STUDY & EVALUATION SCHEME OF

BACHELOR OF SCIENCE

IN

RADIOLOGICAL IMAGING TECHNIQUES

(B.Sc. RIT)

[APPLICABLE W.E.F. ACADEMIC SESSION - 2019-20 TILL REVISED]

[As per CHOICE BASED CREDIT SYSTEM (CBCS) guidelines given by UGC]

TEERTHANKER MAHAVEER UNIVERSITY
COLLEGE OF PARAMEDICAL SCIENCES

Delhi Road, Moradabad, Uttar Pradesh-244001

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TEERTHANKER MAHAVEER UNIVERSITY

(Established Under Govt. of U.P. Act No.30, 2008) Delhi Road, Moradabad (U.P)

Study & Evaluation Scheme of

Bachelor of Science in Radiological Imaging Techniques

Institute Name	Teerthanker Mahaveer University College of Paramedical Sciences
Programme	Bachelor of Science in Radiological Imaging Techniques
Duration	Three year (06 Semester) Full time and Six Months Internship.
Medium	English
Minimum Attendance Required	75%
Total credits	156

PROGRAMME OUTCOMES: (POs)

Oncompletion of the programme, the students will be

PO1.	Understanding ways of functioning effectively as an individual independently and as a member in diverse team in multidisciplinary settings. **(Attitude)**
PO2.	Understanding requirements of continuous education as a function of growth and maintenance of professional competence. **(Lifelong learning**)
PO3	Understanding environmental consciousness and societal concerns in achieving sustainable development.(**Environment and Sustainability)**
PO4.	Applying computer skills in health care system and taking entrepreneurial decisions.(**Entrepreneurship)**
PO5.	Applying knowledge to assess societal, health, safety and legal issues related to professional practice. **(Social interaction & effective citizenship)**
PO6.	Applying systematized problem solving techniques to identify and correct procedural errors to verify the accuracy of laboratoryresult obtained.(**Problem analysis and solving)**
PO7.	Applying appropriate techniques, resources and tools with an understanding of limitations. **(Technology savvy/usage)**
PO8.	Developing the ability towards ethical as well as critical thinking. **(Critical thinking)**
PO9.	Executing professional conduct and interpersonal communicational skills effectively with societyat large. **(Communication)**

Assessment:

	Internal	External	Total
Theory	40	60	100
Practical	50	50	100

Internal Evaluation (Theory papers):

Class Test-I	Class Test-II	Class Test-III	Attendance	Assignment /work book assignments &viva	Total
Best Two out of Three CTs					
10	10	10	10	10	40
	Duration of Examination		**External**	**Internal**	
			3 Hours	1.5 Hours	

To qualify the course a student is required to secure a minimum of 45% marks in aggregate including the semester examination and teacher's continuous evaluation. (i.e. both internal and external). A candidate who secures less than 45% of marks in a course shall be deemed to have failed in that course. The student should have minimum CPI 50 in aggregate to clear the program. The student must have qualified all the semester exam along with supplementary for the commencement of internship.

Internal Practical Evaluation (50 marks)

The internal evaluation would also be done by the Internal Examiner based on the experiment performed during the internal examination.

During Semester				On the day of Examination	
Experiment	**File Work**	**Viva Voce**	**Attendance**	**Experiment**	**Viva Voce**
5 Marks	**10 Marks**	**10 Marks**	**10 Marks**	**5 Marks**	**10 Marks**

External Practical Evaluation (50 marks)

The external evaluation would also be done by the External Examiner based on the experiment performed during the external examination.

Experiment	File Work	Viva Voce	Total Experiment
30 Marks	**10Marks**	**10 Marks**	**50 Marks**

Question Paper Structure

Question paper shall have two sections and examiner shall set questions specific to respective section. Section wise details shall be as mentioned under;

Section 1.	The question paper shall consist of six questions, out of which first question shall be of short answer type **(not exceeding 50 words)** and will be compulsory. Question no. 2 to 6 (from Unit-I to V) shall have explanatory answers (approximately 350 to 400 words) along with having an internal choice within each unit.
Section 2.	Question No. 1 shall contain 8 parts from all units of the syllabus with at least one question from each unit and students shall have to answer any five, each part will carry 2 marks.
Section 3.	The remaining five questions shall have internal choice within each unit; each question will carry 10 marks.
	IMPORTANT NOTES
Note- 1:	*There must be at least one question from the entire syllabus to assess the specific element of the Higher Level of Learning (Thinking). Every question in this section must essentially assess at least one of the following aspects of learning: Applying, Analyzing, Evaluating and Creating/ Designing/ Developing.*
Note- 2:	*The question must be designed in such a way that it assesses the concerned Course outcomes (COs) in entirety. It means a question could have multiple parts depending upon the requirement of the specific Course Outcome.*
Note- 3:	*Strictly avoid repetition of questions. Also Assure that there is at least one question assessing every Course Outcome (COs). The copies of COs of this course & syllabus is attached for your reference*

- **Admission to the Next Semester:** As per the university norms

English Evaluation Scheme for I-IV Semester

INTERNAL			EXTERNAL		TOTAL
40 Marks			60Marks		
20Marks	**10 Marks**	**10 Marks**	**40 Marks**	**20 Marks**	
(Best two out of three CTs)	(Oral Assignment)	Attendance	External Written Examination	External Viva	**100**

*Parameters of External Viva for First Semester

Content	Body Language	Confidence	Question Responsiveness	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	**20 Marks**

*Parameters of External Viva for Second,Third & Fourth Semester

Content	Body Language	Communication Skills	Confidence	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	**20 Marks**

- ***Note: External Viva will be conducted by 2-member committee comprising***

  - *One Faculty teaching the class*
  - *Oneexaminer nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marksobtained bythe students.

Programme Structure

INTRODUCTION

High-quality Paramedical education is essential for the digital age and using technology is powerful way to enhance changing requirements of the dynamic and improved medical field profession. Bachelor of Science in Radiological Imaging Techniques (Radiology/CT/MRI/X-Ray/Mammography) is a 3.5 years undergraduate programme meticulously structured to impart in-depth advance knowledge of Imaging methodologies and principles. The curriculum has been designed to meet the growing needs of professionals in the field of clinical radiography, radiation safety, image processing technology, imaging modalities, etc. The programme prepares students to work collaboratively, evaluate data, interpret results, think vitally, draw logical conclusions and make composite decisions. The curriculum of the programme gives students the opportunities to devise plausible solutions to real-life situations in an active healthcare environment. The programme broadly emphasizes the following key areas Human Anatomy, Human Physiology, Radiation Physics, Pathology, Radio Diagnosis, Medical Microbiology, Medical Biochemistry, Specialised Diagnostic Techniques, Radiological Technology. Bachelor of Science in Radiological Imaging Techniques students should be equipped to work across time zones, languages, and cultures. Employability, innovation, theory to practice connectedness to the professional staff is the central focus of Bachelor of Science in Radiological Imaging Techniques curriculum. The curriculum is designed as such that the students can gain an in-depth mastery of the academic disciplines and applied functional areas necessary to meet the requirements of academic and hospital administration.

College of Paramedical Sciences emphasis on the following courses ***balanced with core, discipline specific and elective courses****:* The curriculum of Bachelor of Science in Radiological Imaging Techniques program emphasizes an intensive, flexible education with 110 credits for theory and 41 credits of practical & clinical posting programme and 4 credits for online MOOC course. Total 155 credits are assigned for the B.Sc. RIT degree.

The programme structure and credits for Bachelor of Science in Radiological Imaging Techniques are finalized based on the stake holder's requirements and general structure of the programme. Out of 155 credits of classroom contact teaching, 24 credits are to be allotted for core courses(CC), 16 credits are allotted to ability enhancement courses (AECC), 43 credits are allotted to skill enhancement courses (SEC), 2 credits are allotted to open elective courses (OEC), 3 credits are allotted to compulsory specifies course (CSC), 3 credits are allotted to discipline specific elective courses (DSEC), 60 credits are allotted to Discipline specific (DSC) and rest of 4 credits for MOOC courses.

Internship Time Period

Internship for qualifying B.Sc. RIT programme will be of six months. Minimum 720 hours of internship should be completed bythe candidate to be awarded the degree.

Students have to undertake the rotational postings during which students have to work under supervision of an experienced staff in the following areas:

Sl. No	Postings	Duration
1.	Conventional radiography	1Month
2.	Radiographic special procedures including diagnostic and Therapeutic Interventional Procedures	1 Month
3.	CR, DR and PACS	1 Month
4.	Computed Tomography	1 Month
5.	Magnetic Resonance Imaging	1 Month
6.	Mammography and Ultrasound	1 Month

✓ Other Details

S.NO.	Entire internship shall be done in a Hospitalor Medical College.
1.	Every candidate after successfully completing the final examination Bachelor of Science in Radiological Imaging Techniques will be required to undergo compulsory rotatory internship up to satisfaction of the University for a period of six months so as to be eligible for the award ofthe degreeof Bachelor of Science in Radiological Imaging Techniques and registration.
2.	The University shall issue a provisional degree of Bachelor of Science in Radiological Imaging Techniques on passing the final examination after the completion of internship on demand bythe candidate.
3.	The internee shall be entrusted with clinical responsibilities under direct supervision of Senior Medical Officer/Technologist. Theyshall not be working independently.
4.	Internee will not issue any certified copy of investigation reports or other related documents under their signature

✓ Assessment of Internship

Assessment- 1	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 works. Apart from scrutiny of record of work, assessment and evaluation of training shall be undertaken by an objective approach using situation tests in knowledge, skills and attitude during at the end of training. Based on the record of work and date of evaluation The Director/Principal shall issue certificate for satisfactory completion of training following which the university shall award the degree of Bachelor of Science in Radiological Imaging Techniques.
Assessment- 2	Satisfactory completion shall be determined on the basis of the following. Proficiency of knowledge required for each Imaging techniques or procedures.
❖	The competencyand skills expected to manage each radiographic technique.
❖	Responsibility, punctuality, works up of radiographic techniques, involvement in special procedures and preparation of reports.
❖	Capacity to work in a team (behaviour with colleagues, nursing staff and relationship with medical and paramedical staffs).
❖	Initiating, participating in discussions and developing research aptitude.

✓ Internship Log Book

Duly signed and completed Internship log book is compulsory to submit in the department/college to obtain internship completion and course completion letter.

Contact hours include work related to Lecture, Tutorial and Practical (LTP), where our institution will have flexibility to decide course wise requirements.

B.Sc. RIT: Three Year (6 Semester) CBCS Programme			
Basic Structure : Distribution of Courses			
S.No	**Type of Course**	**Credit Hours**	**Total Credits**
1	**Core Course (CC)**	8 Courses of 3 Credit Hrs. each (Total Credit Hrs. 8x3)= **24**	**24**
2	**Ability-Enhancement Course (AECC)**	4 Courses of 3 Credit Hrs. each (Total Credit Hrs. 4x3)= **12**	**16**
		1 Courses of 4 Credit Hrs. each (Total Credit Hrs. 1x4)= **4**	
3	**Discipline Specific Course (DSC)**	16 Courses of 3 Credit Hrs. each (Total Credit Hrs. 16x3)= **48**	**60**
		3 Courses of 4 Credit Hrs. each (Total Credit Hrs. 3x4)= **12**	
4	**Skill-Enhancement Course (SEC)**	15 Courses of 1 Credit Hrs. each (Total Credit Hrs. 15x1)= **15**	**43**
		2 Courses of 2 Credit Hrs. each (Total Credit Hrs. 2x2)= **04**	
		1 Courses of 4 Credit Hrs. each (Total Credit Hrs. 1x4)= **04**	
		1 Courses of 5 Credit Hrs. each(Total Credit Hrs. 1x5)= **05**	
		1 Courses of 6 Credit Hrs. each(Total Credit Hrs. 1x6)= **06**	
		1 Courses of 9 Credit Hrs. each(Total Credit Hrs. 1x9)= **09**	
5	**Open Elective Course (OEC)**	1 Courses of 3 Credit Hrs. each (Total Credit Hrs. 1X3)= **03**	**3**
6	**Compulsory Specified Course (CSC)**	1 Course of 3 Credit Hrs. each (Total Credit Hrs.1X3)= **03**	**3**
7	**Discipline Specific Elective Course (DSEC)**	1 Course of 3 Credit Hrs. each (Total Credit Hrs.1X3)= **03**	**3**
8	**Value Added Course (VAC)**	2 Courses of 0 Credit Hrs. each (Total Credit Hrs. 2X0)= **0**	**0**
9	**MOOC Course**	2 Courses of 2 Credit Hrs. each (Total Credit Hrs. 2X2)= **04**	**4**
TOTAL			**156**

❖ 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 bythe UGC and adopted byour University.

The following is the course module designed for the B.Sc. RIT program:

- ***Core Course (CC):*** Core courses of B.Sc. RIT program will provide a holistic approach to clinical or practical education, giving students an overview of the field, a basis to build and specialize upon. These core courses are the strong foundation to establish radiographic knowledge and provide broad multi-disciplined knowledge can be studied further in depth during the elective phase.

  The core courses will provide more practical-based knowledge, case-based lessons and collaborative learning models. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding, develop decision-making ability and contribute to the hospital and community at large.

  A wide range of core courses provides groundwork in the basic hospital management disciplines, patient care handling, responsible radiographer, organizational behavior and human resources etc. The integrated foundation is important for students because it will not only allow them to build upon existing skills, but they can also explore career options in a range of industries, and expand their understanding of various fields.

  The college offers eight core courses from first to fourth semester during the B.Sc. RIT program. There will be different credits for each core course offered as alreadydescribed in above table.

- ***Ability Enhancement Compulsory Course (AECC):*** As per the guidelines of Choice Based Credit System (CBCS) for all Universities, including the private Universities, the Ability Enhancement Compulsory Course (AECC) is a course designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture. The college offers five AECCs from first to fourth semester. Each AECC will be of different credits.

- ***Skill Enhancement Course (SEC):*** This course is designed to provide value-based and/or skill-based knowledge. The college offers twenty two SECs from I Semester to VI Semester. Each SEC will carrydifferent credits.

- ***Open Elective Course (OEC):*** Open Elective is an interdisciplinary additional subject that is compulsory in the third semester of a program. The score of Open Elective is counted in student's overall aggregate marks under Choice Based Credit System (CBCS). Department offers One Open Elective course of 3 Credits and students will have the choice of taking 1open elective in Semester V.

✓ ***Discipline Specific Elective Course (DSEC):*** Discipline Specific Elective Course (DSEC) is offered in semester VI for students with three credits. It provides two subjects in which student will choose anyone to improve their knowledge in specific course for further studies.

✓ ***Compulsory Specified Course (CSC):*** This is a compulsory course that does not have any choice and will be of 3 credits. Each student of B.Sc. RIT program has to compulsorily pass the CSC course.

✓ ***Value Added Course (VAC):*** A value added course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - 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 one course each in Semester III & Semester IV and will carry no credit, however ,it will be compulsory for every student to pass these courses with minimum 45% marks to be eligible for the degree 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.

✓ ***Massive open online course (MOOC)*** : MOOC is an online course aimed at unlimited participation and open access via the web. In addition to traditional course materials, such as filmed lectures, readings, and problem sets, many MOOCs provide interactive courses with user forums or social media discussions to support community interactions among students, professors, and teaching assistants (TAs), as well as immediate feedback to quick quizzes and assignments. MOOCs are a recent and widely researched development in distance education first introduced in 2008 and emerged as a popular mode of learning in 2012. B.Sc. RIT programme offers two MOOC courses each of 2 credits in IV & V semesters.

PROGRAMME SPECIFIC OUTCOMES: (PSOs)

The learning and abilities or skills that a student would have developed at the end:

PSO1.	Understanding the basic concepts, theories of applied sciences (physics, chemistry, Anatomy, physiology, biochemistry, pathology) relevant to radiological imaging techniques.
PSO2.	Remembering the relationship between physics and radiology& modern imaging
PSO3.	Understanding provisions for radiation safety by various national & international regulatory bodies and applying quality assurance measures, safety procedures and maintenance of radiological equipments.
PSO4.	Understanding of health care organization in India & basic medical terminology.
PSO5.	Operating all radiological and imaging equipment independently and perform the image processing in X-Ray, Fluoroscopy, Computed Tomography, Dual Energy X-Ray Absorptiometry (DEXA),Mammography, Digital Subtraction Angiography, Magnetic Resonance Imaging, Ultrasonography, Nuclear Medicine
PSO6.	Analyzing the protocols in Radiological Procedures & evaluating the factors affecting technical qualityof images and various pathological conditions.
PSO7.	Creating & Formulating plan for handling patient with drugs & equipments in general as well in emergency situation.

- ***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.:**

1. 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.

2. Video Based Learning (VBL): 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 educational or clinical videos. In fact, many teachers give examples from movies during their discourses. Making students learn few important theoretical concepts through VBL 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 , wherever possible.

3. MOOCS*:* Students may earn credits by passing MOOCS as decided by the college from time to time. Students can earn pre-requisite credits and certificate through MOOCs

4. Special Guest Lectures (SGL)&Extra Moral 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 fromtime to time to deliver their vital inputs and insights.

5. Special assistance program for slow learners: Write the note how would you identify slow learners, develop the mechanism to correcting knowledge gap. Terms of advance topics what learning challenging it will be provided to the fast learners

6. Orientation program: Two week programme is arranged to introduce students to college services which will support their educational and personal goals. To facilitate initial academic advisement, course selection and registration, creating an atmosphere that minimizes anxiety, promotes positive attitude and stimulates excitement for learning. It also helps knowledge of scope, information regarding academic and student service resources and programme. It provides a welcoming atmosphere for student's to meet faculty, staff and continuing students, as well as other new students.

7. Mentoring scheme: Today the lines between mentoring and networking are blurring. Students and mentor complete this word by mentworking with their bonding. A Mentor is assigned for a groupof 25-30 studentsto guide the students to acquire the clinical or academic knowledge.

8. Extracurricular Activities: Organizing& participation in extracurricular activities will be mandatoryto help students develop confidence & face audience with care.

Study & Evaluation Scheme

B.Sc. RIT- I Semester

S.NO.	CATEGORY	COURSE CODE	COURSE NAME	PERIODS			CREDITS	EVALUATION SCHEME		
				L	T	P		INTERNAL	EXTERNAL	TOTAL
1	CC-1	BRT-S-101	Human Anatomy I	3	-	-	3	40	60	100
2	CC-2	BRT-S-102	Human Physiology I	3	-	-	3	40	60	100
3	CC-3	BRT-S-103	Bio-Chemistry	3	-	-	3	40	60	100
4	DSC-1	BRT-S-104	Radiation Physics	3	2	-	4	40	60	100
5	CC-4	BRT-S-105	Preventive Medicine Healthcare and Radiation Protection	3	-	-	3	40	60	100
6	DSC-2	BRT-S-106	Fundamental of Medical Imaging I	3		-	3	40	60	100
7	AECC-1	TMUGE101	English Communication I	2	-	2	3	40	60	100
8	SEC-1	BRT-S-151	Human Anatomy I (Lab)	-	-	2	1	50	50	100
9	SEC -2	BRT-S-152	Human Physiology I (Lab)	-	-	2	1	50	50	100
10	SEC -3	BRT-S-153	Bio-Chemistry (Lab)	-	-	2	1	50	50	100
11	SEC -4	BRT-S-154	Fundamental of Medical Imaging I (Lab)	-	-	2	1	50	50	100
Total				20	2	10	26	480	620	1100

Study &Evaluation Scheme

B.Sc. RIT- II Semester

S. No.	CATEGORY	COURSE CODE	COURSE	PERIOD			CREDIT	EVALUATION SCHEME		
				L	T	P		INTERNAL	EXTERNAL	TOTAL
1	CC-5	BRT-S-201	Human Anatomy II	3	-	-	3	40	60	100
2	CC-6	BRT-S-202	Human Physiology II	3	-	-	3	40	60	100
3	DSC-3	BRT-S-203	Radiographic Positioning I	3	-	-	3	40	60	100
4	SEC-5	BRT-S-204	Computer Fundamentals	3	-	-	3	40	60	100
5	DSC-4	BRT-S-205	Medical Law & Ethics	3	-	-	3	40	60	100
6	DSC-5	BRT-S-206	Fundamental of Medical Imaging II	3	-	-	3	40	60	100
7	AECC-2	TMUGE201	English Communication II	2	-	2	3	40	60	100
8	SEC -6	BRT-S-251	Human Anatomy II (Lab)	-	-	2	1	50	50	100
9	SEC -7	BRT-S-252	Human Physiology II (Lab)	-	-	2	1	50	50	100
10	SEC -8	BRT-S-253	Radiographic Positioning I (Lab)	-	-	4	2	50	50	100
11	SEC -9	BRT-S-254	Computer Fundamentals (Lab)	-	-	2	1	50	50	100
12	SEC -10	BRT-S-255	Fundamental of Medical Imaging II (Lab)	-	-	2	1	50	50	100
TOTAL				20	0	14	27	530	670	1200

Study & Evaluation Scheme

B.Sc. RIT- III Semester

S. N	CATEGOR	COURSE CODE	COURSE	PERIODS			CREDIT	EVALUATION SCHEME		
				L	T	P		INTERNAL	EXTERNAL	TOTAL
1	DSC-6	BRT-S-301	Radiographic Positioning II	3	-	-	3	40	60	100
2	DSC-7	BRT-S-302	Conventional Radiographic Techniques I	3	-	-	3	40	60	100
3	DSC-8	BRT-S-303	Basics of USG and Mammography	3	-	-	3	40	60	100
4	CC-7	BRT-S-304	Orientation in Para Clinical Sciences	3	-	-	3	40	60	100
5	AECC-3	BRT-S-305	Environmental Sciences	4	-	-	4	40	60	100
6	AECC-4	TMUGE301	English Communication III	2	-	2	3	40	60	100
7	SEC-11	BRT-S-351	Radiographic Positioning II (Lab)	-	-	4	2	50	50	100
8	SEC-12	BRT-S-352	Clinical Posting	-	-	8	4	50	50	100
			Total	**18**	**0**	**14**	**25**	**340**	**460**	**800**
	VAC-1	TMUGS301	**Managing Self**	**2**	**1**	**0**	**0**	**50**	**50**	**100**

Note: Value added course is an audit course. It is compulsory to pass this coursewith 45%.However it will not be added to the overall result.

Study & Evaluation Scheme

B.Sc. RIT- IV Semester

S. NO.	CATEGORY	COURSE CODE	COURSE	PERIODS			CREDIT	EVALUATION SCHEME		
				L	T	P		INTERNAL	EXTERNAL	TOTAL
1	DSC-9	BRT-S-401	Conventional Radiographic Techniques II	3	-	-	3	40	60	100
2	DSC-10	BRT-S-402	Special Radiographic Procedure	3	-	-	3	40	60	100
3	DSC-11	BRT-S-403	Computed Tomography	3	-	-	3	40	60	100
4	DSC-12	BRT-S-404	Radiation Protection and Quality Assurance	3	-	-	3	40	60	100
5	CC-8	BRT-S-405	Orientation in Clinical Sciences	3	-	-	3	40	60	100
6	AECC-5	TMUGE401	English Communication IV	2	-	2	3	40	60	100
7	SEC-13	BRT-S-451	Special Radiographic Procedure (Lab)	-	-	2	1	50	50	100
8	SEC-14	BRT-S-452	Computed Tomography (Lab)	-	-	2	1	50	50	100
9	SEC-15	BRT-S-453	Clinical Posting	-	-	12	6	50	50	100
10		MOOC I		-	-	-	2			100
			Total	**17**	**0**	**18**	**28**	**390**	**510**	**1000**
	VAC-II	TMUGS401	Managing Work and Others	2	1	0	0	50	50	100

Note: Value added course is an audit course. It is compulsory to pass this coursewith 45%.However it will not be added to the overall result.

Study & Evaluation Scheme

B.Sc. RIT- V Semester

S. NO	CATEGORY	COURSE CODE	COURSE	PERIODS			CREDIT	EVALUATION SCHEME		
				L	T	P		INTERNAL	EXTERNAL	TOTAL
1	DSC-13	BRT-S-501	Magnetic Resonance Imaging	3	-	-	3	40	60	100
2	DSC-14	BRT-S-502	Nuclear Medicine Technology	3	-	-	3	40	60	100
3	DSC-15	BRT-S-503	Patient Care and Management	4	-	-	4	40	60	100
4	DSC-16	BRT-S-504	Interventional Procedure and Techniques	4	-	-	4	40	60	100
5	SEC-16	BRT-S-551	Magnetic Resonance Imaging (Lab)	-	-	2	1	50	50	100
6	SEC -17	BRT-S-552	Nuclear Medicine Technology (Lab)	-	-	2	1	50	50	100
7	SEC-18	BRT-S-553	Clinical Posting	-	-	18	9	50	50	100
8	OEC-1		Open Elective Course	-	-	-	3	As Per University Guidelines		
9		MOOC II		-	-	-	2	-	-	100
Total				14	0	22	30	310	390	800

Study &Evaluation Scheme

B.Sc. RIT- VI Semester

S. NO	CATEGORY	COURSE CODE	COURSE		PERIODS			CREDIT	EVALUATION SCHEME		
					L	T	P		INTERNAL	EXTERNAL	TOTAL
1	CSC-1	BRT-S-601	Bio-Statistics and Research Methodology		3	-	-	3	40	60	100
2	DSC-17	BRT-S-603	Advance CT MRI and USG		3	-	-	3	40	60	100
3	DSC-18	BRT-S-605	Clinical Aspects in Radio Imaging		3	-	-	3	40	60	100
4	DSEC-1	BRT-S-606	DISCIPLINE SPECIFIC ELECTIVE COURSES	Hospital Practice	3	-	-	3	40	60	100
		BRT-S-607		Hospital Management	3	-	-	3	40	60	100
5	SEC-19	BRT-S-651	Seminars Journal Clubs and Procedures (Lab)		-	-	2	1	50	50	100
6	SEC-20	BRT-S-653	Clinical Posting		-	-	10	5	50	50	100
7	SEC-21	BRT-S-654	Clinical Aspects in Radio Imaging (Lab)		-	-	2	1	50	50	100
8	SEC-22	BRT-S-656	Hospital Practice (Lab)				2	1	50	50	100
		BRT-S-657	Hospital Management (Lab)				2	1	50	50	100
Total					15	0	18	24	360	440	800

Course Code: BRT-S-101	**CORE COURSE (CC)– 1** **BRIT- SEMESTER- I** **Human Anatomy I**	L-3 T-0 P-2 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding different terminology and recognizing organs, organ system and different sample collection site.	
CO2.	Identifying and discussing the major structures of human body.	
CO3.	Demonstrating various organ systems and employ knowledge of human anatomy to solve questions regarding functions & diseases .	
CO4.	Differentiating the various organ systemand its related disorders.	
CO5.	Developing a holistic approachto human health and medical research.	
Course Content:		
Unit-1:	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	**05 Hours**
Unit-2:	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.	**12 Hours**
Unit-3:	Musculoskeletal System: Basic anatomyof important muscles and bones	**05 Hours**
Unit-4:	Respiratorysystem: Basic anatomyof nose, larynx, trachea, bronchi and lungs	**07 Hours**
Unit-5:	Digestive system: basic anatomy of esophagus, stomach, small intestine, large intestine, liver, gall bladder, pancreas.	**07 Hours**
Text Books:	*1. Sujit Chaudhary, 2.Sembulingam*	
Reference Books:	*1. Anatomy &Physiology,Ross &Wilson* *2. Human Anatomy, B D Chaurasia* *3. Guyton and Hall* *4. Principles of Anatomy and Physiology, Gerard J. Tortora and Bryan H.Derrickson* **** Latest editions of all the suggested books are recommended.***	

Course Code: BRT-S-102	**CORE COURSE (CC)-2** **BRIT- SEMESTER-I** **Human Physiology I**	L-3 T-0 P-2 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the function & structure of cells, tissues and major human organs system/parts	
CO2.	Identifying and explaining the interrelation between different organ systems to maintain biological equilibrium	
CO3.	Demonstrating functions of various organ systems and employ its knowledge to understand diseases	
CO4.	Differentiating and drawing the diagramof various organs & organs system.	
CO5.	Evaluating and determining various experimental techniques related to physiology	
Course Content:		
Unit-1:	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	**05 Hours**
Unit-2:	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	**07 Hours**
Unit-3:	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	**05 Hours**
Unit-4:	Respiratory system: parts of respiratory system, mechanism of respiration, pulmonary function, pulmonary circulation, lungs volume, Gas transport between lungs and tissues, Definition of hypoxia, dyspnoea, cyanosis, asphyxia and obstructive airways diseases	**07 Hours**
Unit-5:	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.	**12 Hours**
Text Books:	1. *Sujit Chaudhary* 2. *Sembulingam* 3. *Guyton and Hall*	
Reference Books:	1. *Anatomy &Physiology, Ross &Wilson* 2. *Human Anatomy, B D Chaurasia* 3. *Principles of Anatomy and Physiology, Gerard J. Tortora and Bryan H.Derrickso* *** Latest editions of all the suggested books are recommended.**	

Course Code: BRT-S-103	**CORE COURSE (CC)-3** **BRIT- SEMESTER-I** **Bio-Chemistry**	L-3 T-0 P-2 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts and theories of Biochemistry related to Radiology	
CO2.	Summarizing the chemistry of carbohydrates, proteins, lipids and amino acids.	
CO3.	Understanding the mechanism of enzyme action and identify the classes and factors affecting action.	
CO4.	Analyzing the biochemical testing and analyzing the test result.	
Course Content:		
Unit-1:	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.	**06 Hours**
Unit-2:	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 ofenzymes, protein, osmolarity, drugs, hormones, vitamins.	**08 Hours**
Unit-3:	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.	**14 Hours**
Unit-4:	Nucleic acids: Structure, function and types of DNA and RNA. Nucleotides, Nucleosides, Nitrogen bases, and role of Nucleic acid.	**04 Hours**
Unit-5:	Vitamins: classification, function and disease associated with vitamins. Role of Minerals and ions: Calcium, Iron, Iodine, Zinc, Phosphorus, Copper, Potassium, Zinc.	**04 Hours**
Text Books:	***1.*** *Bishop, Clinical Chemistry* ***2.*** *Teitz, Clinical Chemistry*	
Reference Books:	*1. Varley, Clinical Chemistry* *2. Vasudevan DM & Sreekumari S, Text book of Biochemistry for medical students* *3. U.Satyanarayn, Medical Biochemistry Chatterjee, Text book of Biochemistry*	

Course Code: BRT-S-104	**DISCIPLINE SPECIFIC COURSE (DSC)-1** **BRIT- SEMESTER-I** **Radiation Physics**	L-3 T-2 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the basic concepts, theories & method, in applied physics relevant to radiological imaging techniques & image quality	
CO2.	Categorizing provisions for radiation safety by various national & international regulatory bodies.	
CO3.	Tagging ofdifferent imaging modalities in radiologydepartment	
CO4.	Differentiating EMR radiation and its application in X –ray diagnosis and therapy.	
CO5.	Evaluating the factors affecting the image quality fromx ray.	
Course Content:		
Unit-1:	**The Atom** - Definition, Thomson Atom, Bohr Atom, Atomic Structure, Electron Binding Energy, Radioactivity, laws of radioactivity and decay schemes ofdifferent alpha, Beta, gamma ray.	**06 Hours**
Unit-2:	**Electromagnetic Radiation-** Photon, Velocity and amplitude, Frequency and wavelength, Electromagnetic Spectrum, Inverse square law, Units and quantities of radiation, dose measurement for various diagnostic procedures.	**09 Hours**
Unit-3:	**Electricity and Magnetism-** Electrostatics, Laws of electrostatics, Coulomb's law, Electrodynamics, Ohm's laws, Alternative & Direct Current, Magnet, Classification of magnets, Magnetic laws. **Electromagnetism –** Electromagnetic Effect, Faraday's & Lenz's law of Electromagnetic Induction, Generator, Transformers, Laws of Transformers, Types of Transformers	**10 Hours**
Unit-4:	**X-ray Imaging System-** Operating console, Autotransformers, Control of kVp, mAs, Exposure Timers, Voltage Rectification **Image Quality**- Exposure, attenuation, absorption, contrast, resolution, sharpness, noise, various factors determining image quality.	**06 Hours**
Unit-5:	**X-ray circuits Components**- Filament Circuit, High voltage circuit, Switched, Fuses, Circuit Breakers **Beam limiting Devices-** Cones, Cylinders, collimator, Grids, Filters.	**05 Hours**
Text Books:	1. Rehani, *Advance Medical Physics* 2. Faiz M Khan, *Radiation Physics*	
Reference Books:	1. *K Thayalan, Basics of Radiation Physics* 2. *Christensen's Physics Of Diagnostic Radiology* 3. *S.K.Srivastava*	

Course Code: BRT-S-105	**CORE COURSE(CC)-4** **BRIT- SEMESTER-I** **Preventive Medicine Health care and Radiation Protection**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Annotating and Remembering the Concept of Health.	
CO2.	Understanding the Nutrition and major Nutritional problem's	
CO3.	Expressing and applying Universal Immunization and Vaccines schedules	
CO4.	Analyzing the causes of various diseases	
CO5.	Understanding the family welfare .	
Course Content:		
Unit-1:	Definition and concepts of health, important public health acts, health problems ofdeveloped and developing countries, environment and health. Nutrition and detection of nutritional disorders, manifestations and prevention of such disorders role of regular exercise and yoga in prevention and management of various diseases.	**10 Hours**
Unit-2:	Epidemiology, etiology, pathogenesis and control of communicable disease like malaria, cholera, tuberculosis, leprosy, diarrhea, poliomyelitis, viral hepatitis, measles, dengue, rabies, AIDS	**09 Hours**
Unit-3:	National Health Policy and Programs, DOTS, National AIDS control programme, National cancer control programme, universal and national immunization programs, and vaccine schedules.	**07 Hours**
Unit-4:	Population, problems of population growth, birth rates, death rates and fertility rates, MMR, CPR, Reproductive and child health. Hygiene and sanitation,	**06 Hours**
Unit-5:	Family welfare and planning, Objectives and goals of WHO, UNICEF, Indian Red Cross Society, UNFPA,, FAO, ILO	**04 Hours**
Text Books:	*1.K.Parks,*	
Reference Books:	1. *Park &Park* 2. *Sunder Lal,* 3. *Harshmohan*	

Course Code: BRT-S-106	**DISCIPLINE SPECIFIC COURSE (DSC)-2** **BRIT- SEMESTER-I** **Fundamental of Medical Imaging I**	**L-3** **T-0** **P-2** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the basic concepts, theories & method, in applied physics relevant to radiological imaging techniques & image quality	
CO2.	Describing the correlation between radiologyand physics.	
CO3.	Analyzing different EMR radiation and its application in medical diagnosis and therapy.	
CO4.	Understanding ofdifferent imaging modalities in radiologydepartment	
Course Content:		
Unit-1:	**Physical quantity, its unit and measurement** Fundamental and derived quantity, SI unit **Radiation quantities and Units:** Activity**,** Exposure, Kerma, Absorbed Dose, Equivalent Dose, Effective Dose.	**06 Hours**
Unit-2:	Capacitor, capacitance, conductors, semiconductors, insulators, power, ammeter and voltmeter	**08 Hours**
Unit-3:	**Light** Properties of light, measurement of light and its units , X-Ray spectrum, application of visible light in medicine, application of ultraviolet and infrared light in medicine.	**08 Hours**
Unit-4:	**Heat** Definition of heat, temperature, Heat capacity, specific heat capacity, Heat transfer-conduction, convection, radiation, thermal conductivity, thermal expansion, Newton's law of cooling, application in diagnostic radiology (Heat dissipation X-Ray tubes).	**08 Hours**
Unit-5:	**Sound** Nature and propagation of sound wave (the characteristics of sound, wave theory), SI unit, speed of sound in a material medium, Ultrasonic wave, production of ultrasonic wave, piezo- electric effect	**06 Hours**
Text Books:	1. *Cristensens, Textbook in diagnostic radiology*	
Reference Books:	1. *K Thaylan-Basic radiological physics-Textbook in diagnostic radiology- Latest edition* 2. *Satish KBhargav, Handbook of radiation Physics- Latest edition*	

Course Code: TMUGE101	**ABILITY ENHANCEMENT COMPULSORY COURSE (AECC-1)** **BRIT- SEMESTER-I** **English Communication I**	L-2 T-0 P-2 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering and understanding** ofthe basic of English grammar and vocabulary.	
CO2.	**Understanding** ofthe basic Communication process.	
CO3.	**Applying** correct vocabulary and tenses in sentences construction.	
CO4.	**Analyzing** communication needs and developing communication strategies using both verbal & non-verbal method.	
CO5.	**Drafting** applications in correct format for common issues.	
CO6.	**Developing** self-confidence.	
Course Content:		
Unit-1:	**Introductory Sessions** • Self-Introduction • Building Self Confidence: Identifying strengths and weakness, reasons of Fear of Failure,strategies to overcome Fear of Failure • Importance of English Language in present scenario (*Practice: Self-introduction session)*	**06 Hours**
Unit-2:	**Basics of Grammar** • Parts of Speech • Tense • Subject and Predicate • Vocabulary: Synonymand Antonym *(Practice: Conversation Practice)*	**12 hours**
Unit-3:	**Basics of Communication** • Communication : Process, Types, 7Cs of Communication, Importance & Barrier • Language as a tool of communication • Non-verbal communication: Body Language • Etiquette & Manners • Basic Problem Sounds	**10 hours**
Unit-4:	**Application writing** • Format & Style of Application Writing • Practice of Application writing on common issues. • *(Practice : Pronuciation drill and building positive body language*	**08 hours**
Unit-5:	**Value based text reading:** Short Story (Non- detailed study) • Gift of Magi – O. Henry	**04 hours**
Text Books:	*Singh R.P., An Anthology of Short stories*	
Reference Books:	1. *Kumar, Sanjay. &Pushp Lata. "Communication Skills" New Delhi: Oxford University Press.* 2. *Harris, Thomas. A. "I am ok, You are ok" New York: Harper and Row.* *Goleman, Daniel. "Emotional Intelligence" Bantam BooK*	

NOTE:-	*Course Outcomes of following Lab's are covered in their respective theory courses.*	
Course Code: **BRT-S-151**	**SKILL ENHANCEMENT COURSE (SEC) -1** **BRIT- SEMESTER-I** **Human Anatomy I (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Content:		
1.	Demonstration of Major organs through models and permanent slides.	
2.	Demonstration of parts of circulatory system from models.	
3.	Demonstration of parts of respiratory system from models.	
4.	Demonstration of digestive system from models.	
5.	Demonstration of excretorysystem from models.	
6.	Demonstration of nervous system from models.	
7.	Structure of eye and ear	
8.	Demonstration of structural differences between skeletal, smooth and cardiac muscles.	
9.	Demonstration of various bones	
10.	Demonstration of various joints	
11.	Demonstration of various parts of male & female reproductive system from model	

Course Code: BRT-S-152	**SKILL ENHANCEMENT COURSE (SEC)-2** **BRIT- SEMESTER-I** **Human Physiology I (Lab)**	L-0 T-0 P-2 C-1
Course Content:		
1.	To measure pulse rate	
2.	To measure blood pressure	
3.	To measure temperature	
4.	Measurement ofthe Vital capacity	
5.	Determination of blood groups	
6.	Transport of food through esophagus	
7.	Calculation and evaluation of daily energy and nutrient intake.	
8.	Measurement of basal metabolic rate	
9.	Demonstration of ECG	
10.	Bile juice secretion and execration	
11.	Urine formation and execration	

Course Code: BRT-S-153	**SKILL ENHANCEMENT COURSE (SEC)-3** **BRIT- SEMESTER-I** **Bio- Chemistry (Lab)**	L-0 T-0 P-2 C-1
Course Content:		
1.	Demonstration of Blood Collection	
2.	Demonstration of Anticoagulation	
3.	Demonstration of Lab Glassware	
4.	Preparation of Normal solution	
5.	Demonstration of Acids	
6.	Demonstration of Alkalis	
7.	Demonstration of Acid-Base Indicator	
8.	Kidney function tests	
9.	Liver function tests	
10.	Urea and Creatinine values	
11.	Demonstration of Blood Collection	

Course Code: BRT-S-154	**SKILL ENHANCEMENT COURSE (SEC)-4** **BRIT- SEMESTER-I** **Fundamental of Medical Imaging I (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Content:	Demonstration of various imaging modalities:	
1.	Demonstration of postures	**02 Hours**
2.	Demonstration of X-ray	**02 Hours**
3.	Observation of internal parts of X Ray tube	**02 Hours**
4.	Demonstration of Patient handling	**02 Hours**
5.	Demonstration of Patient Preparation	**02 Hours**
6.	Demonstration of Instructions for various procedures	**02 Hours**

Course Code: BRT-S-201	**CORE COURSE (CC)-5** **BRIT- SEMESTER-II** **Human Anatomy II**	L-3 T-0 P-2 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding of recognizing organs, organ system and sample collection sites.	
CO2.	Identifying and discussing the major structures of human body	
CO3.	Demonstrating various organ systems and employ knowledge of human anatomyto solve questions regarding functions, diseases and sample collection	
CO4.	Differentiating the various organ systemand its related disorders	
CO5.	Analyzing appropriate sample collection site	
CO.6	Developing a holistic approach to human health and medical research	
Course Content:		
Unit-1:	Cardiovascular system: Basic anatomyof heart and important blood vessels	**10 Hours**
Unit-2:	Brief introduction about Lymphatic System.	**07 Hours**
Unit-3:	The Nervous System : Basic anatomy of brain and spinal cord, meninges and cerebrospinal fluid, Cranial Nerves	**08 Hours**
Unit-4:	Endocrine System: Brief anatomy of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal	**07 Hours**
Unit-5:	Special Senses: Basic anatomyof eye, ear and nose	**04 Hours**
Text Books:	1. *Sujit Chaudhary* 2. *Sembulingam* 3. *Guyton and Hall*	
Reference Books:	1. *Anatomy &Physiology,Ross &Wilson* 2. *Human Anatomy, B D Chaurasia* 3. *Principles of Anatomy and Physiology, Gerard J. Tortora and Bryan H.Derrickson*	

Course Code: BRT-S-202	**CORE COURSE (CC)-6** **BRIT- SEMESTER-II** **Human Physiology II**	L-3 T-0 P-2 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Enlisting and memorizing the function of major human organs system/parts.	
CO2.	Identifying and explaining the interrelation between different organ systems.	
CO3.	Understanding functions of various organ systems and employ its knowledge to identify disease	
CO4.	Differentiating and drawing the diagramof various organs & organs system	
CO5.	Understanding of abnormality and various physical condition	
Course Content:		
Unit-1:	Organs of Excretory System: Kidneys, Nephron, Mechanism of Excretion ,Urine formation (Glomerular filtration and Tubular reabsorption) , Electrolytes: their balances and imbalances	**10 hours**
Unit-2:	Introduction of acidosis and alkalosis.	**06 Hours**
Unit-3:	Muscle nerve physiology, types of muscles, their gross structural and functional difference with reference to properties	**08 Hours**
Unit-4:	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	**10 Hours**
Unit-5:	Special senses-general organization & functions	**04 Hours**
Text Books:	1. *Text Book of Physiology, Sujit Chaudhary* 2. *Text book of Physiology, Sembulingam* 3. *Textbook of Medical Physiology, Guyton and Hall*	
Reference Books:	1. *Anatomy &Physiology, Ross &Wilson* 2. *Human Anatomy, B D Chaurasia* 3. *Principles of Anatomy and Physiology, Gerard J. Tortora and Bryan H.Derrickson*	

Course Code: BRT-S-203	**DISCIPLINE SPECIFIC COURSE (DSC)-3** **BRIT- SEMESTER-II** **Radiographic Positioning I**	L-3 T-0 P-4 C-5
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding and identify radiographic anatomy.	
CO2.	Acting out diagnostic image quality.	
CO3.	Modifying positioning and technical factors.	
CO4.	Communicating appropriately and constructively with the patient.	
CO5.	Calculating and observe recommended radiation safety measures	
Course Content:		
Unit-1:	**SKULL** **Cranial bones and facial bones**-Related radiological anatomy **Basic & special projections**-Cranium Base of skull, Sella turcica Mastoids, Optic foramina and Orbits, Nasal bone, TM joint, Facial bone, Zygomatic arches, Mandible, Para nasal sinuses	**12 Hours**
Unit-2:	**NECK-** Related radiological anatomy**,** Positioning- AP, LAT	**05 Hours**
Unit-3:	**THORAX-** Related radiological anatomy**,** Chest X-ray–AP, LAT**,** Special projections	**05 Hours**
Unit-4:	**ABDOMEN-** Related radiological anatomy **Basic & special projection-Basic**:AP supine (KUB)**,** **Special:** PA prone**,** Lateral decubitus**,** Erect AP**,** Dorsal decubitus**,** Lateral**,** Acute abdomen: three way series	**09 hours**
Unit-5:	**KUB-** Related radiological anatomy**,** Positioning- AP	**05 Hours**
Text Books:	1. *DrKaushal Gahlot* 2. *Lalit Agarwal*	
Reference Books:	1. *Clarks radiographic positioning (latest edition)* 2. *Bontragers handbook of radiographic positioning and techniques* 3. *Merrilis atlas of radiographic technique (vol i,ii,iii)*	

Course Code: BRT-S-204	**SKILL ENHANCEMENT COURSE (SEC)-5** **BRIT- SEMESTER-II** **Computer Fundamentals**	L-3 T-0 P-2 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the fundamental concepts of computers with the present level of knowledge of the student.	
CO2.	Categorizing binary, hexadecimal, and octalnumber system and their arithmetic.	
CO3.	Understanding the MS OFFICE and its applications.	
CO4.	Applying MS office programs to create personal and academic documents	
Course Content:		
Unit-1:	**Introduction and Definition of Computer:** Computer Generation, Characteristics of Computer, Advantages and Limitations of a computer, Classification of computers, Functional components of a computer system (Input, CPU, Storage and Output Unit), Types of memory (Primary and Secondary) Memory Hierarchy. Hardware: a) Input Devices- Keyboard, Mouse, Scanner, Bar Code Reader b) Output Devices – Visual Display Unit (VDU), Printers, Plotters etc. Software: Introduction, types of software with examples, Introduction to languages, Compiler, Interpreter and Assembler. Number System: Decimal, Octal, Binary and Hexadecimal Conversions, BCD, ASCII and EBCDIC Codes.	**08 Hours**
Unit-2:	**MS – DOS:** Getting Started on DOS with Booting the System, Internal Commands: CHDIR(CD),CLS, COPY, DATE, DEL(ERASE), DIR, CHARACTER, EXIT,MKDIR(MD), REM, RENAME(REN), RMDIR(RD), TIME, TYPE, VER, VOL, External Commands: ATTRIB, CHKDSK, COMMAND, DOSKEY, EDIT, FORMAT,HELP, LABEL, MORE, REPLACE, RESTORE, SORT, TREE, UNDELETE, UNFORMAT,XCOPY. **Introduction of Internet:** Historyof internet, Web Browsers, Searching and Surfing, Creating an E-Mail account, sending and receiving E-Mails	**08 Hours**
Unit-3:	**MS Word:** Starting MS WORD, Creating and formatting a document, Changing fonts and point size, Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, Inserting objects, Page setup, Page Preview, Printing a document, Mail Merge.	**08 Hours**
Unit-4:	**MS Excel:** Starting Excel, Work sheet, cell inserting Data into Rows/ Columns, Alignment, Text wrapping , Sorting data, Auto Sum, Use of functions, Cell Referencing form, Generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document, Page set up, Print Preview, Printing Worksheets.MS Power Point: Starting MS–Power Point, Creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note	**08 hours**

	pages, preparing audience handouts, printing presentation documents. MS – Access: creating table and database.	
Unit-5:	**MS-POWER POINT:** Starting MS–Power Point,, Creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note pages, preparing audience handouts, printing presentation documents.	**8 Hours**
Text Books:	1. *Sinha P.K., Computer Fundamentals, BPB Publishing.* 2. *Bill Bruck., The Essentials Office 2000 Book, BPB Publishing.* 3. *Leon A. &Leon M., Introductions to Computers, Vikas Publications.*	
Reference Books:	1. *Peter Norton_s, Introductions to Computers, Tata McGraw Hill.* 2. *Price Michael, Office in Easy Steps,TMH Publication.*	

Course Code: BRT-S-205	**DISCIPLINE SPECIFIC COURSE (DSC)-4** **BRIT- SEMESTER-II** **Medical Law and Ethics**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding professional and ethical responsibility of a Radio Imaging Technologist.	
CO2.	Knowing the importance of patients Right's and informed consent in case of terminally ill Euthanasia and organ transplantation cases.	
CO3.	Expressing the Right's and confidentiality of the records of the patients and their medicolegal aspects.	
CO4.	Explaining the benefits as well as risks of various procedures to the patients before performing.	
Course Content:		
Unit-1:	**Medical ethics** - Definition - Goal – Scope Introduction to Code of conduct Basic principles of medical ethics – Confidentiality Malpractice and negligence - Rational and irrational drug therapy	**08 Hours**
Unit-2:	Autonomy and informed consent - Right of patients Care of the terminally ill-Euthanasia Organtransplantation, ethics and law	**04 Hours**
Unit-3:	Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.	**07 Hours**
Unit-4:	Professional Indemnity insurance policy Development of standardized protocol to avoid near miss or sentinel events Obtaining an informed consent.	**04 hours**
Unit-5:	Basics of emergency care and life support skills Vital signs and primary assessment, Basic emergency care – first aid and triage, Ventilations including use of bag-valve-masks (BVMs),Choking, rescue breathing methods, One and Two-rescuer CPR, Using an AED (Automated external defibrillator),Managing an emergency including moving a patient.	**13 Hours**
Text Books:	1. *Recent Trends in medical imaging (CT, MRI and USG)* 2. *RSNA (Journals from Radiological Society of North America)*	
Reference Books:	1. *AJR (American Journal of Radiology)* 2. *IJR (Indian journal of Radiology*	

Course Code: BRT-S-206	**DISCIPLINE SPECIFIC COURSE (DSC)-5** **BRIT- SEMESTER-II** **Fundamental of Medical Imaging II**	L-3 T-0 P-2 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts and terminologyof various modalities.	
CO2.	Enlisting and memorizing the structure, function & location of different parts of bodyunder imaging.	
CO3.	Recognizing the different parts of diagnostic imaging equipments and their functions.	
CO4.	Summarizing comparison between CR & DR.	
CO5.	Applying the different imaging modalities in radiologydepartment.	
Course Content:		
Unit-1:	**X-Ray** History, Basic principle, Equipment/hardware, Clinical applications, Limitations & Advancements, Basics of darkroom.	**06 Hours**
Unit-2:	**CT and MRI** History, Basic principle, Equipment/hardware, Generations, Clinical applications, Advantages over X-ray, Limitations & Advancements of computed tomography and MRI, CT Vs MRI, Limitations & Advancements.	**10 Hours**
Unit-3:	**Dexa** History, Basic principle, Equipment/hardware, Clinical applications, Limitations & Advancements. **Mammography** History, Basic principle, Equipment/hardware, Clinical applications, Advantages over X-rayLimitations & Advancements.	**12 Hours**
Unit-4:	**U.S.G** History, Basic principle, Equipment/hardware, Working principle & types of Transducer, Clinical applications, Limitations & Advancements, Introduction, principle and comparison of CR & DR.	**08 Hours**
Text Books:	1. *Recent Trends in medical imaging (CT, MRI and USG)* 2. *Cristensens, Textbook in diagnostic radiology* 3. *D N and M O Chesney- X ray equipments for student radiographers- Third edition*	
Reference Books:	1. *Basics of Ultrasonography for Radiographers and Technologists- Latest edition* 2. *MRI Basic Principal and Application, Mark A Brown- Latest Edition.*	

Course Code: TMUGE201	**ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)-2** **BRIT- SEMESTER-II** **English Communication II**	L-2 T-0 P-2 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering & understanding** the basics of English Grammar and Vocabulary	
CO2.	**Understanding** the basics of Listening, Speaking & Writing Skills	
	Understanding principles of letter drafting and various types of formats.	
CO3.	**Applying** correct vocabulary and grammar in sentence construction while writing and delivering presentations	
CO4.	**Analyzing** different types of listening, role of Audience & Locale in presentation	
CO6.	**Creating** Official Letters, E-Mail & Paragraphs in correct format.	
Course Content:		
Unit-1:	**Functional Grammar** • Prefix, suffix and One words substitution • Modals • Concord	**10 hours**
Unit-2:	**Listening Skills** • Difference between listening & hearing, Process and Types of Listening • Importance and Barriers to listening	**04 hours**
Unit-3:	**Writing Skills** • Official letter and email writing • Essentials of a paragraph, • Developing a paragraph: Structure and methods • Paragraph writing (100-120 words)	**12 hours**
Unit-4:	**Strategies & Structure of Oral Presentation** • Purpose, Organizing content, Audience & Locale, Audio-visual aids, Body language • Voice dynamics: Five P's - Pace, Power, Pronunciation, Pause, and Pitch. Modes of speech delivery and 5 W's of presentation	**08 hours**
Unit-5:	**Value based text reading:** Short Essay(Non- detailed study) • How should one Read a book? – Virginia Woolf	**06 hours**
Text Books:	*1. Singh R.P., An Anthology of English Essay, O.U.P. New Delhi.*	
Reference Books:	***1.*** *Nesfield J.C. "English Grammar Composition & Usage" Macmillan Publishers* ***2.*** *Sood Madan "The Business letters" Goodwill Publishing House, NewDelhi* ***3.*** *Kumar Sanjay &Pushplata "Communication Skills" Oxford University Press, New Delhi.*	

NOTE:-	***Course Outcomes of following Lab's are covered in their respective theory courses.***	
Course Code: BRT-S-251	**SKILL ENHANCEMENT COURSE (SEC)-6** **BRIT- SEMESTER-II** **Human Anatomy II (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Content:	Demonstration of various Organs:	
1.	Parts of CVS	
2.	Different types of Nerves	
3.	Special sense organs	
4.	Urinaryorgans	
5.	Excretory system	

Course Code: BRT-S-252	**SKILL ENHANCEMENT COURSE (SEC)-7** **BRIT- SEMESTER-II** **Human Physiology II (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Content:		
1.	Organs of Excretory System	
2.	Special senses-general organization & functions	
3.	Nervous system	

Course Code: **BRT-S-253**	**SKILLENHANCEMENT COURSE (SEC)-8** **BRIT- SEMESTER-II** **Radiographic Positioning I (Lab)**	**L-0** **T-0** **P-4** **C-2**
Course Content:		
1.	**Skull** Cranial bones and facial bones Basic & special projections Related radiological Pathology	
2.	**Neck ,Thorax &Abdomen** Basic & special projection Related radiological Pathology	
3.	**KUB** Basic & special projection Related radiological Pathology	

Course Code: BRT-S-254	**SKILL ENHANCEMENT COURSE (SEC)-9** **BRIT- SEMESTER-II** **Computer Fundamentals (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Content:		
1.	**Concept in Computer:** Definition of Computer, History of Computer , Generations, Characteristic and Application of Computers, Classification of Computers, Computer Hardware, CPU, Various Types of I/O devices, Peripherals Devices, Storage Devices. Management Introductory concepts in operating system, textual Vs GUI Interface, Introduction to DOS	
2.	Starting MS WORD, Creating and formatting a document, Changing fonts and point size, Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, Inserting objects, Page setup, Page Preview, Printing a document, Mail Merge.	
3.	Starting Excel, Work sheet, cell inserting Data into Rows/ Columns, Alignment, Text wrapping , Sorting data, Auto Sum, Use of functions, referencing formula cells in other formulae , Naming cells, Generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document , Page set up, Print Preview, Printing Worksheets.	
4.	Starting MS–Power Point,, Creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note pages, preparing audience handouts, printing presentation documents, MS- Access, Creating tables and database, Internet, Use of Internet (Mailing, Browsing, Surfing).	

Course Code: BRT-S-255	**SKILL ENHANCEMENT COURSE (SEC)-10** **BRIT- SEMESTER-II** **Fundamental of Medical Imaging II (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Content:	**Demonstration of various imaging modalities:**	
1.	Demonstration of X-ray	
2.	Demonstration of C.T	
3.	Demonstration of Darkroom	
4.	Demonstration of MRI	
5.	Demonstration of USG	
6.	Demonstration of CR & DR system	
7.	Demonstration of Dexa	
8.	Demonstration of Mammography	

Course Code: BRT-S-301	**DISCIPLINE SPECIFIC COURSE (DSC)-6** **BRIT- SEMESTER-III** **Radiographic Positioning II**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Enlisting basic lines, planes and projections of the body for precise and accurate radiographic positioning techniques.	
CO2.	Categorizing special positioning skills to capture images of the extremities, vertebral column, skull and respective associated joints.	
CO3.	Understanding and analyzing the techniques for using immobilization devices in pediatric radiography.	
CO4.	Determining and applying different body movement around the axis of different anatomical structure for better diagnosis.	
CO5.	Implementing specific problem solving techniques/approaches to solve the problems faced during patient position, care and management.	
Course Content:		
Unit-1:	**UPPER AND LOWER EXTRIMITIES** **Related radiological Anatomy** **Basic and Special projections** • Finger PA, LAT,OBLIQUE • Hand PA, LAT, **NOGAARD'S VIEW** • Wrist PA, LAT, **CARPAL TUNNEL, CARPAL CANAL** • Thumb AP, LAT, OBLIQUE, **FOLIO METHOD** • Forearm AP, LAT. • Femur AP, LAT • Knee joint AP, LAT • Patella **SKYLINE VIEW** • Tibia & Fibula AP, LAT • Ankle joint AP, LAT, **MORTISE VIEW, AP STRESS VIEW** • Foot AP, LAT • Calcaneus AXIAL and LATERAL	**09Hours**
Unit-2:	**SHOULDER JOINTS** • Related radiological anatomy **Basic and special projections** • Shoulder-AP,AXIAL, **NEER METHOD** • Clavicle-AP,AP AXIAL • Scapula-AP,OBLIQUE,**Y VIEW**	**06Hours**
Unit-3:	**Pelvic Girdle and Proximal Femur** • Related radiological anatomy **Basic & special projections** • Pelvic girdle • AP pelvis • Frog lateral(modified cleaves method) • AP axial for pelvic outlet(Tayelor method) • Posterior oblique- acetabulum(Judet method)	**09Hours**

	• Hip and proximal femur • AP unilateral hip • Axiolateral, inferosuperior (Danelius – Miller method) • Unilateral frog leg(Modified Cleaves method) • Modified Axiolateral(Clements- Nakayama method) • Sacroiliac joints: AP, posterior Obliques	
Unit-4:	**WHOLE SPINE POSITIONING** **Cervical spine** • Related radiological anatomy • **Basic views** • C Spine AP, LAT, AP OPEN MOUTH • 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 • Projections • AP • Lateral • Oblique **Lumbar spine, sacrum and coccyx** • Related radiographic anatomy • **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	**07Hours**
Unit-5:	**Paediatric radiography** • Positioning, • Immobilization devices, • Child Abuse	**05Hours**

	• Handling and Caring • Radiation protection while handling babies • **IMAGING PARTS FOR PAEDIATRIC PATIENTS** • CHEST, • UPPER AND LOWER EXTREMITIES • SKULL • PELVIS AND HIP.	
Text Books:	*1.Clarks radiographic positioning (latest edition)*	
Reference Books:	*1. Bontragers handbook of radiographic positioning and techniques* *2.* Merrilis atlas of radiographictechnique (vol i,ii,iii)	

Course Code: BRT-S-302	**DISCIPLINE SPECIFIC COURSE(DSC)-7** **BRIT- SEMESTER-III** **Conventional Radiographic Techniques I**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Enlisting and remember the concepts and terminologyof various modalities.	
CO2.	Memorizing the structure, function & location of different parts of body under imaging.	
CO3.	Recognizing and interpreting the different parts of diagnostic imaging equipment and their functions.	
CO4.	Comparing between different radiographic modalities such as CR, DR and Fluoroscopy.	
CO5.	Implementing the accurate and precise radiographic techniques such as low reduction dose and high quality images.	
Course Content:		
Unit-1:	**Introduction to Radiologic Imaging**-Radiation, Sources of radiation, Radioactivity, Half life, Ionizing & Non-ionizing Radiation, History of x-ray production, Development of modern Radiology	**09Hours**
Unit-2:	**X-ray production**- 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.	**08Hours**
Unit-3:	**The Recording System-** 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.	**07 Hours**
Unit-4:	**Processing of Latent image-** Manual Processing, Automatic processing, Processing sequence, wetting, developing, fixing, washing, Drying, Processing	**05Hours**

	area (Dark room) **Characteristic curve**, Optical density, Geometry of Radiographic image- magnification, distortion, focal spot blur, Subject factors.	
Unit-5:	**Fluoroscopy**- Introduction to fluoroscopy, Techniques of fluoroscopy, Image Intensifier, Flux gain, Brightness gain, Minification gain, Multifield image intensifier, Cathode raytube.	**07Hours**
Text Books:	1. *Textbook of Radiotherapy- Manipal Manual of Radiotherapy* 2. *Cristensens, Textbook in diagnostic radiology*	
Reference Books:	1. Rehani, *Diagnostic Imaging and Quality Assurance* 2. Chesney and Chesney, *Radiographic Imaging* 3. *D N and M O Chesney- X ray equipments for student radiographers- Third edition*	

Course Code: BRT-S-303	**DISCIPLINE SPECIFIC COURSE (DSC) -8** **BRIT- SEMESTER-III** **Basics of USG and Mammography**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Quoting the basic concepts, theories & method, in applied physics relevant to ultrasonic imaging techniques & image quality	
CO2.	Understanding different scanning protocol and its application in medical diagnosis and treatment.	
CO3.	Interpreting the correlation in between findings of mammographyand ultrasonic imaging.	
CO4.	Executing the quality management of imaging systems (Ultrasound & Mammography)	
CO5.	Integrating and illustrating various pathological conditions of clinical Ultrasonography.	
Course Content:		
Unit-1:	**Introduction to Ultrasound Imaging** Sound, Ultrasound, Attenuation, Echoes, Basic principle of Ultrasound imaging, Advantages and disadvantages	**09Hours**
Unit-2:	**Instrumentation of Ultrasonography** Controls of Ultrasound Equipment, USG probes, Coupling agent, Cathode raytube, Image display, USG contrast agent. **Piezoelectric Effect**-Definition, Types of element, Properties. **Transducers**: Construction and operation, Types of transducers	**08Hours**
Unit-3:	**USG Display modes:** A mode, B mode, M mode, TM mode. **Gray scale imaging** Beam focusing, Resolution	**07Hours**
Unit-4:	**Doppler USG** Principle, Doppler effect, Color Doppler, Continuous wave Doppler, Pulsed wave Doppler. USG Bio effects, safety. **Mammography**: Mammography Equipments and Basic views in Mammography.	**05Hours**
Unit-5:	**Clinical Practice** Scanning protocol, Indication, Patient preparation, image quality and artifacts in Ultrasound and Mammography,	**07Hours**
Text Books:	1. *Garkal, Radiology for Poisoning and Applied Anatomy* 2. *Chesney and Chesney, Radiographic Imaging*	
Reference Books:	1. *Christensens book of diagnostic radiology, Christensens* 2. *Basics of Ultrasonography for Radiographers and Technologists-Latest edition*	

Course Code: BRT-S-304	**CORE COURSE(CC)-7** **BRIT- SEMESTER-III** **Orientation in Para Clinical Sciences**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Remembering the basic pathological conditions related to cardiology, surgery, nephrology, orthopedic, gastrology, neurology and general medicine for the diagnosis relevant to radiological imaging techniques	
CO2.	Understanding the etiology, pathophysiology, manifestations, diagnostic studies and complications of common medical and surgical disorders relevant to radiological imaging techniques	
CO3.	Identify diagnoses and listing them according to priority and formulating radiological imaging techniques plan.	
CO4.	Analyzing pathology according to case diagnosis relevant to radiological imaging techniques	
CO5.	Evaluating case with condition referred to different radiologydepartment	
Course Content:		
Unit-1:	• Pericarditis • Valvular diseases • Rheumatic Heart Disease • Heart failure • Bronchitis • Emphysema • Bronchitis • Pneumonia • Tuberculosis • Pleura effusion • Phenumo thorax	**08Hours**
Unit-2:	• Aclasia cardia • Peptic ulcer • Intestinal obstruction • Crohn's disease • Ulcerative colitis • Pancreatitis • Portal Hypertension • Ascitis • Cirrhosis • Cholecystitis • Melena • Appendicitis	**07 Hours**
Unit-3:	• Hematuria • UTI • Hydronephrosis	**06Hours**

	• Horse shoe Kidney • Hydrocele • Glomerulo nephritis • Nephrotic Syndrome • Urinarycalculi • Polycystic Kidneydisease • Renal failure	
Unit-4:	• Fracture • Type Mechanism, Healing, Delayed Union, Non- complication • Injuries ofthe shoulder girdle, Dislocation of shoulder • Injuries of the carpal • Dislocation of Hip • Femur, Tibia, Ankle, calcaneum • Acute & chronic osteo arthritis • Rhematoid arthritis • Paget's Disease • Ankylosing spondylitis • Club foot • Bone Tumour-Benign Malignant • Perthes diseases	**08Hours**
Unit-5:	• Cholelithiasis • Peritonitis • Suprahrenic Abscess • Appendicitis • Benign Hypertrophy prostate	**07Hours**
Text Books:	1. *Rabbins &Cotran, Pathologic Basis &Diseases* 2. *Harsh Mohan, Pathologic Basis &Diseases* 3. *Todd &Sanford, Clinical Diagnosis by Laboratory Method*	
Reference Books:	1. *Ramanik Sood, Laboratory Technology Methods and Interpretation* 2. *Anand Narayan and Panikar, Textbook of Microbiology* *Baweja, Medical Microbiology*	

Course Code: BRT-S-305	**ABILITY ENHANCEMENT COMPULSORY COURSE (AECC-3)** **BRIT- SEMESTER-III** **Environmental Studies**	L-4 T-0 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding basic concepts in the context of ecological and environmental sciences.	
CO2.	Interpreting the ideas about energy resources in today's scenario and discussing about alternate energy sources.	
CO3.	Classifying and describe biodiversity and also summarize biogeographically distribution of India.	
CO4.	Describing concepts and methods to apply in environmental communication and public awareness.	
CO5.	Interpreting the ethical and cultural conduct in environmental activities.	
Course Content:		
Unit-1:	Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development.	**10 Hours**
Unit-2:	**Ecology and Environment**: Concept of an Ecosystem-its structure and functions, Energy Flow in an Ecosystem, Food Chain, Food Web, Ecological Pyramid& Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.	**12 Hours**
Unit-3:	**Natural Resources:** Renewable & Non-Renewable resources; Land resources and land use change; Land degradation, Soil erosion & desertification. **Deforestation**: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. **Energy Resources**: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies. **Biodiversity:** Hot Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Biogeographical Classification of India	**08 Hours**
Unit-4:	**Environmental policies & practices: Climate change & Global** Warming (Green house Effect),Ozone Layer -Its Depletion and Control Measures, Photochemical Smog, Acid Rain Environmental laws: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context.	**10 Hours**

Unit-5:	**Human Communities & Environment:** Human population growth; impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case studies.	**08 Hours**
Text Books:	1. *"Environmental Chemistry", De, A. K., New Age Publishers Pvt. Ltd.* 2. *"Introduction to Environmental Engineeringand Science", Masters, G. M., PrenticeHall India Pvt. Ltd.* 3. *"Fundamentals of Ecology",Odem, E. P., W. B. Sannders Co.*	
Reference Books:	1. *"BiodiversityandConservation",Bryant, P. J., Hypertext Book* 2. *"Textbook of Environment Studies", Tewari, Khulbe&Tewari,I.K. Publication*	

Course Code: TMUGE301	**ABILITY ENHANCEMENT COMPULSORY COURSE (AECC-4)** **BRIT- SEMESTER-III** **English Communication III**	L-2 T-0 P-2 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Remembering and understanding the English grammar and vocabulary.	
CO2.	Understanding the art of public speaking and strategies of reading comprehension.	
CO3.	Applying correct vocabulary and sentence construction during public speaking or professional writing.	
CO4.	Analyzing different types of sentences like simple, compound and complex. Drafting notice, agenda and minutes ofthe meeting.	
CO5.	Developing speaking skills during common conversation and power point presentation.	
Course Content:		
Unit-1:	**English Grammar & Vocabulary** • Correction of Common Errors (with recap of English Grammar with its usage in practical context.) • Synthesis : Simple , complex and compound sentence Commonly used Idioms & phrases (Progressive learning whole semester)	**06 Hours**
Unit-2:	**Speaking Skills** • Art of public speaking • Common coversation • Extempore • Power Point Presentation (Pptx) Skills**:** Nuances of presenting PPTs	**08 Hours**
Unit-3:	**Comprehension Skills** • Strategies of Reading comprehension: Four S's • How to solve a Comprehension (Short unseen passage: 150-200 words)	**03 Hours**
Unit-4:	**Professional Writing** • Preparing Notice, Agenda& Minutes of the Meeting	**04 Hours**
Unit-5:	**Value based text reading:** Short story. • The Barber's Trade Union – Mulk Raj Anand	**03 Hours**
Text Books:	**1.** *Singh R.P., An Anthology of Short stories, O.U.P. NewDelhi.*	
Reference Books:	***1.*** *Allen, W. "Living EnglishStructure" Pearson Education, NewDelhi.* ***2.*** *Joseph, Dr C.J. & Myall E.G. "A Comprehensive Grammar of Current English" Inter University Press, Delhi* ***3.*** *Kumar Sanjay &Pushplata "Communication Skills" Oxford University Press, New Delhi.*	

Course Code: TMUGS301	**VALUE ADDED COURSE(VAC)-I** **BRIT - Semester-III** **Managing Self**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings	
CO2.	Understanding and analyzing self and devising a strategy for self growth and development.	
CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.	
CO4.	Utilizing time in the most effective manner and avoiding procrastination.	
CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.	
CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.	
Course Content:		
Unit-1:	**Personal Development:** Personal growth and improvement in personality Perception Positive attitude Values and Morals High self motivation and confidence Grooming	**10 Hours**
Unit-2:	**Professional Development:** Goal setting and action planning Effective and assertive communication Decision making Time management Presentation Skills Happiness, risk taking and facing unknown	**8 Hours**
Unit-3:	**Career Development:** Resume Building Occupational Research Group discussion (GD) and Personal Interviews	**12 Hours**
Reference Books:	1. *Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education* 2. *Tracy, Brian, Time Management (2018), Manjul Publishing House* 3. *Hill, Napolean, Think and growrich (2014), Amazing Reads* 4. *Scott, S.J., SMART goals made simple (2014), Createspace Independent Pub* 5. *Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan* 6. *https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression* **** Latest editions of all the suggested books are recommended.***	

NOTE:-	***Course Outcomes of following Lab's are covered in their respective theory courses.***	
Course Code: BRT-S-351	**SKILL ENHANCEMENT COURSE (SEC)-11** **BRIT- SEMESTER-III** **Radiographic Positioning Part II (Lab)**	**L-0** **T-0** **P-4** **C-2**
Course Content:	Demonstration of various Organs:	
1.	Upper & Lower Extremities Hand Forearm Arm Thigh Leg Foot	
2.	Shoulder Joints Basic & special projection Related radiological Pathology Basic & special positioning	
3.	Pelvis Griddle Basic & special projection Related radiological Pathology Basic & special positioning	
4.	Whole Spine Positioning Cervical spine Thoracic spine Lumbar spine, sacrumand coccyx	
5.	Paediatric Radiography Special Positioning Views for all the X-Rays.	

Course Code: BRT-S-352	**SKILL ENHANCEMENT COURSE (SEC)-12** **BRIT- SEMESTER-III** **Clinical Posting**	**L-0** **T-0** **P-8** **C-4**
Course Content:		
1.	Based onthe clinical exposure from hospital.	**10 Hours**

Course Code: BRT-S-401	**DISCIPLINE SPECIFIC COURSE (DSC)-9** **BRIT- SEMESTER-IV** **Conventional Radiographic Techniques Part- III**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the components of conventional X-ray modalities such as Portable and Fluoroscopic machines.	
CO2.	Identifying & maintaining the working principle of image intensifier and tomographic equipment.	
CO3.	Applying the direct and indirect radiographyand factors affecting the image qualities.	
CO4.	Analyzing and identifying the process of image formation, image development and image quality.	
CO5.	Operating the conventional x raytechniques and equipment independently.	
Course Content:		
Unit-1:	**Portable & Mobile equipments** Portable X-Ray Equipments Mains requirements Cable connections to wall plugs Mobile X-Ray Equipments X-Ray Equipments for the Operating Theatre	**08 Hours**
Unit-2:	**Fluoroscopy Equipments** Construction & Working principles of Image Intensifier Direct Fluoroscopy Viewing the Intensified image Recording the intensified Image Digital fluoroscopy	**08 Hours**
Unit-3:	**Fluoroscopic / Radiographic Tables** General features of fluoroscopic / radiographic table The serial changer Remote control table The spot film devices.	**08 Hours**
Unit-4:	**Tomography Equipment** Principles oftomography Various types of tomographic movement Equipment for tomography	**06 Hours**
Unit-5:	**Equipment for Cranial and Dental radiography** The skull table General Dental X-ray equipment Pantomographyequipment Equipment for Cranial & skeletal radiography	**06 Hours**
Text Books:	1. *Christensen's Physics of Diagnostic Radiology* 2. *X-ray Equipment for Student Radiographers – D N & MO Chesney*	
Reference Books:	1. *DR Gahlot*	

Course Code: BRT-S-402	**DISCIPLINE SPECIFIC COURSE (DSC)-10** **BRIT- SEMESTER-IV** **Special Radiographic Procedures**	L-3 T-0 P-4 C-5
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the guidance of fluoroscopy for Barium enhanced GI tract studies.	
CO2.	Identifying proper technique for male and female genitourinary system under fluoroscopyguidance.	
CO3.	Discussing the different positioning techniques for visualization of different ducts and interventional procedures for fluid extraction	
CO4.	Demonstrating equipment and supplies necessary to complete special radiographic procedures with administration of contrast media.	
CO5.	Evaluating the safety aspects of contrast media and describe the allergic reactions associated to use of different contrast media for diagnostic purpose	
Course Content:		
Unit-1:	**Introduction to Radiographic Special Procedures** **Contrast Media-** Application, types, safety aspects &administration, Reaction to contrast media and management of contrast reactions.	**04 Hours**
Unit-2:	• Barium swallow, • Barium meal • Barium meal follow through(BMFT) • Barium enema	**08 Hours**
Unit-3:	• Intravenous urogram (IVU), • Micturating Cystourethrogram (MCU), • Ascending Urethrogram (ASU)/ RGU • Hysterosalpingography (HSG)	**10 Hours**
Unit-4:	• Myelography • ERCP/ PTBD, PTC, T –tube cholangiography	**06 Hours**
Unit-5:	• Sialography, • Dacrocystography, • Sinogram, • Fistulogram, FNAC Biopsy, **Indications, contraindications procedure and technique of all procedures**	**08 Hours**
Text Books:	*1. Special radiological procedures- Bushan N lakkhar* *2. Special Procedures- Snopek (Latest edition)*	
Reference Books:	*1. Chapman, Radiological Procedure* *Krishnamurthy, Medical Radiographic Technique &Darkroom Practice*	

Course Code: BRT-S-403	**DISCIPLINE SPECIFIC COURSE (DSC)-11** **BRIT- SEMESTER-IV** **Computed Tomography**	L-3 T-0 P-4 C-5
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding history, generation & terminology related to computed tomography.	
CO2.	Explaining the basic concepts, theories, techniques & equipment relevant to computed tomography	
CO3.	Describing the components and working of equipments related to C.T.	
CO4.	Applying the techniques of the patient preparations needed before & post procedure care in any CT examination.	
CO5.	Evaluating the factors affecting the image quality.	
Course Content:		
Unit-1:	• **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	**14 Hours**
Unit-2:	• **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.	**08 Hours**
Unit-3:	• **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	**04 Hours**
Unit-4:	• **CT Artefacts-** Classification, Types, Causes, Remedies	**02 Hours**
Unit-5:	• **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.	**08 Hours**
Text Books:	1. *Euclid S., Computed Tomography- Physical Principle, Clinical application & quality control* 2. *www.radiographics.com (Instrumentations in CT)*	

Course Code: BRT-S-404	**DISCIPLINE SPECIFIC COURSE (DSC)-12** **BRIT- SEMESTER-IV** **Radiation Protection and Quality Assurance**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding of the basic concepts, theories & method, in applied physics relevant to radiation monitoring & dose management.	
CO2.	Recognizing the guidelines given bydifferent regulatorybodies.	
CO3.	Describing the correlation between radiation dose and its biological effects.	
CO4.	Analyzing the different types radiation and its effects in medical imaging, diagnosis and therapy.	
CO5.	Evaluating the quality management of different imaging modalities in radiology department.	
Course Content:		
Unit-1:	• **Introduction to Radiation Protection, Units & Quantities-** Primary, secondary radiation, need for radiation protection, Exposure, Absorbed dose, absorbed dose equivalent, Effective dose, air KERMA, Radiation weighting factor, Tissue weighting factor, MPD, **Aim & Principle of Radiation Protection-** Concept of ALARA, Cardinal Principle, ICRP regulation, Radiation Protection in: Radiography, CT, Fluoroscopy, Mammography, Ward radiography, radiation shielding	**12 Hours**
Unit-2:	• **Radiation monitoring:** Personnel – Film badge, TLD, OSLD, pocket dosimeter, Area monitoring Devices. **Radiobiology:** Radiolysis of water, Direct & Indirect effects ofradiation, Stochastic, Deterministic effects, Somatic, Genetic effects, dose relationship, Antenatal exposure.10 day rule, 14 day rule, 28 dayrule, structural shielding, work load, use factor, occupancy factor.	**12 Hours**
Unit-3:	• **Quality Control and Assessment in Radiology:** Quality Assurance and quality controlof Modern Radiological and Imaging Equipment which includes Digital Radiography, Computed Radiography, CT scan, MRI Scan, Ultrasonography and Teleradiology and PACS related.	**06 Hours**
Unit-4:	• **Care and maintenance of diagnostic equipment**: General principles and preventive maintenance for routine - daily, Weekly, monthly, quarterly, annually: care in use, special care of mobile equipment.	**02 Hours**
Unit-5:	• **Role of Radiographer in Planning, QA & Radiation Protection**: Role of technologist in radiology department - Personnel and area monitoring. ICRP, NRPB, NCRP and WHO guidelines for radiation protection, pregnancy and radiation protection. NABH guidelines, AERB guidelines, PNDT Act and guidelines	**04 Hours**
Text Books:	*1. Radiation Protection and Evaluation in Radiology, Mary Alice Statkiewicz sherer- 6th Edition.*	
Reference Books:	*1. S K Bhargava* *2. www.AERB.com (Guidelines and Details of Quality Control in Radiology)* *www.ICRP.com*	

Course Code: BRT-S-405	**CORE COURSE(CC)-8** **BRIT- SEMESTER-IV** **Orientation in Clinical Sciences**	**L-3** **T-0** **P-0** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Defining and recognizing different basic medical pathology's etiology & clinical manifestations aspects with ref to radiology	
CO2.	Understanding to identify morphological change and discuss the major mechanism of pathologyrelevant to radiological imaging techniques	
CO3.	Applying radiological imaging techniques plan for Phases of diagnostic testing (pre-test, intra-test & post-test) in the image interpretation and clinical implications	
CO4.	Analyzing 3 times or more diagnosis evidence based information to maintain responsibility in department and case biases relevant to radiological imaging techniques	
CO5.	Synthesizing stimulant of pathology relevant to radiological imaging techniques	
Course Content:		
Unit-1:	• Meningitis • Cerebral Vascular Disorders • Encephalitis • Sinusitis • Polyps • DNS • Otitis Media • Tonsillitis • CSF Rhinorea	**09 Hours**
Unit-2:	• Aneurysms • Arachnoids cysts • Alzheimer's • Parkinson's • Shock • Hypertension • Embolism • Hemorrhage	**08 Hours**
Unit-3:	• Hangman's fracture • Dishitis • Spondylitis • IVDP • Scoliosis • Pott's • TB Spine • Kyphosis	**08 Hours**

Unit-4:	• Hematocezia • Anemia • Leukemia • Epilepsy • COPD • Asthma • Emphysema • Hepatitis • Diabetes Mellitus • Varicose Vein DVT	**09 Hours**
Unit-5:	Obstetrics -Diagnosis of Pregnancy	**02 Hours**
Text Books:	1. *Krishna Das, Textbook of Medicine* 2. *Kathale, Essentials of clinical medicine*	
Reference Books:	1. *Gopalan, Handbook of Orthopaedics* 2. *Shenoy, Essencial of Orthopaedics*	

Course Code: TMUGE401	**ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)-5** **BRIT- SEMESTER-IV** **English Communication- III**	L-2 T-0 P-2 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Remembering and understanding the English grammar and vocabulary.	
CO2.	Understanding the essentials of effective listening and speaking.	
CO3.	Understanding the corporate expectations and professional ethics.	
CO4.	Applying correct vocabularyand sentence construction during professional writing or job interviews.	
CO5.	Analyzing different types of interviews. Drafting resume, C.V. or cover letter.	
Course Content:		
Unit-1:	**Vocabulary & Grammar** • Homophones and Homonyms • Correction of Common Errors (with recap of English Grammar with its usage in practical context.) • Transformation of sentences	**12 Hours**
Unit-2:	**Essence of Effective listening & speaking** • Listening short conversation/ recording (TED talks / Speeches by eminent personalities) *Critical Reviewof these abovementioned*, Impromptu	**05 Hours**
Unit-3:	**Professional Writing** • Proposal: Significance, Types, Structure & AIDA • Report Writing: Significance ,Types, Structure& Steps towards Report writing	**08 Hours**
Unit-4:	**Job Oriented Skills** • Cover Letter • Preparing Rèsumè and Curriculum-Vitae • Interview: Types of Interview, Tips for preparing for Interview and Mock Interview • Corporate Expectation & Professional ethics: Skills expected in corporate world	**10 Hours**
Unit-5:	**Value based text reading:** Short story • A Bookish Topic – R.K. Narayan	**05 Hours**
Text Books:	1. *Raman Meenakshi & Sharma Sangeeta, "Technical Communication-Principles & Practice" Oxford university press , NewDelhi .* 2. *Mohan K. & Sharma R.C., "Business Correspondence of Report Writing",TMH, NewDelhi.* 3. *Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, NewDelhi.*	
Reference Books:	4. *Kumar Sanjay &Pushplata "Communication Skills" Oxford University Press, New Delhi.* 5. *Agrawal, Malti "Professional Communication" KrishanaPrakashan Media (P) Ltd. Meerut.*	

Course Code: TMUGS401	**VALUE ADDED COURSE (VAC)-II** **BRIT- SEMESTER-IV** **Managing Workand Others**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Communicating effectively in a varietyof public and interpersonal settings.	
CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.	
CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.	
CO4.	Functioning in a teamand enabling other people to act while encouraging growth and creating mutual respect and trust.	
CO5.	Handling difficult situations with grace, style, and professionalism.	
Course Content:		
Unit-1:	**Intrapersonal Skills:** Creativityand Innovation Understanding self and others (Johari window) Stress Management Managing Change for competitive success Handling feedback and criticism	**08 Hours**
Unit-2:	**Interpersonal Skills:** Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organisations Manners, etiquette and net etiquette	**12 Hours**
Unit-3:	**Interview Techniques:** Job Seeking Group discussion (GD) Personal Interview	**10 Hours**
Reference Books:	1. *Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education* 2. *Burne, Eric, Games People Play (2010), Penguin UK* 3. *Carnegie, Dale, Howto win friends and influence people (2004), RHUK* 4. *Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan* 5. *Steinburg, Scott, Nettiquette Essentials (2013), Lulu.com* 6. *https://www.hloom.com/resumes/creative-templates/* 7. *https://www.mbauniverse.com/group-discussion/topic.php* 8. *https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression* **** Latest editions of all the suggested books are recommended.***	

NOTE:-	***Course Outcomes of following Practical's are covered in their respective theory courses.***	
Course Code: BRT-S-451	**SKILL ENHANCEMENT COURSE (SEC)-13** **BRIT- SEMESTER-IV** **Practical- Special Radiographic Procedures**	**L-0** **T-0** **P-2** **C-1**
Course Content:		
1.	Radiography of Special radiological procedures, using contrast media as per syllabus	
2.	Positioning, Patient preparation, assistance while performing procedures	

Course Code: BRT-S-452	**SKILL ENHANCEMENT COURSE (SEC)-14** **BRIT- SEMESTER-IV** **Computed Tomography (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Content:		
1.	Patient preparation, patient positioning, performing all non-contrast and contrast computed tomography procedures.	
2.	Radiation protection and care of patient during procedures including contrast media Management in CT.	
3.	Various post processing techniques and evaluation of image quality and clinical findings.Post procedural care of the patient	

Course Code: BRT-S-453	**SKILL ENHANCEMENT COURSE (SEC)-15** **BRIT- SEMESTER-IV** **Clinical Posting**	**L-0** **T-0** **P-12** **C-6**
Course Content:		
1.	Based onthe clinical exposure fromhospital.	

Course Code: BRT-S-501	**DISCIPLINE SPECIFIC COURSE (DSC)-13** **BRIT- SEMESTER-V** **Magnetic Resonance Imaging**	L-3 T-0 P-2 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding anatomy, physiology and basic concepts of Magnetic Resonance Imaging.	
CO2.	Summarizing the essential hardware and execute different parameters in imaging.	
CO3.	Classifying artifacts in imaging and use of remedy procedure.	
CO4.	Illustrating the scanning protocols.	
CO5.	Describing safetyprocedure for providing clinically safe imaging environment.	
Course Content:		
Unit-1:	**Introduction and Basic Principle of Magnetic Resonance Imaging** 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.	**9 Hours**
Unit-2:	**MRI Hardware** 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.	**10Hours**
Unit-3:	**Pulse sequences** 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 studystate, SSFP**,** Coherent residual transverse magnetization**,** Incoherent residual transverse magnetization**,** Ultra- fast imaging, Advanced imaging techniques, EPI **MRI parameters & Trade offs** 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 reducetime, Tradeoffs, Decision making, Volume imaging.	**15 Hours**
Unit-4:	**MRI Artefacts**	**7 Hours**

	Introduction, Phase miss-mapping, Aliasing or wrap around, Chemical shift artefact, Chemical missregistration, Truncation artefact/Gibbs phenomenon, Motion of the patient Magnetic susceptibility artefact, Magic angle artefact, Zipper artefact, shading artefact Cross excitation and cross talk **MRI contrast agents**	
Unit-5:	**Flow Phenomena & MRI angiography** Introduction, The mechanisms of flow, Time of flight phenomenon, Entry slice phenomenon, Intravoxel Dephasing. **Flow phenomena compensation**-Gradient moment rephrasing, Pre saturation, Even echo rephrasing, MR Angiography. **Clinical Applications, Scanning Protocols and Safety aspects** Protocols for whole body imaging , The main magnetic field, Gradient magnetic field, Radiofrequency fields, Projectiles, Implants and prostheses, Pacemakers, Medical emergencies, Patient monitoring, Monitors and devices in MRI Claustrophobia, Quenching, Safetytips, Layout planning.	**7 Hours**
Text Books:	1. *Textbook of MRI from picture to proton- 2nd Edition* 2. *MRI in Practice, Cathrene- 4th Edition*	
Reference Books:	1. *MRI Parameters and Positioning, Emil Reif, Torsten B Moller- Latest Edition* 2. *MRI Basic Principal and Application, Mark A Brown- Latest Edition*	

Course Code: BRT-S-502	**DISCIPLINE SPECIFIC COURSE (DSC)-14** **BRIT- SEMESTER-V** **Nuclear Medicine Technology**	L-3 T-0 P-2 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Remembering the terms dealing with Radioactivity and its measuring quantities.	
CO2.	Understanding the principle for production of Radio nuclides, such as generators and reactors.	
CO3.	Applying the use of Radiopharmaceutical for diagnosis and therapy.	
CO4.	Analyzing and recognizing the site and route of administration of radiopharmaceuticals in hospitals and diagnostic centers.	
CO5.	Analyzing the applied physics of nuclear medicine such as PET and SPECT.	
Course Content:		
Unit-1:	**Introduction to NMT and Radioactive Transformation** Basic atomic and nuclear physics, History of radioactivity, Units & quantities, Isotopes, Isobars, Isomers, Radioactivity and half life, Exponential decay,specific activity, Modes of Radioactive decay, parent daughter decay.	**12 Hours**
Unit-2:	**Production of Radio nuclides** Reactor produced radionuclide, Reactor principles; Accelerator produced radionuclide, Radionuclide generators.	**12Hours**
Unit-3:	**Radio pharmacy &** **Handling & Transport of Radio-nuclides** Cold kits, Radio pharmacy used in Nuclear medicine, Radiopharmaceuticals used in various procedures, Safe handling of radioactive materials, Procedures for handling spills	**12 Hours**
Unit-4:	**Equipments of NMT** Gamma camera, PET, SPECT (working principle)	**12 Hours**
Text Books:	1. *Physics in Nuclear Medicine-Simon R Cherry, James A Sorenson- 4th Edition.*	
Reference Books:	2. *Physics in Nuclear Medicine-Simon R Cherry, James A Sorenson- 4th Edition*	

Course Code: BRT-S-503	**DISCIPLINE SPECIFIC COURSE (DSC)-15** **BRIT- SEMESTER-V** **Patient Care and Management**	L-4 T-0 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the effective verbal/nonverbal communication skills with patients and healthcare staff.	
CO2.	Discussing and demonstrating the patient care and assessment tools.	
CO3.	Demonstrating the professional code of ethics and comply with the profession's scope of practice.	
CO4.	Discussing and evaluating the practices which lead to prevention of nosocomial infections.	
CO5.	Applying appropriate radiation protection practice while performing radiologic procedures on children and adults.	
Course Content:		
Unit-1:	**Patient care and Assessment** Taking history, Assessing current physical status, Skin temperature, colour, consciousness, Breathing, Obtaining Vitalsigns, Electronic Patient Monitoring.	**6 Hours**
Unit-2:	**Responsibilities of the Imaging Technologist-** Medication administration, routesof administration, List of frequently used medications **Patient transfer technique &Restraint technique-** Preparation for transfer, wheelchair transfer, stretcher transfer, immobilization techniques	**8Hours**
Unit-3:	**Handling the emergencies in Radiology** Reaction to contrast media, Oxygen administration and suction, Respiratory emergencies, Cardiac emergencies, Trauma, Shock **Patient care during Investigation-** G.I. Tract, Biliary tract, Respiratory tract, Gynecology, Cardiovascular, Lymphatic system, C.N.S. etc	**12 Hours**
Unit-4:	**Infection Control** Microorganism- Bacteria, Viruses, Fungi, Prions, Protozoa Cycle of Infection Immunity, Infectious disease Transmission modes Isolation techniques Sterilization & sterile techniques	**12 Hours**
Unit-5:	**Patient Education & Communication** Patient communication problems Explanation of examinations Radiation Safety / Protection Interacting with terminally ill patient Informed Consent	**10 Hours**
Text Books:	1. *Textbook of Patient care in Radiography, Ruth Ann Ehralich- 8th Edition.*	
Reference Books:	2. *Textbook of Patient care in Radiography, Ruth Ann Ehralich- 8th Edition.*	

Course Code: BRT-S-504	**DISCIPLINE SPECIFIC COURSE (DSC)-16** **BRIT- SEMESTER-V** **Interventional Procedure and Techniques**	L-4 T-0 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the basic concepts, theories, techniques & equipment's for different interventional radiological procedures.	
CO2.	Using the emergency drugs , and preparing the patient before & post procedure care in any interventional radiological examination	
CO3.	Interpreting& applying provisions for radiation safety and protection as prescribed by various national & international regulatory bodies.	
CO4.	Applying the factors affecting the image quality.	
Course Content:		
Unit-1:	**Introduction to Interventional Radiology, Contrast media & Emergency Drugs** Need for interventional procedures, Informed consent, patient care, patient preparation, Patient monitoring, role of technologist in interventional procedure Types of contrast media, method of administration, contraindication, contrast reaction management, emergency crash cart.	**8 Hours**
Unit-2:	**Angiographic Equipments, Catheters & guide wires** Basics of Angiographic equipments, Single and biplane angiographic equipment, Angiographic Table, Image intensifier, Flat panel detector, electromechanical injectors, Catheters, types of catheters & guide wires, seldinger technique.	**12Hours**
Unit-3:	**Digital Subtraction Angiography** Types, Instrumentation	**10 Hours**
Unit-4:	**Sterile Techniques & Radiation Protection** Laying up a sterile trolley, sterile techniques, radiation protection for staff and patient , protective devices , monitors .	**6 Hours**
Unit-5:	**Interventional Procedures** Cardiac, Vascular, Nonvascular	**12 Hours**
Text Books:	1. Handbook of Interventional Radiologic Procedures , Lippincott Williams and Wilkhins Series- Latest Edition.	
Reference Books:	1. Vascular and Interventional Radiology, Karim Valzi (RSNA Publications) 2. Vascular and Interventional Radiography: A compherensive text and examination, Jonathan Schwartz	

NOTE:-	***Course Outcomes of following Lab's are covered in their respective theory courses.***	
Course Code: **BRT-S-551**	**SKILL ENHANCEMENT COURSE (SEC)-16** **BRIT- SEMESTER-V** **Magnetic Resonance Imaging (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Content:		
1:	Patient preparation, patient positioning, performing all non-contrast and contrast MRI procedures.	
2:	Planning of different scanning planes, parameters and their tradeoffs & patient monitoring during the procedures.	
3:	Various post processing techniques and evaluation of image quality and clinical findings	
4:	Post procedural care ofthe patient	
Text Books:	1. Textbook of MRI from picture to proton- 2nd Edition 2. MRI in Practice, Cathrene- 4th Edition	
Reference Books:	1. MRI Parameters and Positioning, Emil Reif, Torsten B Moller- Latest Edition 2. MRI Basic Principal and Application, Mark A Brown- Latest Edition	

Course Code: BRT-S-552	**SKILL ENHANCEMENT COURSE (SEC)-17** **BRIT- SEMESTER-V** **Nuclear Medicine Technology (Lab)**	L-0 T-0 P-2 C-1
Course Content:		
1:	Handling & Transport of Radio-nuclides	
2:	Equipment's of NMT	
3:	Various post processing techniques and evaluation of image quality and clinical findings.	
4:	Post procedural care of the patient.	
Text Books:	*Physics in Nuclear Medicine-Simon R Cherry, James A Sorenson- 4th Edition*	
Reference Books:	*Physics in Nuclear Medicine-Simon R Cherry, James A Sorenson- 4th Edition*	

Course Code: BRT-S-553	**SKILL ENHANCEMENT COURSE (SEC)-18** **BRIT- SEMESTER-V** **Clinical Posting**	**L-0** **T-0** **P-18** **C-9**
Course Content:		
1.	Based onthe clinical exposure fromhospital.	

Course Code: BRT-S-601	**COMPULSORY SPECIFIED COURSE (CSC)-1** **BRIT- SEMESTER-VI** **Bio-Statistics and Research Methodology**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding Biostatistics & methodologyof research.	
CO2.	Assessing and designing of research.	
CO3.	Analyzing the Clinical audit and data	
Course Content:		
Unit-1:	**Introduction** I: Biostatistics – Definition, Role of statistics in health science and health care delivery system. **Introduction II:** Research Methodology - Research process, Steps involved in research process , Research methods and methodology	**8 Hours**
Unit-2:	**Accessing research literature:** Use of databases and other sources	**12 Hours**
Unit-3:	**Understanding research design:** Qualitative and quantitative methodologies - their differences and potential integration. Evaluating research and its potential for informing practice. Developing research questions and devising methods for their investigation. Ethical issues in research	**10 Hours**
Unit-4:	**Analysis:** Analysis of qualitative and quantitative data. Utilization of appropriate software to assist in the retrieval of information and data analysis	**6 Hours**
Unit-5:	**Clinical audit:** Distinctiveness of research and audit processes and their function **Research Skills and Management**: The role of evidence based practice within health and welfare.	**12 Hours**
Text Books:	*1. Mahajan BK: Methods in Biostatistics for medical students and research workers, 6th edition Jaypee, 1997* *2. Kothari CR: Research methodology – Methods and techniques, Wiley eastern Ltd*	
Reference Books:	*1. Sunder RaoPSS, Richard J: Introdcution to Biostatistics – A manual for students in Health* *2. Sciences, Prentic – Hall of India Pvt Ltd.*	

Course Code: BRT-S-603	**DISCIPLINE SPECIFIC COURSE (DSC)-18** **BRIT- SEMESTER-VI** **Advance CT MRI and USG**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Categorizing the advancements in technology in the context of CT, MRI and USG procedures.	
CO2.	Comparing latest upgraded hardware ofdifferent imaging modalities.	
CO3.	Classifying imaging methods and techniques used in CT, MRI and USG.	
CO4.	Selecting safetyaspects in different imaging modalities for patients.	
CO5.	Implementing of different post processing techniques in various procedures.	
Course Content:		
Unit-1:	Helical CT scan: Slip ring technology, advantages, multi detector array helical CT, cone – beamgeometry, reconstruction of helical CT images, CT artifact, CT angiography, CT fluoroscopy, HRCT, post processing techniques: MPR, MIP, Min IP, 3D rendering: SSD and VR, CT Dose.	**12 Hours**
Unit-2:	MRI imaging methods – Head and Neck, Thorax, Abdomen, Musculoskeletal System imaging Clinical indications and contraindications- types of common sequences on imaging Protocols for various studies- slice section- patient preparation-positioning ofthe patient Plain studies- contrast studies -special procedures- reconstructions- 3D images- MRS blood flow imaging, diffusion/perfusion scans - strength and limitations of MRI- role of radiographer.	**12 Hours**
Unit-3:	Techniques of sonography-selection- Preparations - instructions and positioning of patient for TAS, TVS, TRUS, neck USG and extremities- biopsy procedures, assurance to patients.	**12 Hours**
Unit-4:	CT of head and neck – thorax – abdomen – pelvis – musculo skeletal system – spine – PNS. Anatomy – clinical indications and contraindications – patient preparation – technique – contrast media-types, dose, injection technique; timing, sequence - image display – patient care – utilization of available techniques & image processing facilities to guide the clinician- CT anatomyand pathologyof different organ systems.	**12 Hours**
Text Books:	1. *All Textbooks related to advance Medical Imaging.* 2. *Recent Trends in medical imaging (CT, MRI and USG)*	
Reference Books:	*RSNA (Journals from Radiological Society of North America)* *AJR (American Journal of Radiology)*	

Course Code: BRT-S-605	**DISCIPLINE SPECIFIC COURSE (DSC)-17** **BRIT- SEMESTER-VI** **Clinical Aspect in Radio Imaging**	L-3 T-0 P-2 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Comparing the Clinical historypre and post processing	
CO2.	Planning the different protocols and documentation for different procedures	
CO3.	Distinguishing how to prepare patients for different radiologystudies for contrast and non contrast examinations.	
CO4.	Formulating the importance of effective communication radioimaging.	
CO5.	Evaluating image quality in advance modalities.	
Course Content:		
Unit-1:	Patient identification steps and its importance PC-PNDT act 1994, Documentation in case of Medico legal patents, BI-RADS	**8 Hours**
Unit-2:	Advancements in radiation monitoring devices, their advantages and material used, Handling of radiation protection devices, advances in material, Cleaning or sterilization of the radiology department/equipment	**12 Hours**
Unit-3:	HIS, RIS, PACS, DICOM, E-LORA	**6 Hours**
Unit-4:	RFA, Nerve block, HIFU and their applications, Localand general anesthesia drugs used to anesthetize the patient and monitoring of patient	**10 Hours**
Unit-5:	Moral and Ethics values , Legal issue, Donning and Doffing of PPE (Face mask, Hand gloves, Hair cover, Gown etc.), Clinical Responsibilities of Radiographer	**12 Hours**
Text Books:	***1.*** *Recent Research topics in Radio imaging (Diagnostic radiology)* ***2.*** *Focus on advance practices in medical imaging.* ***3.*** *RSNA (Journals from Radiological Society of North America)*	
Reference Books:	*4. AJR (American Journal of Radiology)* *5. IJR (Indian journal of Radiology)* *6. Pubmed (Latest Journals)*	

Course Code: BRT-S-606	**DISCIPLINE SPECIFIC ELECTIVE COURSE (DSEC)-1** **BRIT- SEMESTER-VI** **Hospital Practice**	L-3 T-0 P-2 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the Concept of biomedical waste management.	
CO2.	Remembering the hospital setting and management	
CO3.	Understanding and applying emergency situation rescue	
CO4.	Applying the patient's right and code of conduct.	
Course Content:		
Unit-1:	**Introduction to hospital staffing-** Hospital staffing and administration, Handling of patient in radiology department (like patient shifting management of an infectious, mentally impaired/ pschycological issues of patient etc) **Medical records and documentation-** Medical records and documentation	**12 Hours**
Unit-2:	**Legal issues** Legal issues in radiology department	**6 Hours**
Unit-3:	**Professional ethics-** Professional ethics and Code of conduct of radiographer, Patient rights.	**10 Hours**
Unit-4:	**First aid-** Artificial respiration, homeostasis, first aid techniques, ABCD management.	**8 Hours**
Unit-5:	**Anesthesia-** Local anesthesia and general anesthesia, uses in hospital Facilities regarding general Anesthesia in the X-ray department Emergencycodes, Biomedical waste management.	**12 Hours**
Text Books:	*1. All Textbooks related to advance Medical Imaging.*	
Reference Books:	*RSNA (Journals from Radiological Society of North America)* *AJR (American Journal of Radiology)*	

Course Code: BRT-S-607	**DISCIPLINE SPECIFIC ELECTIVE COURSE (DSEC)-1** **BRIT- SEMESTER-VI** **Hospital Management**	L-3 T-0 P-2 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Understanding the concepts of Patients care in hospital.	
CO2.	Understanding & applying provisions for hospital management	
CO3.	Evaluating the factors affecting the hospital services.	
CO4.	Analyzing challenges and strategies in Hospital administration	
Course Content:		
Unit-1:	Functions of Hospital administration, Modern techniques in Hospital management, Challenges and strategies of Hospital management	**12 Hours**
Unit-2:	**Administrative Functions–** Planning, Organizing, Staffing, Leading and Controlling Organizational Structure, Motivation and leadership. Designing health care organization.	**12 Hours**
Unit-3:	Medical record, House-keeping services, Laboratoryperformance	**12 Hours**
Unit-4:	Total patient care – indoor and outdoor, Evaluation of hospital services, Quality assurance. Record reviews and medical audit.	**12 Hours**
Text Books:	*1. All Textbooks related to advance Medical Imaging.*	
Reference Books:	*RSNA (Journals from Radiological Society of North America)* *AJR (American Journal of Radiology)*	

NOTE:-	***Course Outcomes of following Lab's are covered in their respective theory courses.***	
Course Code: **BRT-S-651**	**SKILL ENHANCEMENT COURSE (SEC)-19** **BRIT- SEMESTER-IV** **Seminars, Journal Clubs and Procedures (Lab)**	**L-0** **T-0** **P-2** **C-1**
Course Content:		
1	Each student will be assigned topics for presentations as seminars, will explore recent innovations in MRIT for presenting topics during journal clubs and shall be holding group discussions along with in the presence of faculty	**36 Hours**
Text Books:	Recent Research topics in Radio imaging (Diagnostic radiology) Focus on advance practices in medical imaging. RSNA (Journals from Radiological Society of North America)	
Reference Books:	AJR (American Journal of Radiology) IJR (Indian journal of Radiology) Pubmed (Latest Journals)	

Course Code: **BRT-S-653**	**SKILL ENHANCEMENT COURSE (SEC)-21** **BRIT- SEMESTER-VI** **Clinical Posting**	**L-0** **T-0** **P-10** **C-5**
Course Content:		
1	Based on the Clinical exposure from hospital	**12 Hours**

Course Code: BRT-S-654	**SKILL ENHANCEMENT COURSE (SEC)-20** **BRIT- SEMESTER-VI** **Clinical Aspect in Radio Imaging (Lab)**	L-0 T-0 P-2 C-1
Course Content:		
1	RFA, Nerve block, HIFU and their applications, Localand general anesthesia drugs used to anesthetize the patient and monitoring of patient	
2	Donning and Doffing of PPE (Face mask, Hand gloves, Hair cover, Gown etc.)	
Text Books:	***1.*** *Recent Research topics in Radio imaging (Diagnostic radiology)* ***2.*** *Focus on advance practices in medical imaging.* ***3.*** *RSNA (Journals from Radiological Society of North America)*	
Reference Books:	*4. AJR (American Journal of Radiology)* *5. IJR (Indian journal of Radiology)* *6. Pubmed (Latest Journals)*	

Course Code: BRT-S-656	**SKILL ENHANCEMENT COURSE (SEC)-22** **BRIT- SEMESTER-VI** **Hospital Practice (Lab)**	L-0 T-0 P-2 C-1
Course Content:		
1	Localanesthesia, General anesthesia	
2	First Aid	
3	Emergency codes	
4	Biomedical waste management.	

Course Code: BRT-S-657	SKILL ENHANCEMENT COURSE (SEC)-22 BRIT- SEMESTER-VI Hospital Management (Lab)	L-0 T-0 P-2 C-1
Course Content:		
1	Management of biomedical waste	
2	Totalpatient care – indoor and outdoor