, people, places</li> <li>7. Learning correct pronunciation, syllable, stress, intonation</li> <li>8. Extempore speaking</li> <li>9. Role play</li> <li>10. Presentation skills</li> <li>11. Grammar-tense practice</li> <li>12. Mother tongue influence-correction</li> <li>13. Speech making / public speaking</li> <li>14. Listening effectively</li> <li>15. E-mail Etiquettes</li> </ol>	
<b>Mode of Evaluation</b>	Internal and External Examinations
<b>Recommendation by Board of Studies on</b>	27-07-2020
<b>Date of approval by the Academic Council</b>	13-09-2020

**BMRIT V 2020 Course Outcome for EG3140**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn about Common conversation Skills	2	Emp
<b>CO2</b>	Students will be able to know about Making requests, asking for permission, Asking questions	1	Emp
<b>CO3</b>	Students will be able to learn about Describing events, people, places & correct pronunciation, syllable, stress, intonation	3	Emp
<b>CO4</b>	Students will be able to learn about Extempore speaking, Role play & presentation skills.	2	Emp
<b>CO5</b>	Students will be able to learn about Speech making / public speaking, Listening effectively & E-mail Etiquettes	2	Emp

**CO-PO Mapping for EG3140**

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO3
CO 1	2	2	1	2	3	2	3	3	2	3	3	3	3	2
CO 2	2	2	2	2	2	2	3	3	2	3	3	3	3	3
CO 3	2	3	2	2	3	3	2	3	1	2	2	3	2	3
CO 4	3	2	2	3	2	3	2	3	3	3	3	3	3	2
CO 5	3	1	1	1	2	2	2	3	2	2	3	3	2	2
Avg	2.4	2	1.6	2	2.4	2.4	2.4	3	2	2.6	2.8	3	2.6	2.4

<b>RD3140</b>	<b>Title: Human Anatomy- I Lab</b>	<b>LTPC 0021</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	To develop the basic concept of gross, functional and applied anatomy.	
Experiment No	List of Experiments	
	1. Major organs through models and permanent slides. 2. Parts of the circulatory system from models. 3. Parts of the respiratory system from models. 4. Digestive system from models. 5. Excretory system from models.	
<b>Mode of Evaluation</b>	Internal and External Examinations	

<b>Recommendation by Board of Studies on</b>	27-07-2020
<b>Date of approval by the Academic Council</b>	13-09-2020

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**BMRIT V 2020 Course Outcome for RD3140**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn about Major organs through models and permanent slides	1	Emp
<b>CO2</b>	Students will be able to study about Parts of Circulatory system from models.	2	Emp
<b>CO3</b>	Students will be able to study about Parts of respiratory system from models.	3	Emp
<b>CO4</b>	Students will be able to learn about Digestive system from Models	2	Emp
<b>CO5</b>	Students will be able to learn about Excretory system from models.	3	Emp

**CO-PO Mapping for RD3140**

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3
CO 1	2	3	1	3	2	2	2	3	1	2	3	3	3	3
CO 2	2	2	1	3	0	1	2	1	1	1	3	3	3	3
CO 3	3	3	2	3	0	3	2	2	1	1	3	3	3	3

CO 4	2	2	2	3	0	2	2	2	1	1	3	3	3	3
CO 5	2	2	2	3	0	2	2	2	1	2	3	3	3	3
Avg	<b>2.2</b>	<b>2.4</b>	<b>1.6</b>	<b>3</b>	<b>0.4</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1.4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>

<b>RD3143</b>	<b>Title: Basics of Human Physiology- I Lab</b>	<b>L T P C</b> <b>0 0 2 1</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	To enable the studentsto understand the normal functioning of various organ systems of the body.	
Experiment No.	List of Experiments	
	<ol style="list-style-type: none"> <li>1. To measure pulse rate</li> <li>2. To measure blood pressure</li> <li>3. To measure temperature</li> <li>4. Measurement of the Vital capacity</li> <li>5. Determination of blood groups</li> <li>6. Transport of food through esophagus</li> <li>7. Calculation and evaluation of daily energy and nutrient intake.</li> <li>8. Measurement of basal metabolic rate</li> <li>9. Demonstration of ECG</li> <li>10. Bile juice secretion and excretion</li> <li>11. Urine formation and excretion</li> </ol>	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

Unit wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)
<b>CO1</b>	Students will be able to learn about measurement of pulse rate, blood pressure & temperature	1	Emp
<b>CO2</b>	Students will be able to learn about Measurement of the Vital capacity & determination of blood groups	2	Emp
<b>CO3</b>	Students will be able to learn about transport of food through esophagus, Bile juice secretion and excretion & Urine formation and excretion	2	Emp
<b>CO4</b>	Students will be able to learn about determination of blood Group	1	Emp
<b>CO5</b>	Students will be able to learn about Calculation and evaluation of daily energy and nutrient intake.	3	Emp

#### CO-PO Mapping for RD3143

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	2	2	3	3	2	1	2	1	1	2	3	3	3	2
CO 2	3	2	3	3	3	2	2	2	2	2	3	3	3	3
CO 3	3	2	3	3	3	3	2	3	3	2	3	3	3	3
CO 4	3	2	3	3	3	3	2	2	2	2	3	3	3	3
CO 5	3	2	3	3	3	3	2	2	2	2	3	3	3	3
Avg	<b>2.8</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2.8</b>	<b>2.4</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2.8</b>

<b>ND3144</b>	<b>Title: Biochemistry Lab</b>	<b>L T P C 0 0 2 1</b>
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<b>Version No.</b>	<b>1.0</b>
<b>Course Prerequisites</b>	NIL
<b>Objectives</b>	To develop the basic concepts of Lab diagnosis for Radiology.
Experiment No.	List of Experiments
	<ol style="list-style-type: none"> <li>1. Demonstration of Blood Collection</li> <li>2. Demonstration of Anticoagulation</li> <li>3. Demonstration of Lab Glassware</li> <li>4. Preparation of Normal solution</li> <li>5. Demonstration of Acids</li> <li>6. Demonstration of Alkalis</li> <li>7. Demonstration of Acid-Base Indicator</li> <li>8. Kidney function tests</li> <li>9. Liver function tests</li> <li>10. Urea and Creatine values</li> </ol>
<b>Mode of Evaluation</b>	Internal and External Examinations
<b>Recommendation by Board of Studies</b>	27-07-2020
<b>Date of approval by the Academic Council</b>	13-09-2020

**BMRIT V 2020 Course Outcome for ND3144**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn about Demonstration of Blood Collection & Anticoagulation	1	Emp
<b>CO2</b>	Students will be able to learn about Demonstration of Lab Glassware & Normal solution	2	Emp
<b>CO3</b>	Students will be able to learn about Demonstration of Acids, Alkalis & Acid-Base Indicator	3	Emp



<b>CO4</b>	Students will be able to learn about Kidney function tests, Urea and Creatine values	1	Emp
<b>CO5</b>	Students will be able to learn about Liver function tests	1	Emp

#### CO-PO Mapping for ND3144

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO3
CO 1	0	0	0	1	0	1	1	2	2	1	1	2	2	1
CO 2	0	0	0	0	0	1	1	2	1	1	1	2	2	1
CO 3	3	2	2	2	2	2	2	3	2	1	2	2	3	1
CO 4	2	1	2	2	2	2	2	2	3	1	2	3	3	1
CO 5	3	2	2	1	2	2	1	2	2	1	2	3	3	1
Avg	<b>1.6</b>	<b>1</b>	<b>1.2</b>	<b>1.2</b>	<b>1.2</b>	<b>1.6</b>	<b>1.4</b>	<b>2.2</b>	<b>2</b>	<b>1</b>	<b>1.6</b>	<b>2.4</b>	<b>2.6</b>	<b>1</b>

#### SEMESTER 2 Year -1

<b>RD3201</b>	<b>Title: Human Anatomy- II</b>	<b>L T P C 3 0 0 3</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	To develop and to ensure proper knowledge on description, orientation and positions of organs and their relations to other organs.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Cardiovascular system</b>	8

Cardiovascular system: Basic anatomy of heart and important blood vessels, Brief introduction about Lymphatic System		
<b>Unit II</b>	<b>The Nervous System</b>	7
The Nervous System: Basic anatomy of brain and spinal cord, meninges and cerebrospinal fluid, Cranial Nerves		
<b>Unit III</b>	<b>Endocrine System</b>	7
Endocrine System: Brief anatomy of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal		
<b>Unit IV</b>	<b>Special Senses</b>	7
Special Senses: Basic anatomy of eye, ear and nose		
<b>Unit V</b>	<b>Genitourinary system</b>	7
Genitourinary system: Basic anatomy of kidney and associated organs, male reproductive organs, female reproductive organs		
<b>Textbooks</b>	1. Waugh A, Grant A. Ross & Wilson Anatomy and Physiology in Health and Illness E-Book. Elsevier Health Sciences, Chaurasia BD, Garg K.BD 2. Chourasia's Human Anatomy: Lower limb, abdomen & pelvis. CBS Publishers & Distributors.	
<b>Reference Books</b>	1. Garg K. BD Chourasia's Human Anatomy–Regional and Applied Dissection and Clinical: Volume 1 Upper Limb and Thorax. 2. Principles of Anatomy and Physiology, Gerard J. Tortora and Bryan H. Derrickson	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

**BMRIT V 2020 Course Outcome for RD3201**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn the basic anatomy of cardiovascular system and clinical disorders	3	Emp

<b>CO2</b>	Students will be able to study the basic anatomy of brain and spinal cord, meninges, and cerebrospinal fluid.	2	Emp
<b>CO3</b>	Students will be able to know about the Endocrine System: Anatomy of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal glands.	2	Emp
<b>CO4</b>	Students will be able to study the basic anatomy of special senses.	3	Emp
<b>CO5</b>	Students will be able to study the basic anatomy of Genitourinary organs and reproductive system.	2	Emp

### CO-PO Mapping for RD3201

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PS O1	PSO2	PSO3
CO 1	3	3	3	3	3	3	3	3	3	1	3	3	3	1
CO 2	3	3	3	3	3	3	3	3	3	1	3	3	3	1
CO 3	3	3	3	3	3	2	2	3	3	1	3	3	3	1
CO 4	3	3	3	3	3	3	2	3	3	2	3	3	3	1
CO 5	3	3	3	3	3	3	3	3	3	1	3	3	3	1
Avg	3	3	3	3	3	2.8	2.6	3	3	1.2	3	3	3	1

<b>RD3206</b>	<b>Title: Basics of Human Physiology- II</b>	<b>L T P C</b> <b>3 0 0 3</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	To enable the studentsto recognize the anatomical structures and explain the physiological function of body systems.	

<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit I</b>	<b>Organs of Excretory System</b>	7
Organs of Excretory System: Kidneys, Nephron, Mechanism of Excretion, Urine formation (Glomerular filtration and Tubular reabsorption), Electrolytes: their balances and imbalances Introduction of acidosis and alkalosis		
<b>Unit II</b>	<b>Muscle nerve physiology</b>	7
Muscle nerve physiology, types of muscles, their gross structural and functional difference with reference to Properties		
<b>Unit III</b>	<b>Nervous system</b>	7
Nervous system- general organization of CNS, function of important structure and spinal cord, neuron, nerve impulse, type of nerves according to function, Autonomic nervous system-organization &function Special <sup>senses</sup> general organization & functions		
<b>Unit IV</b>	<b>Endocrine System</b>	8
Endocrine System: Brief introduction about endocrine glands and their secretion, common endocrinological disorder such as diabetes mellitus, hyper & hypothyroidism, dwarfism, gigantism, tetany.		
<b>Unit V</b>	<b>Reproductive System</b>	7
Reproductive System: male & female reproductive organs, sex hormones, secondary sexual characteristics, puberty, spermatogenesis, oogenesis, menstrual cycle, pregnancy, menopause, contraceptive measures.		
<b>Textbooks</b>	1. Sembulingam K, Sembulingam P. Essentials of medical physiology.JP Medical Ltd; 2012.	
<b>Reference Books</b>	1. Arthur C, Guyton MD, Hall JE. Textbook of medical physiology Saunders, Philadelphia. 2. Tortora GJ, Derrickson BH. Principles of anatomy and physiology. John Wiley & Sons.	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

Unit wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)
<b>CO1</b>	Students will be able to learn the physiology of excretory organs.	3	Emp
<b>CO2</b>	Students will be able to study about muscle nerve physiology and types of muscles.	2	Emp
<b>CO3</b>	Students will be able to know about Introduction of Nervous system i.e.: general organization of CNS and ANS.	1	Emp
<b>CO4</b>	Students will be able to study about endocrine system and its clinical disorders.	1	Emp
<b>CO5</b>	Students will be able to study about reproductive system and its clinical disorders.	2	Emp

#### CO-PO Mapping for RD3206

CourseOutcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PS O1	PS O2	PSO3
CO 1	3	3	3	3	2	3	2	3	3	1	3	3	2	2
CO 2	3	1	3	3	2	1	1	1	3	1	3	3	2	2
CO 3	3	3	3	3	3	3	1	3	3	1	3	3	3	3
CO 4	3	2	3	3	2	3	1	3	3	1	3	2	2	2
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	3	2.4	3	3	2.4	2.6	1.6	2.6	3	1.4	3	2.8	2.4	2.4

<b>RD3203</b>	<b>Title: Radiographic Positioning- I</b>	<b>L T P C 4 0 0 4</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The objective is to learn basic and special projections for the better and delineation diagnosis of the diseased conditions of different anatomical structure.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Cranial bones and facial bones</b>	7
<b>Cranial bones and facial bones:</b> Related radiological anatomy, <b>Basic &amp; special projections:</b> Cranium Base of skull, Sellaturcica, Mastoids, Optic foramina and Orbits, Nasal bone, TM joint, Facial bone, Zygomatic arches, Mandible, Para nasal sinuses		
<b>Unit II</b>	<b>Neck</b>	7
<b>NECK:</b> Related radiological anatomy, Positioning- AP, LAT		
<b>Unit III</b>	<b>Thorax</b>	8
<b>THORAX:</b> Related radiological anatomy, Chest X-ray –AP, LAT, Special projections		
<b>Unit IV</b>	<b>Abdomen</b>	7
<b>ABDOMEN:</b> Related radiological anatomy, <b>Basic &amp; special projection:</b> Basic, AP supine (KUB), Special, PA prone, Lateral decubitus, Erect AP, Dorsal decubitus, Lateral, Acute abdomen: three-way series		
<b>Unit V</b>	<b>KUB</b>	7
<b>KUB:</b> Related radiological anatomy, Positioning- AP		
<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. Whitley AS, Jefferson G, Holmes K, Sloane C, Anderson C, Hoadley G. Clark's Positioning in Radiography 13E. CRC Press; 2015 Jul28.</li> <li>2. Bontrager KL, Lampugnano J. Textbook of Radiographic Positioning and Related Anatomy-E-Book. Elsevier Health Sciences; 2013 Aug7.</li> </ol>	
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Bontrager KL, Lampugnano J. Bontrager's Handbook of Radiographic Positioning and Techniques-E-BOOK. Elsevier Health Sciences; 2017 Feb 10.</li> <li>2. Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures-E-Book. Elsevier Health Sciences; 2013 Aug13.</li> </ol>	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

## BMRIT V 2020 Course Outcome for RD3203

Unit wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)
<b>CO1</b>	Students will be able to learn the basic and special projections of cranial and facial bones.	3	Ent
<b>CO2</b>	Students will be able to learn the basic and special radiographic Positioning of neck- AP, LAT with its radiological anatomy.	2	Ent
<b>CO3</b>	Students will be able to learn the basic and special radiographic Positioning of routine thorax- AP, LAT with its radiological anatomy.	1	Emp
<b>CO4</b>	Students will be able to learn the basic and special radiographic positioning of abdomen with its radiological anatomy.	2	Emp
<b>CO5</b>	Students will be able to learn the basic and special radiographic positioning of KUB with its radiological Anatomy	1	Emp

## CO-PO Mapping for RD3203

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3
CO 1	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	1	3	3	2	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1.8</b>	<b>3</b>	<b>3</b>	<b>2.8</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>

<b>CS3102</b>	<b>Title: Fundamentals of Computer Applications</b>	<b>L T P C 3 0 0 3</b>
<b>Version No.</b>	1.0	
<b>Course Prerequisites</b>	NIL	
<b>Objective</b>	This subject aims to make student handy with the computer's basics and programming.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit 1</b>	<b>Architecture of Computer</b>	4
What is Computer: Brief History and Evolution Chain, Concept of Hardware, The Inside Computer [Hard Drives (HD), Solid State Drives (SSD), Concept of CPU, Concept Of RAM		
<b>Unit 2</b>	<b>Arithmetic of Computer</b>	5
Number System [Decimal, Binary, Octal, Hexadecimal], Conversions, Binary Arithmetic [Addition, Subtraction, Multiplication, Division, 1s Complement, 2s Complement		
<b>Unit 3</b>	<b>Algorithms &amp; Flow Chart</b>	5
Algorithm [What is Algorithm? Algorithm Writing Examples] Flow Chart [What is Flow Chart? Flow Chart Symbols, how to make Flow Chart? Types of Flow Chart, Flow Chart Examples]		
<b>Unit 4</b>	<b>Basics of DOS</b>	5
Disk Operating System: Dos Commands Internal - DIR, MD, CD, RD, COPY, DEL, REN, VOL, DATE, TIME, CLS, PATH, TYPE. External- CHKDSK, XCOPY, PRINT, DISKCOPY, DISCOMP, DOSKEY, TREE, MOVE, LABEL, APPEND, FORMAT, SORT, FDISK, BACKUP, EDIT, MODE, ATTRIB HELP, SYS.		
<b>Unit 5</b>	<b>Windows Concepts</b>	5
Hardware requirements of Windows, Windows, Windows concepts, Calculator, Notepad, Paint, and Windows Explorer: Creating folders and other explorer facilities. Entertainment, CD Player, DVD Player, Media Player, Sound Recorder, Volume Control.		
<b>Textbooks</b>	Computer Fundamentals by P.K. Sinha	
<b>Reference Books</b>	Computer Fundamentals by Anita Goel "Pearson " Google Windows help	
<b>Mode of Evaluation</b>	Internal and External Examinations	



<b>Recommended by Board of Studied on</b>	27-07-2020
<b>Date of Approval by the Academic Council on</b>	13-09-2020

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**BMRIT V 2020 Course Outcome for CS3102**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn the architecture of computer.	1	Emp
<b>CO2</b>	Students will be able to study the arithmetic of computer.	2	Emp
<b>CO3</b>	Students will be able to study the algorithms and flow chart of computer.	3	Emp
<b>CO4</b>	Students will be able to study about disk operating study and its Dos commands.	3	Emp
<b>CO5</b>	Students will be able to learn about hardware of windows concepts.	2	Emp

**CO-PO Mapping for CS3102**

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO2	PSO3
CO 1	2	1	1	1	1	3	0	2	3	1	2	2	2	3
CO 2	2	2	2	2	2	2	0	2	3	2	3	3	3	3
CO 3	2	2	2	2	3	3	0	3	3	2	3	3	3	3
CO 4	2	2	3	2	3	3	2	2	3	2	3	3	2	3
CO 5	2	2	2	1	2	2	0	2	3	1	2	3	2	3

Avg	2	1.8	2	1.6	2.2	2.6	0.4	2.2	3	1.6	2.6	2.8	2.4	3
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<b>RD3240</b>	<b>Title: Human Anatomy-II Lab</b>	<b>L T P C</b> <b>0 0 2 1</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	To develop and to ensure proper knowledge on description, orientation, and positions of organs and their relations to other organs.	
Experiment No.	List of Experiments	
	1. Nervous system from models. 2. Structure of eye and ear 3. Structural differences between skeletal, smooth and cardiac muscles. 4. Various bones 5. Various joints 6. Various parts of male & female reproductive system from models	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

**Course Outcome for RD3240**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn about Nervous system from models.	1	Emp
<b>CO2</b>	Students will be able to understand about Structure of eye and ear	2	Emp

<b>CO3</b>	Students will be able to know about Structural differences between skeletal, smooth, and cardiac muscles.	3	Emp
<b>CO4</b>	Students will be able to know about Various bones and joints of body	2	Emp
<b>CO5</b>	Students will be able to understand about Various parts of male & female reproductive system from models	1	Emp

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**BMRIT V 2020 CO-PO Mapping for RD3240**

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO1	PSO2	PSO3
CO 1	3	3	3	3	3	3	3	3	3	1	3	3	3	1
CO 2	3	3	3	3	3	3	3	3	3	1	3	3	3	1
CO 3	3	3	3	3	3	2	2	3	3	1	3	3	3	1
CO 4	3	3	3	3	3	3	2	3	3	2	3	3	3	1
CO 5	3	3	3	3	3	3	3	3	3	1	3	3	3	1
Avg	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2.8</b>	<b>2.6</b>	<b>3</b>	<b>3</b>	<b>1.2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>

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BMRIT V 2020

<b>RD3242</b>	<b>Title: Radiographic Positioning- I Lab</b>	<b>L T P C 0 0 4 2</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The objective is to learn basic and special projections for the better and delineation diagnosis of the disease conditions of different anatomical structure.	

Experiment No.	List of Experiments
1. Cranial bones and facial bones 2. Basic & special projections 3. Related radiological Pathology 4. Neck, Thorax Abdomen 5. Basic & special projection 6. Basic & special projection 7. Related radiological Pathology	
<b>Mode of Evaluation</b>	Internal and External Examinations
<b>Recommendation by Board of Studies on</b>	27-07-2020
<b>Date of approval by the Academic Council</b>	13-09-2020

#### Course Outcome for RD3242

Unit wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)
<b>CO1</b>	Students will be able to learn about Cranial bones Basic & special projections and Related radiological Pathology	3	Emp
<b>CO2</b>	Students will be able to learn about facial bones Basic & special projections and Related radiological Pathology	2	Emp
<b>CO3</b>	Students will be able to learn about neck Basic & special projections and Related radiological Pathology	3	Emp
<b>CO4</b>	Students will be able to learn about Thorax Basic & special projections and Related radiological Pathology	1	Emp
<b>CO5</b>	Students will be able to learn about Abdomen Basic & special projection	2	Emp

#### BMRIT V 2020 CO-PO Mapping for RD3242

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))	Program Specific Outcomes
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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO2	PSO3
CO 1	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	1	3	3	2	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1.8</b>	<b>3</b>	<b>3</b>	<b>2.8</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>

<b>RD3243</b>	<b>Title: Basics of Human Physiology- II Lab</b>	<b>L T P C</b> <b>0 0 2 1</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	To enable the studentsto detect the abnormalities related to various body parts.	
Experiment No.	List of Experiments	
	1. To perform total platelet count. 2. To perform bleeding time. 3. To perform clotting time. 4. To study about Semination. 5. To study about intrauterine contraceptive devices. 6. To demonstrate microscopic structure of bones with permanent slides. 7. To demonstrate microscopic structure of muscles with permanent slides.	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommen dati on byBoard of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

**Course Outcome for RD3243**

Unit wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)
<b>CO1</b>	Students will be able to perform total platelet count.	2	Emp
<b>CO2</b>	Students will be able to perform bleeding time and clotting time.	3	Emp
<b>CO3</b>	Students will be able to study about CSF examination.	1	Emp
<b>CO4</b>	Students will be able to study about intrauterine contraceptive devices	3	Emp
<b>CO5</b>	Students will be able to demonstrate microscopic structure of bones & muscles with permanent slides.	2	Emp

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**BMRIT V 2020 CO-PO Mapping for RD3243**

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO3
CO 1	3	3	3	3	2	3	2	3	3	1	3	3	2	2
CO 2	3	1	3	3	2	1	1	1	3	1	3	3	2	2
CO 3	3	3	3	3	3	3	1	3	3	1	3	3	3	3
CO 4	3	2	3	3	2	3	1	3	3	1	3	2	2	2
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	<b>3</b>	<b>2.4</b>	<b>3</b>	<b>3</b>	<b>2.4</b>	<b>2.6</b>	<b>1.6</b>	<b>2.6</b>	<b>3</b>	<b>1.4</b>	<b>3</b>	<b>2.8</b>	<b>2.4</b>	<b>2.4</b>

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<b>CS 3141</b>	<b>Title: Fundamentals of Computer Applications Lab</b>	<b>L T P C 0 0 2 1</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The course introduces you to fundamental „Computer Literacy“ concepts. You will learn to use Windows on the PC-compatible computers.	
Experiment No	List of Experiments	
	<ol style="list-style-type: none"> <li>1. Dos Commands Internal - DIR, MD, CD, RD,</li> <li>2. Dos Commands Internal COPY, DEL, REN</li> <li>3. Dos Commands Internal VOL, DATE, TIME</li> <li>4. Dos Commands Internal CLS, PATH, TYPE</li> <li>5. Dos Commands External- CHKDSK, XCOPY, PRINT,</li> <li>6. Dos Commands External- DISKCOPY, DISCOMP, DOSKEY</li> <li>7. Dos Commands External- TREE, MOVE, LABEL, APPEND</li> <li>8. Dos Commands External- FORMAT, SORT, FDISK</li> <li>9. Dos Commands External- BACKUP, EDIT, MODE</li> <li>10. Dos Commands External- ATTRIB HELP, SYS</li> <li>11. Windows Explorer: Creating folders and other explorer facilities</li> </ol>	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

#### Course Outcome for CS3141

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more thanone)</b>
<b>CO1</b>	Students will be able to learn about Dos Commands Internal - DIR, MD, CD, RD,	1	Emp
<b>CO2</b>	Students will be able to learn about Dos Commands Internal COPY, DEL, REN, CHKDSK, XCOPY, PRINT	2	Emp
<b>CO3</b>	Students will be able to learn about Dos Commands Internal VOL, DATE, TIME, CLS, PATH, TYPE	3	Emp
<b>CO4</b>	Students will be able to learn about FORMAT, SORT, FDISK	2	Emp

<b>CO5</b>	Students will be able to learn about ATTRIB HELP, SYS	3	Emp
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**CO-PO Mapping for CS3141**

BMRIT V 2020

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PSO2	PSO3
CO 1	2	1	1	1	1	3	1	2	3	2	2	2	2	3
CO 2	2	2	2	2	2	2	1	2	3	1	3	3	3	3
CO 3	2	2	2	2	3	3	1	3	3	1	3	3	3	3
CO 4	2	2	3	2	3	3	2	2	3	1	3	3	2	3
CO 5	2	2	2	1	2	2	1	2	3	1	2	3	2	3
Avg	2	1.8	2	1.6	2.2	2.6	1.2	2.2	3	1.2	2.6	2.8	2.4	3

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BMRIT V 2020

**SEMESTER 3 Year -2**

<b>RD3301</b>	<b>Title: Radiographic Positioning- II</b>	<b>L T P C 4 0 0 4</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The objective is to learn basic and special projections for the better and delineation diagnosis of the disease conditions of different Anatomical structure.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Upper and lower Extremities</b>	10



Upper and lower Extremity: Related radiological anatomy, Basic & special projections: Finger- PA, Latrobe Hand- PA, LAT Wrist Joint-PA, LAT Forearm- AP, LAT Elbow Joint- AP, LAT Humerus- AP, LAT Femur-AP.LAT Knew Joint- AP, LAT Patella- Skyline View, Intercondyler projection Tibia- AP, LAT Ankle joint- AP.LAT Foot- AP, LAT		
<b>Unit II</b>	<b>Shoulder joint</b>	10
Shoulder joint: Related radiological anatomy, Basic & special projections: shoulder: AP, AXIAL Clavicle: AP, AP AXIAL Scapula: AP, Oblique, Y projection		
<b>Unit III</b>	<b>Pelvic Girdle and proximal</b>	10
Pelvic Girdle and proximal Femur: Related radiology anatomy, Basic & special projection: Pelvic girdle, AP Pelvis, Frog Lateral, AP axial for pelvic outlet(taylor method), AP axial for pelvic inlet(modified linienfield method),Posterior oblique acetabulum( judet method), Hip and proximal femur, AP unilateral hip, Axiolateral, infer superior (danelius – miller method), Unilateral frog leg( modified cleaves method), Modified Axiolateral (Clements- nakayama method),Sacroiliac joints: AP, posterior oblique		
<b>Unit IV</b>	<b>Whole Spine Positioning</b>	10
Cervical spine - Related radiological anatomy, Basic projection- AP open mouth (C1 and C2),AP axial, Oblique, Lateral, Erect, Trauma lateral (horizontal beam), Cervicothoracic junction (swimmers view), Special views, Lateral- hyperflexion and hyperextension, AP (Fuchs method) or PA (Judd method), AP wagging jaw (ottonello method), AP axial (pillars) Thoracic spine- Related radiographic anatomy, Basic Projections- AP, Lateral, Oblique Lumbar spine, sacrum and coccyx- Related radiographic anatomy, Basic Projections- Lumbar spine, AP Oblique, Lateral, Lateral (L5 – S1), AP axial (L5 – S1), Scoliosis series, AP or PA, Erect lateral, AP (Ferguson method), AP – R and L bending, Spinal fusion series, AP or PA – R and L bending, Lateral – hyperextension and hyper flexion Sacrum and Coccyx, AP axial sacrum, AP axial coccyx, Lateral sacrum, Lateral coccyx.		
<b>Unit V</b>	<b>Pediatrics Radiography</b>	8
Pediatricsradiography Positioning, care and radiation protection while handling babies		
<b>Textbooks</b>	1. Whitley AS, Jefferson G, Holmes K, Sloane C, Anderson C, Hoadley G. Clark's Positioning in Radiography 13E. CRC Press; 2015 Jul 28. 2. Bontrager KL, Lampignano J. Textbook of Radiographic Positioning and Related Anatomy E-Book. Elsevier Health Sciences; 2013 Aug 7.	
<b>Reference Books</b>	1. Bontrager KL, Lampignano J. Bontrager's Handbook of Radiographic Positioning and Techniques-E-BOOK. Elsevier Health Sciences; 2017 Feb 10. 2. Frank ED, Long BW, Smith BJ. Merrill's Atlas of Radiographic Positioning and Procedures-E-Book. Elsevier Health Sciences; 2013 Aug 13.	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

**BMRIT V 2020 Course Outcome for RD3301**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to Learn about patient positioning for Upper and lower Extremities	1	Emp
<b>CO2</b>	Students will be able to Learn about imaging of Shoulder joint	1	Emp
<b>CO3</b>	Students will be able to Know about imaging of Pelvic Girdle and proximal Femur	2	Emp
<b>CO4</b>	Students will be able to Know about Whole Spine Positioning techniques	2	Emp
<b>CO5</b>	Students will be able to learn about Pediatrics radiography	3	Emp

**CO-PO Mapping for RD3301**

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO3
CO 1	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	1	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	1	3	3	2	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1.8</b>	<b>3</b>	<b>3</b>	<b>2.8</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>

<b>RD3302</b>	<b>Title: Conventional Radiographic Technique I</b>	<b>L T P C 4 0 0 4</b>
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<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The main objective is too aware the student about the conventional technique of radio imaging technique like (manual image processing & fluoroscopy / dynamic imaging)along with the image formation, developing and reading	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Introduction to Radiologic Imaging</b>	10
Radiation, Sources of radiation, Radioactivity, Half-life, Ionizing & Non-ionizing Radiation, History of x-ray production, Development of modern Radiology. X-Ray Tube- External components- X-ray tube support, Protective housing, Glass or metal Enclosure, Internal components- cathode, anode, focusing cup, focal spot, Line focus principle, Heel effect, X-ray tube failure, Rating charts		
<b>Unit II</b>	<b>X-ray production</b>	9
Characteristic Radiation, Bremsstrahlung Radiation, X-ray Emission Spectrum, Properties of X-ray, X-ray quality, X-ray quantity, Half value layer. Interaction of x-ray with matter- Coherent scattering, Compton effect, Photoelectric effect, Pair Production, Photodisintegration, Differential absorption.		
<b>Unit III</b>	<b>The Recording System</b>	10
X-ray film construction, Emulsion, Formation of latent image, Types of film, Handling and storage of film, Construction of Intensifying screen, Luminescence, screen characteristics, Cassette construction and types, silver recovery, Film artifacts		
<b>Unit IV</b>	<b>Processing of Latent image</b>	10
Manual Processing, Automatic processing, Processing sequence, wetting, developing, fixing, washing, Drying, Processing area (Dark room) Characteristic curve, Optical density, Geometry of Radiographic image- magnification, distortion, focal spot, Blur, Subject factors.		
<b>Unit V</b>	<b>Fluoroscopy</b>	9
Introduction to fluoroscopy, Techniques of fluoroscopy, Image Intensifier, Flux Gain, Brightness gain, Minification gain, Multifield image intensifier, Cathode ray tube.		
<b>Textbooks</b>	<ol style="list-style-type: none"> <li>1. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams &amp; Wilkins; 2012 Mar 20.</li> <li>2. Curry TS, Dowdey JE, Murray RC. Introduction to the physics of diagnostic radiology.</li> <li>3. Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. 4. Grainger &amp; Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences.</li> </ol>	
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. D N and M O Chesney- X ray equipments for student radiographers- Third edition</li> <li>2. Burgener FA, Korman M. Differential diagnosis in conventional radiology.</li> </ol>	



Avg	3	3	3	3	2.4	3	2.4	3	3	3	3	3	2.2	2
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<b>RD3303</b>	<b>Title: Basics of USG and Mammography</b>	<b>L T P C 4 0 0 4</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The objective is to learn basic knowledge on ultrasound and Doppler equipments for various imaging and equipments used for breast imaging and mammography techniques.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Introduction to Ultrasound Imaging</b>	9
Sound, Ultrasound, Attenuation, Echoes, Basic principle of Ultrasound imaging, Advantages and disadvantages		
<b>Unit II</b>	<b>Instrumentation of Ultrasonography</b>	10
Controls of Ultrasound Equipment, USG probes, Coupling agent, Cathode ray tube, Image Display, USG contrast agent. Piezoelectric Effect- Definition, Types of elements, Properties. Transducers: Construction and operation, Types of transducers		
<b>Unit III</b>	<b>USG Display mode</b>	10
USG Display modes: A mode, B mode, M mode, TM mode. Gray scale imaging Beam focusing, Resolution		
<b>Unit IV</b>	<b>Doppler USG</b>	9
Principle, Doppler effect, Color Doppler, Continuous wave Doppler, Pulsed wave Doppler. USG Bio effects, safety. Mammography- Mammography Equipments and Basic views in Mammography		
<b>Unit V</b>	<b>Clinical Practice</b>	10
Scanning protocol, Indication, Patient preparation, image quality and artifacts in Ultrasound and Mammography,		

<b>Text Books</b>	1. Zwiebel WJ, Sohaey R. Introduction to ultrasound. WB Saunders Company; 1998. 2. Hagen-Ansert SL. Textbook of diagnostic Ultrasonography. Mosby Elsevier; 2006. 3. Basics of Ultrasonography for Radiographers and Technologists- Latest edition
<b>Reference Books</b>	1. Tucker AK, Ng YY. Textbook of mammography. Churchill Livingstone; 2001. 2. Wentz G, Parsons WC. Mammography for radiologic technologists. McGraw-Hill, Health Professions Division; 1997.
<b>Mode of Evaluation</b>	Internal and External Examinations
<b>Recommendation by Board of Studies on</b>	27-07-2020
<b>Date of approval by the Academic Council</b>	13-09-2020

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#### Course Outcome for RD3303

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn about Basic principle of Ultrasound imaging	2	Emp
<b>CO2</b>	Students will be able to learn about Instrumentation of Ultrasonography	3	Emp
<b>CO3</b>	Students will be able to learn about USG Display modes: A mode, B mode, M mode	2	Emp
<b>CO4</b>	Students will be able to learn about Doppler USG and Mammography techniques	3	Emp
<b>CO5</b>	Students will be able to Know about Clinical Practice of Ultrasonography	2	Emp

#### CO-PO Mapping for RD3303

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped 3, Moderate- 2, Low-1, Not related-0))	Program Specific Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PSO 1	PSO2	PSO3
CO 1	3	2	1	3	1	1	1	1	3	3	2	3	2	2
CO 2	3	2	2	3	1	1	1	1	3	1	2	3	2	3
CO 3	3	3	2	3	1	1	1	1	3	1	2	3	2	3
CO 4	3	3	3	2	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	1	3	3	3	3	3	3	3	3
Avg	3	2.6	2.2	3	2	1.4	1.8	1.8	3	2.2	2.4	3	2.4	2.8

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<b>RD3304</b>	<b>Title: Special Radiographic Procedure</b>	<b>L T P C 3 0 0 3</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The objective is to learn contrast imaging techniques under the guidance of fluoroscopy, administration of contrast media and its safety aspect.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Introduction to Radiographic Special Procedures</b>	8
Contrast Media- Application, types, safety aspects & administration, Reaction to contrast media and management of contrast reactions.		
<b>Unit II</b>	<b>Ba Studies</b>	7
Barium swallow, Barium meal, Barium meal follow through (BMFT) Barium enema, Enteroclysis.		
<b>Unit III</b>	<b>Routine Special Examinations</b>	7
Intravenous urogram (IVU), Micturating Cystourethrogram (MCU), Ascending Urethrogram (ASU)/ RGU, Hysterosalpingography (HSG)		
<b>Unit IV</b>	<b>Spine and Hepatobiliary Exams</b>	7

Myelography ERCP/ PTBD, PTC, T – tube cholangiography		
<b>Unit V</b>	<b>FNAC</b>	7
Sialography, Dacrocystography, Sinogram, Fistulogram, FNAC, Biopsy		
<b>Text Books</b>	1. Curry TS, Dowdey JE, Murry RC. Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins; 1990. 2. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams & Wilkins; 2012 Mar 20. 3. Curry TS, Dowdey JE, Murray RC. Introduction to the physics of diagnostic radiology.	
<b>Reference Books</b>	1. Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger & Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences. 2.D N and M O Chesney- X ray equipments for student radiographers- Third edition 3. Burgener FA, Korman M. Differential diagnosis in conventional radiology.	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

**Course Outcome for RD3304**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn about Special radiographic Procedures	2	Emp
<b>CO2</b>	Students will be able to Know about barium studies	3	Emp
<b>CO3</b>	Students will Examinations be able to learn about Routine Special	2	Emp



<b>CO4</b>	Students will be able to learn about Spine and Hepatobiliary Exams	3	Emp
<b>CO5</b>	Students will be able to learn about Sialography, Dacrocystography, Sinogram, Fistulogram, FNAC, Biopsy	2	Emp

#### CO-PO Mapping for RD3304

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PS O2	PSO3
CO 1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	2	3	3	2	3	3	2	2
CO 3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO 4	3	3	3	2	3	3	2	3	3	2	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	3	3	3	3	3	3	2.2	3	3	2.6	3	3	2.8	2.8

<b>RD3306</b>	<b>Title: Orientation in Para Clinical Sciences</b>	<b>L T P C 4 0 0 4</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The objective isto learn Parasitology, Microbiology, Pharmacokinetics of Drugs and Virology	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Parasitology</b>	10
EntamoebaHistolytica, Leishmania, Material Parasites of man, Helminthology, TaeniaSaginata, TaeniaSoleum, Echinococcusgranulosus, AscarisLumbricoides, Ancylostomaduodenale, Strongylidsstercoralis		

<b>Unit II</b>	<b>Microbiology</b>	10
Morphology & Physiology of Bacteria, Staphylococcus, Streptococcus, Mycobacterium tuberculosis, Spirochetes, Corynebacterium Diphtheria		
<b>Unit III</b>	<b>Virus</b>	10
General Properties of Virus, Herpes virus, Poliovirus, Hepatitis virus, Oncogenic virus, HIV		
<b>Unit IV</b>	<b>Pathology</b>	10
Inflammation, Neoplasia, Osteomyelitis, Fractures, Osteoporosis, Rickets, Osteomalacia, Tumors of Bone, Rheumatoid Arthritis, Gout, Osteoarthritis		
<b>Unit V</b>	<b>Pharmacology</b>	8
Pharmacokinetics of Drugs (Absorption, Distribution, Metabolism, Excretion), Adverse drug reactions, Management and Pharmacology of different dyes used in Radiological procedures		
<b>Text Books</b>	<i>1. Harsh Mohan Pathologic Basis &amp; Diseases Todd &amp; Sanford, Clinical Diagnosis by Laboratory Method</i> <i>2. RamanikSood, Laboratory Technology Methods and Interpretation</i>	
<b>Reference Books</b>	<i>1. Rabbins&amp;Cotran, Pathologic Basis &amp; Diseases</i> <i>2. Harsh Mohan, Pathologic Basis &amp; Diseases</i> <i>3. Todd &amp; Sanford, Clinical Diagnosis by Laboratory Method</i> <i>4. RamanikSood, Laboratory Technology Methods and Interpretation</i> <i>5. Anand Narayan and Panikar, Textbook of Microbiology</i> <i>6. Baweja, Medical Microbiology</i> <i>7. Arora, Medical Lab Technology</i>	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

**Course Outcome for RD3306**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to know about Parasitology	1	Emp

<b>CO2</b>	Students will be able to learn about Morphology & Physiology of Bacteria	2	Emp
<b>CO3</b>	Students will be able to learn about General Properties of Virus, Herpes virus	1	Emp
<b>CO4</b>	Students will be able to learn about Inflammation, Neoplasia, Osteomyelitis, Fractures	2	Emp
<b>CO5</b>	Students will be able to learn about Pharmacokinetics of Drugs	3	Emp

### CO-PO Mapping for RD3306

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped 3, Moderate- 2, Low-1, Not related-0))										Program Specific Outcomes			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O 1	PS O2	PSO3
CO 1	1	0	1	3	1	1	1	0	1	1	2	1	1	1
CO 2	2	0	2	3	1	1	1	0	1	1	2	2	1	1
CO 3	2	1	3	3	1	1	1	3	3	3	3	2	1	2
CO 4	3	3	3	3	3	1	2	3	2	3	3	3	2	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	2.2	1.4	2.4	3	1.8	1.4	1.6	1.8	2	2.2	2.6	2	2	2

<b>RD 3341</b>	<b>Title: Special Radiographic Procedure Lab</b>	<b>L T P C 0 0 2 1</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The objective is to learn contrast imaging techniques under the guidance of fluoroscopy, administration of contrast media and its safety aspect	
<b>List of Experiments</b>		

1. Radiography of Special radiological procedures, using contrast media as per syllabus. 2. Positioning, Patient preparation, assistance while performing procedures.	
<b>Mode of Evaluation</b>	Internal and External Examinations
<b>Recommendation by Board of Studies on</b>	27-07-2020
<b>Date of approval by the Academic Council</b>	13-09-2020

### Course Outcome for RD3341

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to perform all special radiographic procedures done with using contrast media.	2	Emp
<b>CO2</b>	Students will be able to learn about Barium procedures with its pros. and cons.	1	Emp
<b>CO3</b>	Students will be able to perform all routine radiographic procedures related to its clinical diagnosis.	2	Emp
<b>CO4</b>	Students will be able to perform all spine and hepatobiliary procedures related to its clinical diagnosis.	3	Emp
<b>CO5</b>	Students will be able to learn about FNAC procedures with its clinical pathology.	2	Emp

### CO-PO Mapping for RD3341

<b>Course Outcomes</b>	<b>Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))</b>	<b>Program Specific Outcomes</b>

	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PSO 1	PSO2	PSO3
CO 1	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	2	3	3	2	3	3	2	2
CO 3	3	3	3	3	3	3	2	3	3	3	3	3	3	3
CO 4	3	3	3	2	3	3	2	3	3	2	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	3	3	3	3	3	3	2.2	3	3	2.6	3	3	2.8	2.8

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<b>RD3342</b>	<b>Title: Radiographic Positioning II Lab</b>	<b>L T P C</b> <b>0 0 2 1</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The objective is to learn radiographic positionings of various x-rays done in radiology department.	
<b>List of Experiments</b>		
<p>1. Upper &amp; Lower Extremities Hand, Forearm, Arm, Thigh, Leg, Foot</p> <p>2. Shoulder Joints Basic &amp; special projection, Related radiological Pathology, Basic &amp; special positioning</p> <p>3. Pelvis Girdle Basic &amp; special projection, Related radiological Pathology, Basic &amp; special positioning</p> <p>4. Whole Spine Positioning Cervical spine, Thoracic spine, Lumbar spine, sacrum and coccyx</p> <p>5. Pediatric Radiography Special Positioning Views for all the X-Rays.</p>		
<b>Mode of Evaluation</b>	Internal and External Examinations	



CO 5	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Avg	3	3	3	3	3	3	1.8	3	3	2.8	3	3	3	3

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<b>RD3401</b>	<b>Title: Conventional Radiographic Technique II</b>	<b>L T P C 4 0 0 4</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The main objective is too aware the student about the conventional technique of radio imaging technique like (manual image processing & fluoroscopy / dynamic imaging) along with the image formation, developing and reading.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Portable &amp; Mobile equipments</b>	10
Portable X-Ray Equipments, Mainsrequirements, Cable connections to wall plugs, Mobile X-Ray Equipments, X-Ray Equipments for the Operating Theatre, Direct & indirect Radiography		
<b>Unit II</b>	<b>Fluoroscopy Equipment</b>	10
Construction & Working principles of Image Intensifier, Direct Fluoroscopy, Viewing the Intensified image, Recording the intensified Image, Digital fluoroscopy		
<b>Unit III</b>	<b>Fluoroscopic / Radiographic Tables</b>	10
General features of fluoroscopic / radiographic table, The serial changer, Remote control table, The spot film devices		
<b>Unit IV</b>	<b>Tomography Equipment</b>	8
Principles of tomography, Various types of tomographic movement, Equipment for tomography		
<b>Unit V</b>	<b>Equipment for Cranial and Dental Radiography</b>	10
The skull table, General Dental X-ray equipment, Pan tomography equipment, Equipment for Cranial & skeletal radiography		

<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. Curry TS, Dowdey JE, Murry RC. Christensen's physics of diagnostic radiology. Lippincott Williams &amp; Wilkins; 1990.</li> <li>2. Brant WE, Helms CA, editors. Fundamentals of diagnostic radiology. Lippincott Williams &amp; Wilkins; 2012 Mar 20.</li> <li>3. Curry TS, Dowdey JE, Murray RC. Introduction to the physics of diagnostic radiology.</li> </ol>
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Adam A, Dixon AK, Gillard JH, Schaefer-Prokop C, Grainger RG, Allison DJ. Grainger &amp; Allison's Diagnostic Radiology E-Book. Elsevier Health Sciences.</li> <li>2. D N and M O Chesney- X ray equipments for student radiographers- Third edition</li> <li>3. Burgener FA, Korman M. Differential diagnosis in conventional radiology.</li> </ol>
<b>Mode of Evaluation</b>	Internal and External Examinations
<b>Recommendation by Board of Studies on</b>	27-07-2020
<b>Date of approval by the Academic Council</b>	13-09-2020

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#### Course Outcome for RD3401

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn about Portable & Mobile equipments	2	Emp
<b>CO2</b>	Students will be able to Understand about the Fluoroscopy Equipment	3	Emp
<b>CO3</b>	Students will be able to Understand about General features of fluoroscopic / radiographic table	2	Emp
<b>CO4</b>	Students will be able to Learn about the Principles of tomography	1	Emp
<b>CO5</b>	Students will be able to learn about Equipment for Cranial and Dental radiography	2	Emp

#### CO-PO Mapping for RD3401

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0)	Program Specific Outcomes
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	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11											PSO3		
CO 1	3	3	3	3	2	3	3	3	1	2	3	3	2	3
CO 2	3	3	3	3	2	3	3	3	3	2	3	3	2	3
CO 3	3	3	3	3	1	3	1	3	1	2	3	3	2	3
CO 4	3	3	3	3	2	3	3	3	3	2	1	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	2	2	3	3	3
Avg	3	3	3	3	2	3	2.6	3	2.2	2	2.4	3	2.5	3

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<b>RD3402</b>	<b>Title: Computed Tomography</b>	<b>L T P C 4 0 0 4</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The objective is to induce idea on cross sectional imaging of different anatomical area along with the pathology	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Introduction to CT</b>	12
Introduction to Computed Tomography and Principle of Computed Tomography History, Advantage and Disadvantages of CT, Basic principle of CT Generations of Computed Tomography- 1st generation, 2nd generation, 3rd generation, Slip ring technology, 4th generation, Electron beam CT, Dual Source CT, Flat Panel Detector CT Single and Multi-slice Technology		
<b>Unit II</b>	<b>Instrumentation of CT</b>	10
Instrumentation-CT scanner gantry, Detectors & Data Acquisition System, Generator, Computer and image processing System Image display system, storage, recording and communication system, CT control console, Options and accessories for CT systems.		
<b>Unit III</b>	<b>CT Image</b>	10

Image Reconstruction- Basic principle, Reconstruction algorithms, Image reconstruction from projections, Types of data reconstruction Image Display and Image Quality Image formation and representation, Image processing, Pixel and voxel, CT number Window level and window width, Qualities, Resolution, Contrast, Sharpness, Noise properties in CT		
<b>Unit IV</b>	<b>Artefacts</b>	6
CT Artefacts- Classification, Types, Causes, Remedies		
<b>Unit V</b>	<b>Post processing</b>	10
Diagnostic aspects of CT and post Processing Techniques HRCT, Isotropic imaging, Patient management, Patient preparation, positioning, Technologist role, Protocols for whole body imaging Clinical applications of CT, 2D & 3D imaging, MPR, SSD, Volume Rendering, BMD.		
<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. Seeram E. Computed Tomography-E-Book: Physical Principles, Clinical Applications and Quality Control. Elsevier Health Sciences</li> <li>2. Seeram E. Computed tomography: physical principles and recent technical advances. Journal of Medical Imaging and Radiation Sciences</li> <li>3. Kak AC, Slaney M. Principles of computerized tomography imaging. Society for Industrial and Applied Mathematics</li> </ol>	
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Hsieh J. Computed tomography: principles, design, artifacts, and recent advances. SPIE press;</li> <li>2. Shaw CC, editor. Cone beam computed tomography. Taylor &amp; Francis;</li> </ol>	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

**Course Outcome for RD3402**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn about Principle of Computed Tomography	1	Emp
<b>CO2</b>	Students will be able to learn about Instrumentation of CT	2	Emp

<b>CO3</b>	Students will be able to learn about CT Image Reconstruction Processes	2	Emp
<b>CO4</b>	Students will be able to learn about CT Artefacts Classification, Types, Causes, Remedies	1	Emp
<b>CO5</b>	Students will be able to learn about Diagnostic aspects of CT and post Processing Techniques	3	Emp

#### CO-PO Mapping for RD3402

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO3
CO 1	3	3	3	3	1	3	1	3	3	1	3	3	2	1
CO 2	3	1	3	3	2	3	1	2	3	3	3	3	2	3
CO 3	3	3	3	3	2	3	2	2	3	1	3	3	3	3
CO 4	3	3	3	3	2	3	2	2	3	1	3	3	3	3
CO 5	3	3	3	3	3	3	3	2	3	1	3	3	3	3
Avg	<b>3</b>	<b>2.6</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1.8</b>	<b>2.2</b>	<b>3</b>	<b>1.4</b>	<b>3</b>	<b>3</b>	<b>2.6</b>	<b>2.6</b>

<b>RD3403</b>	<b>Title: Equipment of Radiotherapy</b>	<b>L T P C 4 0 0 4</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The objective is to learn aim, objective, philosophy and principle of Radiotherapy and Radiation safety during radioisotope therapy.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit I</b>	<b>Introduction to Orthovoltage equipment</b>	10

Orthovoltage equipment with special reference to physical design equipment of tube and its accessories and interlocks, gamma ray sources used radiotherapy especially cobalt 60 source its construction and source housing and handling mechanism.		
<b>Unit II</b>	<b>Isocentric Tele-isotope Machines and Simulators</b>	10
Principles of Isocentric Tele-isotope machines, megavoltage x-ray and electron beam accelerators and Beta tron. Principles of simulators and vacuum forming machines for making casts.		
<b>Unit III</b>	<b>Components of Linear Accelerator</b>	10
Salient features of components of Linear Accelerator like tube design, wave guide, target design, beam bending system.		
<b>Unit IV</b>	<b>Radiofrequency generators and Stereotaxic</b>	8
Radio-frequency generators like magnetron and klystron. Stereotaxic template cutting system introduction to radio-surgery.		
<b>Unit V</b>	<b>Principle of remote after loading- system</b>	10
Basic principle of remote after-loading system/machines and sources used. Equipment and dosimetry equipment.		
<b>Text Books</b>	<ol style="list-style-type: none"> <li>1. Sherer MA, Visconti PJ, Ritenour ER, Haynes K. Radiation Protection in Medical Radiography-E-Book. Elsevier Health Sciences</li> <li>2. Brandon AN, Hill DR. Selected list of books and journals in allied health. Bulletin of the Medical Library Association.</li> <li>3. Long BW, Frank ED, Ehrlich RA. Radiography Essentials for Limited Practice-E-Book. Elsevier Health Sciences;</li> </ol>	
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Krishan, Step by Step Management of Chemo and Radiotherapy</li> <li>2. Lele, Principle and Practice of Nuclear Medicine and Correlative Medical Imaging</li> <li>3. Faiz M Khan, Textbook of Radiotherapy</li> </ol>	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	
<b>Date of approval by the Academic Council</b>	13-09-2020	

Unit wise Course Outcome	Descriptions	BL Level	Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)
<b>CO1</b>	Students will be able to learn about Introduction to Orthovoltage equipment	1	Emp
<b>CO2</b>	Students will be able to know about principles of Isocentric Tele-isotope machines	3	Emp
<b>CO3</b>	Students will be able to learn about Salient features of components of Linear Accelerator	2	Emp
<b>CO4</b>	Students will be able to learn about Radio-frequency generators like magnetron and klystron	3	Emp
<b>CO5</b>	Students will be able to learn about Basic principle of remote after-loading system/machines	2	Emp

### CO-PO Mapping for RD3403

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PS O1	PS O2	PSO3
CO 1	3	3	2	2	1	1	1	2	2	1	2	1	3	2
CO 2	2	2	1	1	2	2	2	1	2	2	1	3	2	1
CO 3	3	1	3	2	1	1	1	2	1	1	3	1	1	2
CO 4	1	3	2	1	3	3	3	1	2	1	1	1	2	1
CO 5	3	2	1	2	1	1	2	3	1	3	2	2	1	3
Avg	<b>2.4</b>	<b>2.2</b>	<b>1.8</b>	<b>1.6</b>	<b>1.6</b>	<b>1.6</b>	<b>1.8</b>	<b>1.8</b>	<b>1.6</b>	<b>1.6</b>	<b>1.8</b>	<b>1.6</b>	<b>1.8</b>	<b>1.8</b>

<b>RD3404</b>	<b>Title: Magnetic Resonance Imaging</b>	<b>L T P C 4 0 0 4</b>
<b>Version No.</b>	<b>1.0</b>	

<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The objective is to induce idea on cross sectional imaging of different anatomical area along with the different pathologies related to musculoskeletal, soft tissue Imaging.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>	<b>Introduction and Basic Principle of Magnetic Resonance Imaging</b>	10
History of MRI, Electricity & Magnetism, Laws of magnetism, atomic structure, Motion within the atom, The Hydrogen nucleus, Precession, Larmor equation, Resonance, MR signal, Free induction decay signal, Relaxation, T1 recovery, T2 decay, Pulse timing& parameters.		
<b>Unit II</b>	<b>MRI Hardware</b>	10
Introduction, Permanent magnets, Electromagnets, Super conducting magnets, Fringe fields, Shim coils, Gradient coils, Radio-frequency coils, the pulse control units, Patient transportation system, Operator interface, Encoding, Data collection & Image formation Introduction, Gradients, Slice selection, Frequency encoding, Phase encoding, Scan timing, Sampling, data space, k-space, k-space filling and fast Fourier transformation.		
<b>Unit III</b>	<b>Pulse sequences</b>	10
Introduction To basic pulse sequences., Spin echo sequences, Conventional spin echo, Fast spin echo Inversion recovery, STIR, FLAIR, Proton Density Imaging, Gradient echo pulse sequences Conventional gradient echo, The study state, SSFP, Coherent residual transverse magnetization, Incoherent residual transverse magnetization, Ultra- fast imaging, Advanced imaging techniques, EPI. MRI parameters & Tradeoffs-Introduction, Signal to Noise Ratio (SNR) & how to increase SNR, Contrast to Noise Ratio (CNR), Spatial resolution & how to increase the spatial resolution, Scan time & how to reduce time, Tradeoffs, Decision making, Volume imaging.		
<b>Unit IV</b>	<b>MRI Artefacts</b>	8
Introduction, Phase miss-mapping, Aliasing or wrap around, Chemical shift artifact, Chemical misregistration, Truncation artefact/Gibbs phenomenon, Motion of the patient Magnetic susceptibility artefact, Magic angle artefact, Zipper artifact, shading artefact Cross excitation and cross talk. MRI contrast agent		
<b>Unit V</b>	<b>Flow Phenomena &amp; MRI angiography</b>	10
Introduction, The mechanisms of flow, Time of flight phenomenon, Entry slice phenomenon, IntravoxelDephasing. Flow phenomena compensation-Gradient moment rephrasing, Presaturation, Even echo rephrasing, MRI Angiography.		
<b>Text Books</b>	1 Westbrook, Catherine. <i>Handbook of MRI technique</i> . John Wiley & Sons 2. Möller, Torsten B., and Emil Reif. <i>MRI parameters and positioning</i> . Thieme,	
<b>Reference Books</b>	1. Möller, Torsten B., and Emil Reif. <i>MRI parameters and positioning</i> . Thieme, 2. Dale BM, Brown MA, Semelka RC. MRI: basic principles and applications. John Wiley & Sons;	
<b>Mode of Evaluation</b>	Internal and External Examinations	
<b>Recommendation by Board of Studies on</b>	27-07-2020	

<b>Date of approval by the Academic Council</b>	13-09-2020
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**Course Outcome for RD3404**

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn about Basic Principle of Magnetic Resonance Imaging	1	Emp
<b>CO2</b>	Students will be able to learn about the MRI Hardware	2	Emp
<b>CO3</b>	Students will be able to learn about Pulse sequences used in MRI	3	Emp
<b>CO4</b>	Students will be able to learn about MRI Artifacts	2	Emp
<b>CO5</b>	Students will be able to learn about Flow Phenomena & MRI angiography	1	Emp

**CO-PO Mapping for RD3404**

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO3
CO 1	3	2	2	1	1	2	1	1	3	2	3	3	2	3
CO 2	2	3	3	3	1	1	3	3	1	1	2	1	2	1
CO 3	3	2	1	2	3	3	1	2	3	3	3	3	3	3
CO 4	1	3	3	3	2	2	2	3	2	1	1	2	2	2
CO 5	3	1	2	1	3	3	1	2	3	2	3	3	3	3
Avg	<b>2.4</b>	<b>2.2</b>	<b>2.2</b>	<b>2</b>	<b>2</b>	<b>2.2</b>	<b>1.6</b>	<b>2.2</b>	<b>2.4</b>	<b>1.8</b>	<b>2.4</b>	<b>2.4</b>	<b>2.4</b>	<b>2.4</b>

<b>RD3406</b>	<b>Title: Orientation in Clinical Sciences</b>	<b>L T P C</b> <b>4 0 0 4</b>
<b>Version No.</b>	<b>1.0</b>	
<b>Course Prerequisites</b>	NIL	
<b>Objectives</b>	The objective is to learn basic pathological conditions related to cardiology, surgery, nephrology, orthopedic, gastrology, neurology and general medicine for the diagnosis.	
<b>Unit No.</b>		<b>No. of hours (per Unit)</b>
<b>Unit: I</b>		10
Pericarditis, Valvular diseases, Rheumatic Heart Disease Heart failure, Bronchitis, Emphysema Bronchitis, Pneumonia, Tuberculosis, Pleura effusion, Pneumothorax		
<b>Unit II</b>		8
Aclasia cardia, Peptic ulcer, Intestinal obstruction, Crohn's disease, Ulcerative colitis, Pancreatitis, Portal Hypertension, Ascites, Cirrhosis, Cholecystitis, Melena, Appendicitis		
<b>Unit III</b>		10
Hematuria, UTI, Hydronephrosis Horse shoe Kidney, Hydrocele, Glomerulo nephritis, Nephrotic Syndrome Urinary calculi, Polycystic Kidney disease, Renal failure		
<b>Unit IV</b>		12
Fracture, Type Mechanism, Healing, Delayed Union, Non- complication Injuries of the shoulder girdle, Dislocation of shoulder, Injuries of the carpal Dislocation of Hip, Femur, Tibia, Ankle, calcaneum, Acute & chronic osteo arthritis Rheumatoid arthritis, Paget's Disease, Ankylosing spondylitis Club foot, Bone Tumors-Benign Malignant, Perthes diseases		
<b>Unit V</b>		8
Cholelithiasis, Peritonitis, Suprahrenic Abscess, Appendicitis, Benign Hypertrophy prostate		
<b>Textbooks</b>	1. Kumar V, Abbas AK, Fausto N, Aster JC. Robbins and Cotran Pathologic Basis of Disease, Professional Edition E-Book. Elsevier Health Sciences 2. Mohan H. Textbook of pathology. New Delhi: Jaypee brothers' medical publishers	
<b>Reference Books</b>	1. Boyd W. A Textbook of Pathology: An Introduction to Medicine. Academic Medicine. 2. Davidson I, Henry JB, Todd JC. Todd-Sanford clinical diagnosis by laboratory methods.	



<b>Mode of Evaluation</b>	Internal and External Examinations
<b>Recommendation by Board of Studies on</b>	27-07-2020
<b>Date of approval by the Academic Council</b>	13-09-2020

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#### Course Outcome for RD3406

<b>Unit wise Course Outcome</b>	<b>Descriptions</b>	<b>BL Level</b>	<b>Employability (Emp)/ Skill(S)/ Entrepreneurship (Ent)/ None (Use, for more than one)</b>
<b>CO1</b>	Students will be able to learn about heart diseases	2	Emp
<b>CO2</b>	Students will be able to know about Intestinal obstruction, Crohn's disease, Ulcerative colitis	2	Emp
<b>CO3</b>	Students will be able to learn about urinary tract diseases	3	Emp
<b>CO4</b>	Students will be able to learn about Fracture types, Paget's Disease, Bone Tumor-Benign Malignant	2	Emp
<b>CO5</b>	Students will be able to learn about Cholelithiasis, Peritonitis, Appendicitis	3	Emp

#### CO-PO Mapping for RD3406

Course Outcomes	Program Outcomes (Course Articulation Matrix (Highly Mapped- 3, Moderate- 2, Low-1, Not related-0))											Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO3
CO 1	2	2	2	3	2	3	2	3	3	1	3	3	3	2
CO 2	3	2	2	3	2	3	2	3	3	2	3	3	3	2
CO 3	3	2	3	3	2	3	2	3	3	2	3	3	3	2
CO 4	3	3	3	3	2	3	2	3	3	1	3	3	3	3

CO 5	3	3	3	3	2	3	2	3	2	2	3	3	3	2
Avg	<b>2.8</b>	<b>2.4</b>	<b>2.6</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2.2</b>